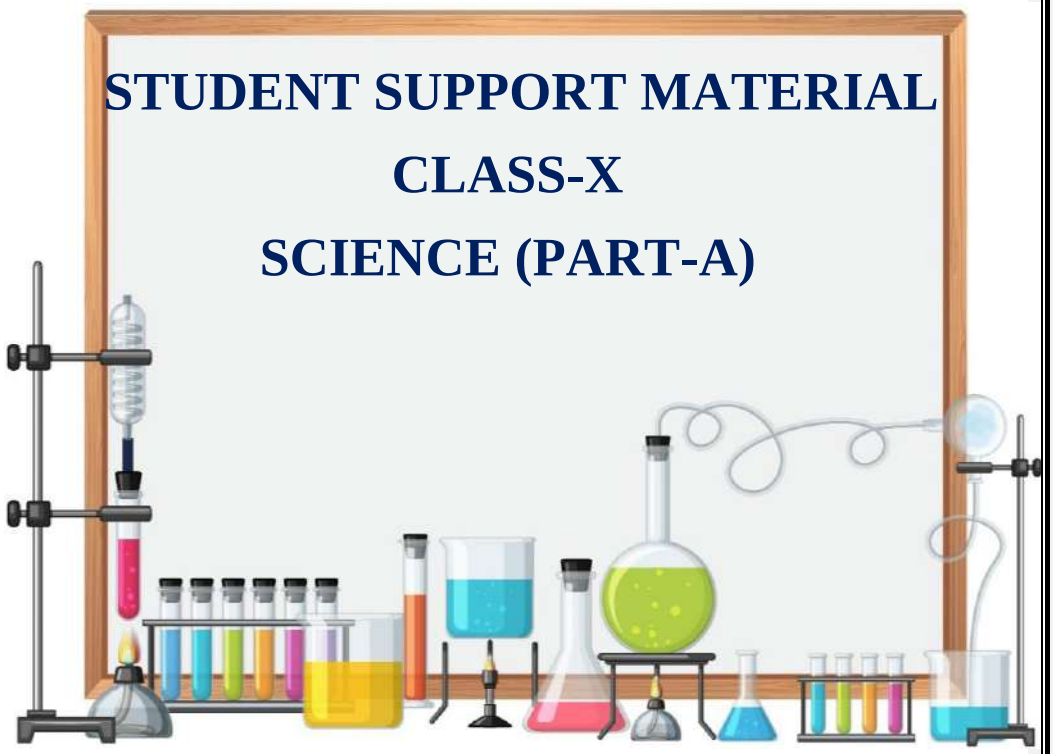
केंद्रीय विद्यालय संगठन, एरणाकुलम संभाग

KENDRIYA VIDYALAYA SANGATHAN

ERNAKULAM REGION



STUDENT SUPPORT MATERIAL

CLASS-X

SCIENCE (PART-A)

AIM THE BEST, STRAIN THE BEST, SCORE THE BEST

STUDENT SUPPORT MATERIAL

SCIENCE

OUR PATRON

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Regional Office, Ernakulam

MESSAGE

I am delighted to announce the release of Support Material / Study Material for the students of Classes X and XII. In our relentless pursuit of academic excellence, we have been constantly revising and upgrading our teaching methodologies and resources. And one of the important resources is the support material which is prepared by Kendriya Vidyalayas for the students of classes X and XII.

This support material is in two parts: Part-A is the core concepts/topics of all subjects which aims minimum level of learning for each student and part-B is a detailed topics/lessons with practice questions which aims to foster a deeper understanding of the subjects, stimulate critical thinking and helps in achieve better score in CBSE exam. Whereas Part-A is planned to be printed and distributed amongst all students whereas Part-B which is the larger one is planned to disseminate through electronic media/blogs.

I hope this support material in two parts will greatly benefit the academic journey of Classes X and XII not only in pursuit of good result in CBSE exams but also helpful for various entrance examinations.

Let's march ahead with dedicated minds and relentless endeavours for better future through better education.

With warm regards

भवदीय,
संतोष कुमार एन
(सन्तोष कुमार एन)
उपायुक्त

CONTENT CREATORS

CHAPTER	NAME OF THE TEACHER & NAME OF THE KV	CONTENT REVIEW I/C
CHEMICAL REACTION & EQUATIONS	Ms.LITTY NINAN, KV AFS AKKULAM Ms.RESMI.C KV AFS AKKULAM	MS.VIDYA V KV CRPF, PALLIPPPURAM
ACIDS, BASES & SALTS	Ms.LEEJA, KV SAP PEROORKKADA Ms.SANDHYA.S, KV SAP PEROORKKADA	MS.DEEPAKUMARI KV THRISSUR
METALS & NON-METALS	Ms.SANDHYA.S, KV .PATTOM SHIFT 1 Ms.SOBHA S NAIR, KV PATTOM SHIFT 2	MS.C V PRASANNA KV OTTRAPPALAM
CARBON & ITS COMPOUNDS	Ms.SHEEJA, KV.No.2 CALICUT MS.SUBHADRA SANKAR KV MALAPPURAM	Ms.DEEPA K BHARATHAN KV No.1 CALICUT .
LIFE PROCESS	Ms.P.SUCHITHRA, KV KANJIKKODE Ms,AMMU CHUNGATH, KV KANJIKKODE	AKHILESWARI K P, PGT BIO KV KANHANGAD
CONTROL & COORDINATION	Ms,LOTUS RANI, KV No.2 KOCHI Ms.SAREENA A, KV NO.1 KOCHI	Ms.BINDU PGT KV OTTAPPALAM
HOW DO ORGANISMS REPRODUCE	Mr.A.SATHEES KUMAR, KV ERNAKULAM Ms.RENJINI S, KV PORT TRUST	P SHEEBA, TGT BIO KV PATTOM SHIFT-1
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LIGHT-REFLECTION & REFRACTION	MS.SEENA C , KV NAD ALUVA Ms.DOLLY DEVASSY, KV THRISSUR	Mr.SAJI R, PGT PHY, KV ADOOR SHIFT- 1
THE HUMAN EYE & COLOURFUL WORLD	Ms.SHEEBA RANI, KV CRPF PALLIPPURAM Ms.ANITHA ELEZABETH KURIEN, KV PANGODE	SATHYAJITH G, PGT PHY KV CHENNEERKARA

ELECTRICITY	Ms.LEKSHMI VENUGOPAL, KV RB KOTTAYAM Ms.SHEENA C GEORGE, KV RB KOTTAYAM	Ms.SANDHYA K ,PGT PHY, KV ADOOR SHIFT 1
MAGNETIC EFFECTS OF ELECTRIC CURRECT	Ms.SHEEJA MENON, KV KADUTHURUTHI Ms.RADHIKA .R, KV NAD ALUVA	Mr.RAJENDER G, PGT PHY, KV IDUKKI
OUR ENVIRONMENT	Ms.RAJANI N, KV PERINGOME Ms.BEENA RANI PS, KV No.1 NAVAL BASE KOCHI	Ms.SAVITHRI DEVI, PGT BIO KV No.1 CPCRI, KASARAGOD
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SAMPLE PAPER PREPARAION CLASS X SCIENCE 2023-24

Sample Paper 1	MS.ROOBY SYED KOODAT	. KV NO.2 KOCHII
Sample Paper 2	MS.SWAPNA SUDHAKAAN	KV PORT TRUST
Sample Paper 3	MS.SANTHA	KV KANJIKODE
Sample Paper 4	Dr.SREEJITH GOPALAN	KV KOLLAM
Sample Paper 5	MS.ATHIRA.MD	KV KOLLAM

CURRICULUM -CLASS X SCIENCE 086 23 -24

No	Unit	Marks
I	**CHEMICAL SUSBSTANCES -NATURE AND BEHAVIOUR**	**25**
II	**WORLD OF LIVING**	**25**
III	**NATURAL PHENOMENA**	**12**
IV	**EFFECTS OF CURRENT**	**13**
V	**NATURAL RESOURCES**	**5**
	TOTAL	**80**
	INTERNAL ASSESSMENT	**20**
	GRAND TOTAL	**100**

Theme: Materials Unit I:

Chemical Substances - Nature and Behaviour Chemical reactions: **Chemical equation**, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, endothermic exothermic reactions, oxidation and reduction.

Acids, bases and salts: Their definitions in terms of furnishing of H+ and OH– ions, General properties, examples and uses, neutralization, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and nonmetals: Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydro carbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Theme: The World of the Living Unit II: World of Living Life processes: 'Living Being'. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and co-ordination in animals and plants: Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health - need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity and Evolution: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction: (**topics excluded - evolution; evolution and classification and evolution should not be equated with progress**).

Theme: Natural Phenomena Unit III: Natural Phenomena

Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required),magnification. Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula(Derivation not required); Magnification. Power of a lens.

Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses. Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life (excluding colour of the sun at sunrise and sunset).

Theme: How Things Work Unit IV:

Effects of Current Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Magnetic effects of current : Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Theme: Natural Resources Unit V: Natural Resources Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

Note for the Teachers: 1. The chapter Management of Natural Resources (NCERT Chapter 16) will not be assessed in the year-end examination. However, learners may be assigned to read this chapter and encouraged to prepare a brief write up to any concept of this chapter in their Portfolio. This may be for Internal Assessment and credit may be given Periodic Assessment/Portfolio). 2. The NCERT text books present information in boxes across the book. These help students to get conceptual clarity. However, the information in these boxes would not be assessed in the year-end examination

. **Unit-II PRESCRIBED BOOKS**: • • Science-Text book for class X- NCERT Publication • - CBSE Publication • Assessment of Practical Skills in Science- Class X- CBSE Publication • Laboratory • Laboratory Manual-Science-Class X, NCERT Publication • • Exemplar Problems Class X – NCERT Publication

PRACTICALS Practical should be conducted alongside the concepts taught in theory classes

LIST OF EXPERIMENTS

1. A. Finding the pH of the following samples by using pH paper/universal indicator: Unit-I

(i) Dilute Hydrochloric Acid (ii) Dilute NaOH solution (iii) Dilute Ethanoic Acid solution (iv) Lemon juice (v) Water (vi) Dilute Hydrogen Carbonate solution

B. Studying the properties of acids and bases (HCl & NaOH) on the basis of their reaction with: Unit-I a) Litmus solution (Blue/Red) b) Zinc metal c) Solid sodium carbonate

2. Performing and observing the following reactions and classifying them into: Unit-I A. Combination reaction B. Decomposition reaction C. Displacement reaction D. Double displacement reaction (i) Action of water on quicklime (ii) Action of heat on ferrous sulphate crystals (iii) Iron nails kept in copper sulphate solution (iv) Reaction between sodium sulphate and barium chloride solutions

3. Observing the action of Zn, Fe, Cu and Al metals on the following salt solutions: Unit-I i) ZnSO4(aq) ii) FeSO4(aq) iii) CuSO4(aq) iv) Al2 (SO4)3(aq) Arranging Zn, Fe, Cu and Al (metals) in the decreasing order of reactivity based on the above result.

4. Studying the dependence of potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. Also plotting a graph between V and I. Unit-IV

5. Determination of the equivalent resistance of two resistors when connected in series and parallel. Unit-IV

6. Preparing a temporary mount of a leaf peel to show stomata. Unit- II

7. Experimentally show that carbon dioxide is given out during respiration. Unit-II

8. Study of the following properties of acetic acid (ethanoic acid): Unit- I i) Odour ii) solubility in water iii) effect on litmus iv) reaction with Sodium Hydrogen Carbonate

9. Study of the comparative cleaning capacity of a sample of soap in soft and hard water. Unit- I

10. Determination of the focal length of: Unit-III i) Concave mirror ii) Convex lens by obtaining the image of a distant object.

11. Tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. Measure the angle of incidence, angle of refraction, angle of emergence and interpret the result. Unit - III

12. Studying (a) binary fission in Amoeba, and (b) budding in yeast and Hydra with the help of prepared slides. Unit-II

13. Tracing the path of the rays of light through a glass prism. Unit-III

14. Identification of the different parts of an embryo of a dicot seed (Pea, gram or red kidney bean

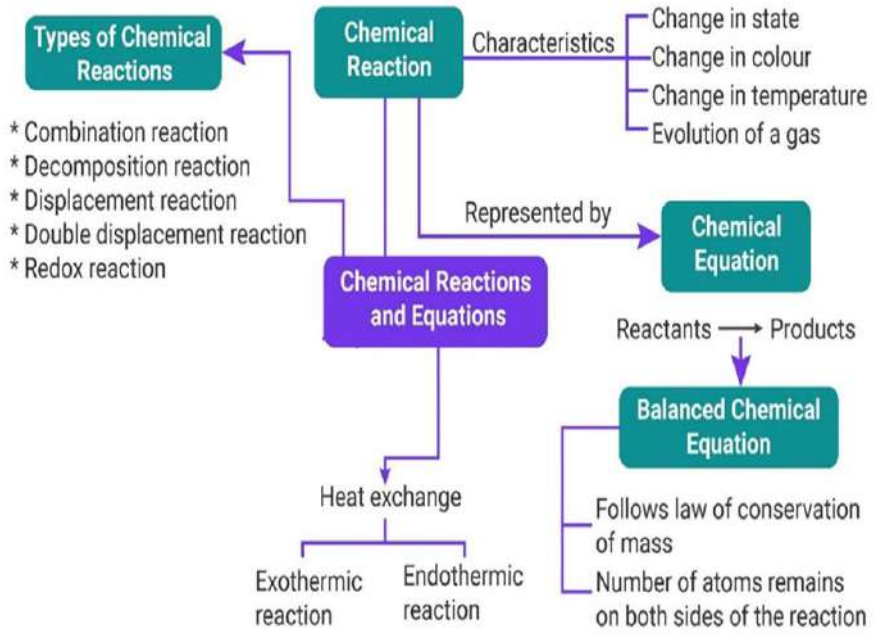
REVISION PLANNER

S.No	CONTENT	REVISION1 With date	REVISION 2 with date	REVISION 3 With date	Sign of stake holder
1	CHEMCIAL REACTIONS AND EQUATIONS				
2	ACIDS,BASES & SALTS				
3	METALS & NONMETALS				
4	CARBON & ITS COMPOUNDS				
5	LIFE PROCESSES				
6	CONTROL & COORDINATION				
7	HOW DO ORGANISMS REPRODUCE				
8	HEREDITY AND EVOLUTION				
9	OUR ENVIRONMENT				
10	LIGHT				
11	HUMAN EYE & COLOURFUL WORLD				
12	ELECTRICITY				
13	MAGNETIC EFFECTS OF CURRENT				
14	SAMPLE PAPERS & SOLUTIONS				

CHAPTER 1

CHEMICAL REACTIONS AND EQUATIONS

MIND MAP



Characteristics of Chemical Reaction

Some important characteristics of chemical reactions are given below:

1. **Formation of a precipitate**
2. **Evolution of gas**
3. **Change in colour**
4. **Change in state**:
5. **Change in temperature**

Balancing of a Chemical Equation Balancing of a chemical equation means making the number of atoms of each element equal on both sides of the equation.

Steps involved in the balancing of a chemical equation:

Step I: To write the word equation-

Step II: To write the skeletal chemical equation-

Step III: To enclose the formulae in boxes-

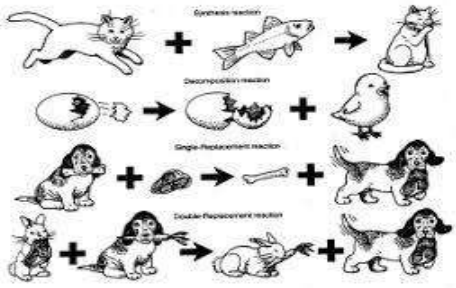
Step IV: To list the number of atoms of different elements on LHS(Reactants) and RHS (Products)

Step V: To select the biggest formula to start balancing

Step VI: To start balancing of different elements which has the highest number of atoms.

Step VII: To check the correctness of the balanced equation-

TYPES OF CHEMICAL REACTIONS



(i) **Combination Reaction**: Reactions in which two or more reactants combine to form one product is called Combination Reactions. (A + B → AB)

e.g.: $2\ Mg_{(s)} + O_{2(g)} \rightarrow 2MgO_{(s)}$ $\quad C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

(ii) Decomposition Reaction: Reactions in which one compound decomposes into two or more compounds or elements are known as Decomposition Reaction. A decomposition reaction is just opposite of combination reaction.

(AB → A + B)

Types of decomposition:

1. **Thermal Decomposition:** The decomposition of a substance on heating is known as Thermal Decomposition.

Example i) $2Pb(NO_3)_2(s) \xrightarrow{\Delta} 2PbO(s) + 4NO_2(g) + O_2(g)$

ii) $CaCO_3$ (Calcium Carbonate) $\xrightarrow[\text{Decomposition}]{\text{Heat}}$ CaO (Calcium oxide) $+ CO_2$

2. Electrolytic Decomposition: Reactions in which compounds decompose into simpler compounds because of passing of electricity, are known as Electrolytic Decomposition. This is also known as Electrolysis.

Example: When electricity is passed in water, it decomposes into hydrogen and oxygen.

$$\underset{\text{Water}}{2H_2O\ (l)} \xrightarrow[\text{(decomposition)}]{\text{Electricity}} 2H_2\ (g) + O_2\ (g)$$

3. Photochemical Decomposition: Reactions in which a compound decomposes because of sunlight are known as photolysis or photo chemical decomposition reaction.

Eg: When silver chloride is put in sunlight, it decomposes into silver metal and chlorine gas.

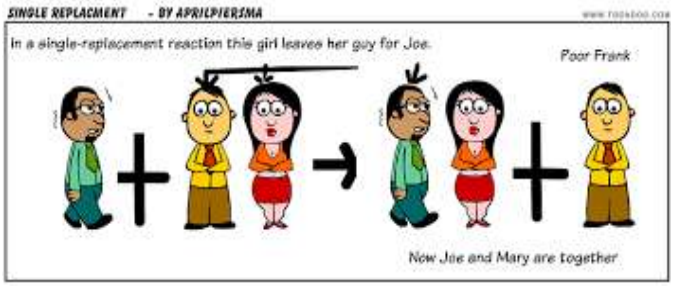
$$\underset{\text{White}}{2AgCl(s)} \xrightarrow{\text{Sunlight}} \underset{\text{Grey}}{2Ag(s)} + Cl_2(g)$$

Photographic paper has a coat of silver chloride, which turns into grey when exposed to sunlight. It happens because silver chloride is colourless while silver is a grey metal.

(iii) **Displacement Reaction**: The chemical reaction in which a more reactive element displaces a less reactive element from a compound is known as a displacement reaction

(A + BC → AC + B)

Displacement reaction takes place only when 'A' is more reactive than B.

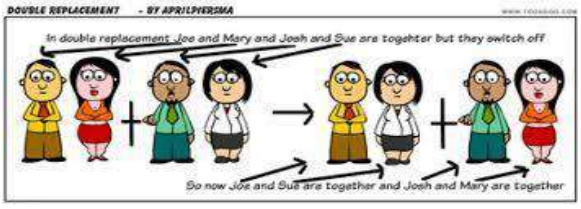


Eg: $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$

$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

(iv) **Double Displacement Reaction**: Reactions in which ions are exchanged between two reactants forming new compounds are called Double Displacement Reactions.

(AB + CD →AC + BD)



i) When the solution of barium chloride reacts with the solution of sodium sulphate, white precipitate of barium sulphate is formed along with sodium chloride.

$BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s)$ (Precipitate) + 2NaCl(aq)

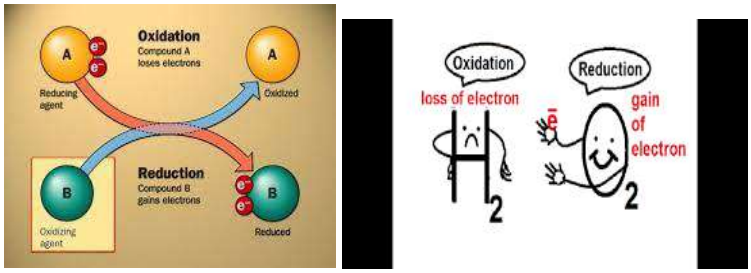
Precipitation Reaction: The reaction in which precipitate is formed by the mixing of the aqueous solution of two salts is called precipitation reaction.

Example: $AgNO_3 + NaCl \rightarrow AgCl$ (precipitate)+ $NaNO_3$

(v) Neutralization Reaction: The reaction in which an acid reacts with a base to form salt and water by an exchange of ions is called Neutralization Reaction.

Example: $NaOH + HCl \rightarrow NaCl + H_2O$

(vi) Redox reactions



Oxidation: Addition of oxygen or removal of hydrogen from a compound is known as oxidation.

Elements or compounds in which oxygen or non-metallic element is added or hydrogen or metallic element is removed are called to be oxidized.

Reduction: Addition of hydrogen or removal of oxygen from a compound is called Reduction.

The compound or element which undergoes reduction is called to be reduced.

Oxidizing agent:

• The substance which gives oxygen for oxidation is called an Oxidizing agent.

• The substance which removes hydrogen is also called an Oxidizing agent.

Reducing agent:

• The substance which gives hydrogen for reduction is called a reducing agent.

• The substance which removes oxygen is also called a reducing agent.

The reaction in which oxidation and reduction both take place simultaneously is called **Redox reaction**.

When copper oxide is heated with hydrogen, then copper metal and water are formed.

$CuO + H_2 \rightarrow Cu + H_2O$

(i) In this reaction, CuO is changing into Cu. Oxygen is being removed from copper oxide.

Removal of oxygen from a substance is called reduction, so copper oxide is being reduced to copper.

(ii) In this reaction, H_2 is changing to H_2O. Oxygen is being added to hydrogen. Addition of oxygen to a substance is called oxidation, so hydrogen is being oxidised to water.

• The substance which gets oxidised is the reducing agent.

• The substance which gets reduced is the oxidizing agent.

(vii) **Exothermic and Endothermic Reactions**:

Exothermic Reaction: Reaction in which energy is produced is called Exothermic Reaction.

Most of the decomposition reactions are exothermic.

Example: (i)Respiration is an exothermic reaction in which energy is released.

$$\underset{\text{Glucose}}{C_6H_{12}O_6\,(aq)} + 6O_2\,(g) \longrightarrow 6CO_2\,(g) + 6H_2O\,(l) + \text{Energy}$$

(ii)When quick lime (CaO) is added to water, it releases heat energy.

$$\underset{\text{Calcium oxide}}{CaO(s)} + \underset{\text{Water}}{H_2O(l)} \longrightarrow \underset{\text{Calcium hydroxide}}{Ca(OH)_2(aq)} + \text{Heat}$$

Endothermic Reaction: A chemical reaction in which heat energy is absorbed is called Endothermic Reaction.

Example: Decomposition of calcium carbonate.

$$\underset{\text{Calcium carbonate}}{CaCO_3\,(s)} \xrightarrow{\text{Heat}} CaO\,(s) + CO_2\,(g)$$

SECTION A

MULTIPLE CHOICE QUESTIONS

1. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

Identify the substance oxidized in the above equation.

(a) $MnCl_2$ (b) HCl (c) H_2O (d) MnO_2

2. Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is:

(a) 1: 1 (b) 2:1 (c) 4:1 (d) 1:2

3. $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$

The above reaction is an example of:

(a) combination (b) double displacement (c) decomposition (d) displacement

4. When green coloured ferrous sulphate crystals are heated, the colour of the crystal changes because

(a) it is decomposed to ferric oxide (b) it loses water of crystallisation

(c) it forms SO_2 (d) it forms SO_3

5. $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$; is an example of

(i) displacement reaction (ii) double displacement reaction

(iii) neutralisation reaction (iv) combination reaction.

(a) (i) and (ii) (b) (ii) and (iii) (c) (iii) and (iv) (d) (i) and (iv)

6. What is observed when a solution of potassium iodide is added to silver nitrate solution?

(a) No reaction takes place (b) White precipitate of silver iodide is formed

(c) yellow precipitate of Agl is formed (d) Agl is soluble in water.

7. Identify 'x', 'y' and 'z' in the following balanced reaction.

$$x\ Pb(NO_3)_2\ (s) \xrightarrow{Heat} y\ PbO + z\ NO_2 + O_2$$

(a) 2, 4, 2 (b) 2, 2, 4 (c) 2, 4, 4 (d) 4, 2, 2

8. Oxidation involves

(i) gain of electron (ii) loss of electron

(iii) addition of oxygen or electronegative element

(iv) removal of hydrogen or electropositive element

(a) (i), (ii), (iii) (b) (ii), (iii), (iv)

(c) (i), (iii), (iv) (d) (i), (ii), (iv)

9. Which of the following statements about the given reaction are correct?

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(g) + 4H_2(g)$

(i) Iron metal is getting oxidised (ii) Water is getting reduced

(iii) Water is acting as reducing agent (iv)Water is acting as an oxidising agent

(a) (i), (ii) and (iii) (b) (iii) and (iv)

(c) (i), (ii) and (iv) (d) (ii) and (iv)

10. Barium chloride on reacting with ammonium sulphate forms barium sulphate and ammonium chloride. Which of the following correctly represents the type of the reaction involved?

(i) Displacement reaction (ii) Precipitation reaction

(iii) Combination reaction (iv) Double displacement reaction

(a) (i) only (b) (ii) only (c) (iv) only (d) (ii) and (iv)

MULTIPLE CHOICE QUESTIONS

ANSWERS 1.b 2. b 3.d 4. b 5.b 6.c 7.b 8. b 9.c 10. d

SECTION B

ASSERTION- REASON TYPE QUESTIONS

DIRECTION: Each of these questions contains an assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are correct and reason is the correct

explanation of Assertion.

(b) If both Assertion and Reason are correct, but reason is not the correct

explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If Assertion is incorrect but Reason is correct.

Q1. ***Assertion (A):*** Photosynthesis is considered as an endothermic reaction.

Reason (R): Energy gets released in the process of photosynthesis

Q2. ***Assertion (A):*** Decomposition of vegetable matter into compost is an example of exothermic reactions.

Reason (R): Exothermic reaction are those reactions in which heat is evolved.

Q3. ***Assertion (A):*** When HCl is added to zinc granules, a chemical reaction occurs.

Reason (R): Evolution of a gas indicates that the chemical

reaction is taking place.

Q4. ***Assertion (A):*** Calcium carbonate when heated gives calcium oxide and water.

Reason (R): On heating calcium carbonate, decomposition reaction takes place.

Q5. ***Assertion (A):*** Chemical reaction changes the physical and chemical properties of a substance

Reason (R): Chemical change involves a change in the chemical composition of matter, and a new substance is formed

6. ***Assertion (A):*** AgBr is used in photographic and X-ray film.

Reason (R): AgBr is photosensitive and changes to Ag and bromine in presence of sunlight and undergoes decomposition reaction.

7. ***Assertion (A):*** Magnesium ribbon keeps on burning in atmosphere of nitrogen.

Reason (R): Magnesium reacts with nitrogen to form magnesium nitrides and this reaction is combination reaction.

8. ***Assertion (A):*** Zinc reacts with sulphuric acid to form zinc sulphate and hydrogen gas and it is displacement reaction.

Reason (R): Zinc reacts with oxygen to form zinc oxide.

9. ***Assertion (A):*** $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$ is redox reaction.

Reason (R): MnO_2 oxidises HCl to Cl_2 and gets reduced to $MnCl_2$.

10. ***Assertion (A):*** White silver chloride turns grey in sunlight.

Reason (R): Decomposition of silver chloride in presence of sunlight takes place to form silver metal and chlorine gas.

ASSERTION – REASON ANSWER KEY

Q NO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
ANS	**C**	**A**	**A**	**A**	**A**	**A**	**A**	**B**	**A**	**A**

SECTION C

CASE STUDY QUESTIONS

Reactions in which one element takes place of another element in a compound, are known as displacement reactions. In general, more reactive elements displaces a less reactive element from its compound. In all single displacement reactions, only one element displaces another element from its compound. The single displacement reactions are, however, written as just displacement reactions. The displacement reaction between iron (III) oxide and powdered aluminium produces so much heat that iron metal obtained is in molten form.

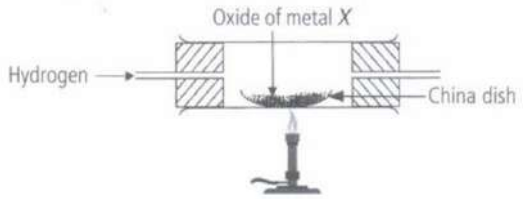
(i) Copper displaces which of the following metals from its salt solution?

(a) $ZnSO_4$ (b) $FeSO_4$ (c) $AgNO_3$ (d) $NiSO_4$
Answer: c

(ii) When zinc reacts with dilute sulphuric acid, the gas evolved is

(a) red in colour and have a sweet smelling
(b) green in colour and have a foul smell
(c) colourless, odourless and burns with a pop sound
(d) colourless, pungent smelling and burns with a pop sound
Answer: c

(iii) When dry hydrogen is passed over a heated oxide of metal X using the apparatus shown below, a reddish-brown residue is obtained



The reddish -brown residue could be

(a) copper (b) lead (c) silver (d) zinc

Answer: a

(iv) Which of the following reactions is a displacement reaction?

(a) $CaO + H_2O \longrightarrow Ca(OH)_2$ (b) $MgCO_3 \longrightarrow Mg + CO_2$
(c) $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu$ (d) $H_2 + Cl_2 \longrightarrow 2HCl$
Answer: c
(v) When dilute hydrochloric acid is added to granulated zinc placed in a test tube, the observation made is

(a) the surface of the metal turns shining
(b) the reaction mixture turns milky
(c) greenish yellow gas is evolved
(d) the colourless and odourless gas evolves with a pop sound.
Answer: d

SECTION D- Short Answer Type Questions:

Question 1 List four observations that help us to determine whether a chemical reaction has taken place. [Board Term-I, 2012]
Answer :
(i) Evolution of gas (ii) Change in temperature
(iii) Change in state (iv) Change in colour

Question 2. What is observed when carbon dioxide gas is passed through lime water.
(i) For a short duration (ii) For long duration?
Also, write the chemical equations for the reaction involved. [Board Term I, 2016]
Answer :
(i) For short duration:
Limewater turns milky due to the formation of $CaCO_3$, Which is insoluble in water.

$$\underset{\text{Lime water}}{Ca(OH)_2\,(aq)} + CO_2\,(g) \rightarrow \underset{\text{White ppt.}}{CaCO_3\,(s)} + H_2O\,(l)$$

(ii) For Long duration:
A clear solution is obtained due to the formation of calcium bicarbonate. $Ca(HCO_3)_2$ which is soluble in water

$$CaCO_3(s) + H_2O(l) \rightarrow Ca(HCO_3)_2(aq)$$

Question 3 Write the balanced chemical equation for the following reaction and write the name of the reaction
Barium Chloride + Aluminium Sulphate →→ Barium Sulphate + Aluminium Chloride
Answer :

$$3BaCl_2 + Al_2(SO_4) \rightarrow 3BaSO_4 + 2AlCl_3$$

It is a double displacement reaction.

Question 4 Why do we store silver chloride in dark coloured bottles? Explain in brief. [CBSE 2010]
Answer : Silver chloride on exposure to sunlight may decompose as per the following reaction

$$2AgCl \rightarrow 2Ag + Cl_2$$

Therefore it is stored in dark coloured bottles.

Question 5. Define a combination reaction. Give one example of a combination reaction which is also exothermic.
Answer: A combination reaction is said to have occurred when two or more than two substances combine to form a single substance.

$$\underset{Quick\ lime}{CaO} + H_2O \rightarrow Ca(OH)_2 + Heat$$

Question 6. What happens when an iron nail is put inside the copper sulphate solution? Write a reaction with observation.
Answer: Iron nail turns brown, blue colour of $CuSO_4$ changes to colourless.

$$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$$

Question 7 Name the raw materials that are required for the manufacture of washing soda by Solvay process. Describe the chemical reactions involved in the process. [2007]
Answer: The raw materials needed for the manufacture of washing soda are NaCl (sodium chloride), water, ammonia gas, and limestone to give CO_2 gas. Chemical reactions involved:

$$NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3.$$

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2\uparrow + H_2O$$

$$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3.10H_2O$$

Question 8 (i) State the law which is followed in balancing a chemical equation.
(ii) Balance the following chemical equation:
$Fe + H_2O \rightarrow Fe_3O_4 + H_2$ [Board Term-I, 2012]

Answer :(i) Mass can neither be created nor destroyed in a chemical reaction-Law of conservation of mass.
(ii) $3\ Fe + 4\ H_2O \longrightarrow Fe_3O_4 + 4H_2$

Question 9 A white solid when dropped in water produces a hissing sound. What the solid may be? Give the chemical reaction for the above. Name the product formed. [2010]
Answer : White solid is quicklime CaO
Chemical reaction involved with the name of products is

$$\underset{\text{Quick lime}}{CaO} + H_2O \rightarrow \underset{\text{Slaked lime}}{Ca(OH)_2(aq)} + Heat(aq)$$

Question 10 When Hydrogen gas is passed over heated copper (II) oxide, copper and steam are formed. Write the balanced chemical equation with physical states for this reaction. State what kind of chemical reaction is this?
[Board Term-I, 2015]
Answer: $CuO(s) + H_2(g) \xrightarrow{Heat} Cu(s) + H_2O(g)$
This is a Redox reaction.

SECTION E (LONG ANSWER QUESTIONS)

1. (a) 2g of ferrous sulphate crystals are heated in a dry boiling tube.
(i) List any two observations.
(ii) Name the type of chemical reaction taking place.
(iii) 'Write the chemical equation for the reaction.

(b) Write the chemical equation of the reaction in which the following changes have taken place with an example of each:
(i) Change in colour (ii) Change in temperature (iii) Formation of precipitate
Answer:

$$(iii)\ 2FeSO_4\ (s) \xrightarrow{\text{heat}} Fe_2O_3\ (s) + SO_2\ (g) + SO_3\ (g)$$

a) (i) •Green colour of Fe SO_4 disappears and reddish brown solid is formed.
• Smell of burning Sulphur.
(ii) Decomposition reaction
b) (i)Cu (s) + 2$AgNO_3$ (aq)————> $Cu(NO_3)_2$(aq) + 2Ag
The solution will become blue in colour and shiny silver metal will be deposited.
(ii) NaOH + HCl ————> NaCl + H_2O+ heat
The temperature will increase because heat will be evolved.
(iii) $Pb(NO_3)2$ (aq) + 2KI (aq)————> PbI_2 (s) + 2KNO_3 (aq)
Yellow ppt
Yellow precipitate of PbI_2 will be formed.

2. Raju made the following observations during the reaction of some metals with dilute hydrochloric acid.

(a) Silver metal does not show any change

(b) The temperature of the reaction mixture rises when aluminium (Al) is added.

(c) The sodium metal reaction is highly explosive.

(d) Some gas bubbles are seen when lead (Pb) is reacted with the acid.

Explain these observations giving suitable reasons.

Answer: (a) Silver does not show any characteristics change because silver is less reactive than hydrogen. Thus, it cannot displace hydrogen from dilute hydrochloric acid.

(b) The reaction between aluminium (Al) and hydrochloric acid is highly exothermic. Thus, the temperature of the reaction mixture rises.

(c) Sodium is a highly reactive metal. It reacts with hydrochloric acid, vigorously forming hydrogen gas and a large amount of heat.

(d) When lead reacts with hydrochloric acid, the gas bubbles observed are hydrogen gas.

$$Pb\,(s) + 2\,HCl\,(aq) \rightarrow PbCl_2\,(s) + H_2\,(g)$$

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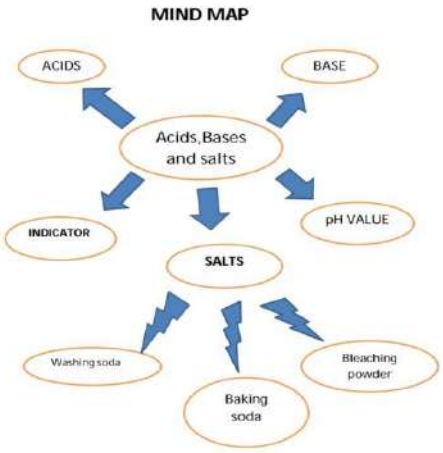
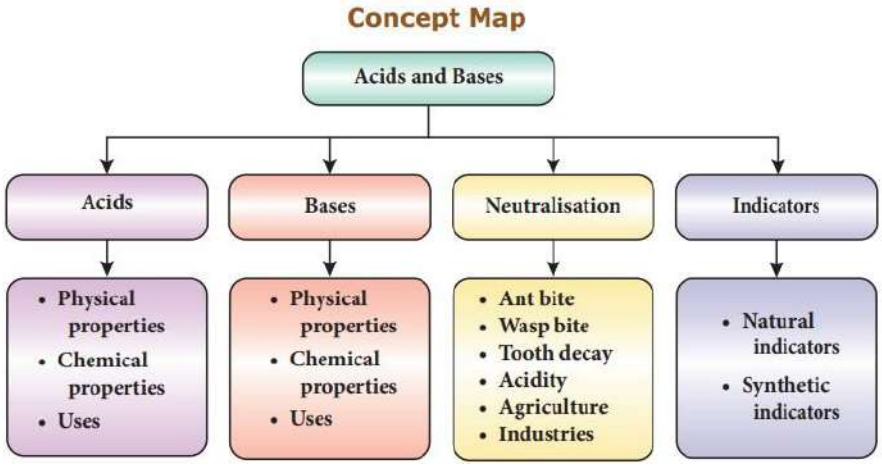
CHAPTER 2-

-ACIDS, BASES AND SALTS





FOCUS AREAS

Acids: Substances which turn blue litmus solution red are called acids. Acids are sour in taste

Bases: Substances which change red litmus solution blue are called bases. They are bitter in taste.

Mineral Acids: Acids which are obtained from minerals like sulphates, nitrates, chlorides etc. Are called mineral acids, e.g., H_2SO_4(Sulphuric acid), HNO_3(Nitric acid) and HCl (Hydrochloric acid).

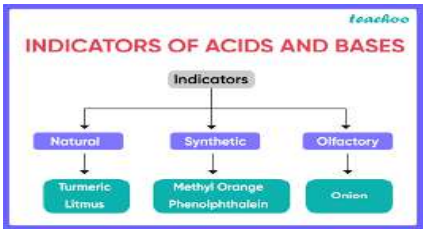
Organic Acids: Acids which are obtained from plants and animals are called organic acids.e.g.citric acid, ascorbic acid, tartaric acid, lactic acid, acetic acid.

Hydronium Ions(H_3O^+): They are formed by reaction of H+ (from acid) and H_2O. It is because $H^+$is unstable.

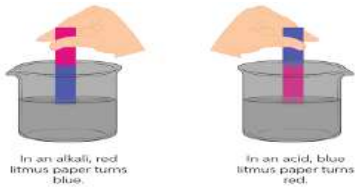
Strong Acids: Acids which dissociate into ions completely are called strong acids. E.g. H_2SO_4,HCl

Weak Acids: Acids which do not dissociate into ions completely are called weak acids E.g. Citric acid, acetic acid.

Indicators - Indicators are substances which indicate the acidic or basic nature of the solution by their colour change.



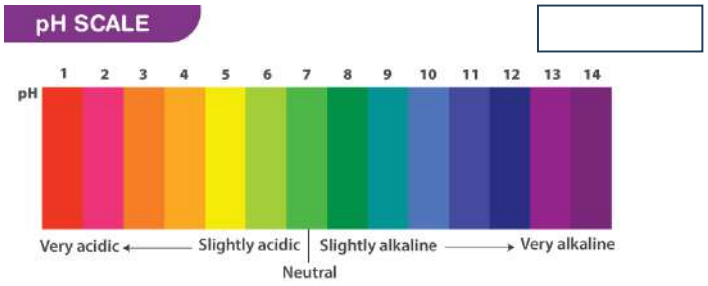
Litmus:



Indicator	Colour in acid (pH < 7)	Colour at pH = 7	Colour in base (pH > 7)
Red cabbage water	red, pink	purple	blue, green, yellow
Red onion water	red	violet	green
Turmeric water	yellow	yellow	red
Phenolphthalein	colourless	colourless	pink, red
Bromothymol blue	yellow	green	blue
Red litmus	red	red	blue
Blue litmus	red	blue	blue
Universal indicator	red, orange, yellow	green	Blue, violet, purple

Olfactory indicators: These are chemical substances whose odour changes in acidic or basic medium. For example, onion, vanilla and clove oil.

Universal Indicator: A universal indicator is a mixture of indicators which shows a gradual but well-marked series of colour changes over a very wide range of change in concentration of H^+ ion.



CHEMICAL REACTIONS OF ACIDS & BASES:

(i)Reaction of acid or base with metal:

Acid + Metal → Salt + Hydrogen gas

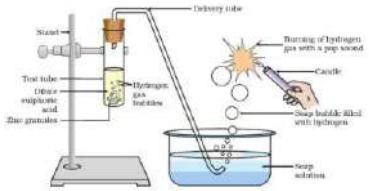
Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidizing agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO, NO_2).

The metal Copper (Cu) does not liberate Hydrogen gas with acids.

A few metals like zinc, lead and aluminium react with bases to give off hydrogen.

$2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$ (sodium zincate)

Test for Hydrogen gas: POP test



(ii) Reaction of acids with metal hydrogen carbonate and metal carbonates:

Metal carbonate + Acid → Salt + H_2O + CO_2

Metal hydrogen carbonate + Acid → Salt + H_2O + CO_2

For example,

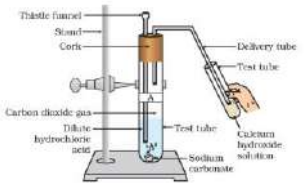
$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$

The released CO_2 gas turns lime water milky due to formation of $CaCO_3$.

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(Lime water) *(Milky white)*



(iii) Neutralisation reaction: A chemical reaction between an acid and a base to give a salt and water is known as neutralisation reaction.

Base + Acid → Salt + Water

Eg: $NaOH + HCl \rightarrow NaCl + H_2O$

(iv) Reactions of metal oxides with acids

Metal oxide + Acid → Salt + Water

Eg: $CuO + 2HCl \rightarrow CuCl_2 + H_2O$

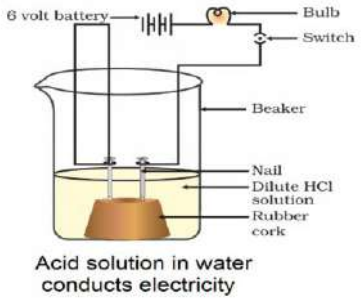
Copperoxide *Copper Chloride*

(v) Reactions of non-metallic oxide with base

Non-metallic oxide + Base→ Salt + Water

Eg: $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$

What does acids and bases have in common? Ions



Acid solution in water conducts electricity

Chlor-Alkali Process:

$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

When electricity is passed through an aqueous solution of sodium chloride (called brine), Chlorine gas is given off at the anode, and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode. The process is called the chlor-alkali process.

Uses of Sodium Hydroxide: -

(i) It is used for de-greasing Metals. (ii) In soaps and detergents.

(iii) In Paper making. (iv) For making of artificial fibres.

Uses of Hydrochloric acid:
HCl is used in manufacturing of medicines, cosmetics and ammonium chloride and also used for cleaning steel.

Uses of hydrogen:

(i) It is used as fuels. (ii) It is used in Margarine. (iii) In manufacturing of ammonia for fertilisers.

Uses of Chlorine gas :-

1.It is used In water treatment. 2.In swimming pool.

3.In manufacturing of PVC, CFCs and pesticides. 4.It is also used as disinfectants.

Some Important Compounds and their uses

Common Name	Chemical name/ Chemical formula	Preparation	Uses
Washing soda	Sodium carbonate decahydrate $Na_2CO_3.10H_2O$	$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$	Manufacture of borax, caustic soda, softening of hard water
Baking soda	Sodium hydrogen carbonate $NaHCO_3$	$NaCl+NH_3+CO_2+H_2O \rightarrow NaHCO3 + NH_4Cl$	Used as antacid, ingredient of baking powder
Bleaching powder	Calcium oxychloride $CaOCl_2$	By the action of chlorine on dry slaked lime $Ca(OH)_2+Cl_2 \rightarrow CaOCl_2+H_2O$	Bleaching clothes, used as oxidizing agent, disinfecting water, manufacture of chloroform
Plaster of Paris	Calcium sulphate hemihydrate $CaSO_4.1/2H_2O$	$CaSO_4.2H_2O \xrightarrow{373K\ (Heat)} CaSO_4.1/2\ H_2O + 1.1/2H_2O$	Plastering fractured bones, making toys, decorative materials, statues

Importance of pH in everyday life:

(i) If pH of rainwater is less than 5.6, it is called **acid rain.**

(ii) **pH in our digestive system:** Our stomach produces digestive juices/hydrochloric acid (HCl), which helps in the digestion of food without harming the stomach. However, sometimes the stomach produces too much of acid and this causes indigestion, which is accompanied by pain and irritation. To get rid of this pain, people use antacids like magnesium hydroxide. These antacids neutralise the excess acid formed.

(iii) **pH change as the cause of tooth decay:** Tooth decay starts when the pH of the mouth is lower than 5.5. Tooth enamel, made up of calcium phosphate is the hardest substance in the body. It does not dissolve in water but is corroded when the pH in the mouth is below 5.5. Using toothpaste, which are generally basic, for cleaning the teeth can neutralise the excessacid and prevent tooth decay.

(iv)**Bee-sting** leaves an acid which causes pain and irritation. Using a mild base like baking soda on the stung area gives relief. Stinging hair of nettle leaves inject methanoic acid causing a burning pain. A traditional remedy is rubbing the area with the leaf of the dock plant.

(v) Various fluids in our body work within a particular range of pH such as, pH of **human blood** should be between 7.3 to 7.5.

(vi) **For the growth of plants**, a particular pH range of soil is essential. Usually, neutral soil is best for crops. If the soil is acidic, farmers treat the soil with quick lime or slaked lime.

(vii) The tarnished surface of a copper vessel due to the formation of copper oxide layer (which is basic) can be cleaned by rubbing with lemon (which is acidic).

QUESTION BANK

MCQ

1. Which one of the following salts does not contain water of crystallisation?
(a) Blue vitriol (b) Baking soda (c) Washing soda (d) Gypsum

2. In terms of acidic strength, which one of the following is in the correct increasing order?
(a) Water < Acetic acid < Hydrochloric acid
(b) Water < Hydrochloric acid < Acetic acid
(c) Acetic acid < Water < Hydrochloric acid
(d) Hydrochloric acid < Water < Acetic acid

3.Sodium hydroxide turns phenolphthalein solution
(a) pink (b) yellow (c) colourless (d) orange

4.Nettle sting is a natural source of which acid?
(a) Methanoic acid (b) Lactic acid (c) Citric acid (d) Tartaric acid

5.An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?
(a) Baking powder (b) Lime (c) Ammonium hydroxide solution (d) Hydrochloric acid

6.Lime water reacts with chlorine to give
(a) bleaching powder (b) baking powder (c) baking soda (d) washing soda

7. Alkalis are
(a) acids, which are soluble in water (b) acids, which are insoluble in water
(c) bases, which are insoluble in water (d) bases, which are soluble in water

8. Sodium carbonate is a basic salt because it is a salt of a
(a) strong acid and strong base (b) weak acid and weak base
(c) strong acid and weak base (d) weak acid and strong base

9. Brine is an
(a) aqueous solution of sodium hydroxide (b) aqueous solution of sodium carbonate
(c) aqueous solution of sodium chloride (d) aqueous solution of sodium bicarbonate

10. What is formed when zinc reacts with sodium hydroxide?
(a) Zinc hydroxide and sodium (b) Sodium zincate and hydrogen gas
(c) Sodium zinc-oxide and hydrogen gas (d) Sodium zincate and water

Ans: 1. (b) ,2 (a) , 3(a) ,4 (a),5 (d) ,6(a),7(d), 8(d), 9 (c),10 (b)

VERY SHORT ANSWER TYPE QUESTIONS

1.Write a balanced chemical equation for the reaction between sodium carbonate and hydrochloric acid indicating the physical state of the reactants and the products.
Answer.

$$Na_2CO_3(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

2.Name the gas usually liberated when a dilute acid reacts with a metal. What happens when a burning candle is brought near this gas?
Answer. H_2 gas is liberated. It burns with pop sound when burning candle is brought near the gas.

3.Which one of these has a higher concentration of H^+ ions ? 1 M HCl or 1 M CH_3COOH
Answer.1 M HCl has higher concentration of H^+ ions.

4.**Name the sodium compound which is used for softening hard water.**
Ans: The compound which is used for softening hard water is Sodium carbonate

5.If someone is suffering from the problem of acidity after overeating, which of the following would you suggest as remedy ? Lemon juice, Vinegar, Baking soda solution .Give reason for your choice.

Solution
Baking soda, because it is basic in nature and will neutralize the excessive acid formed in the stomach.
Lemon juice on the other hand is itself acidic in nature and will only aggravate the condition.

6.A white powder is added while baking breads and cakes to make them soft and fluffy. Write the name of the powder. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during baking.
Answer. Baking powder.
It consist of sodium hyrogencarbonate and tartaric acid.
Sodium hydrogencarbonate gives CO_2 which makes cake soft and fluffy. Tartaric acid neutralizes the bitterness due to sodium carbonate produced.

$$2NaHCO_3(s) \xrightarrow{heat} Na_2CO_3(s) + CO_2(g) + H_2O(l)$$

7. Dry pellets of a base 'X' when kept in open absorbs moisture and turns sticky. The compound is also formed by chlor-alkali process. Write chemical name and formula of X. Describe chlor-alkali process with balanced chemical equation. Name the type of reaction occurs when X is treated with dilute hydrochloric acid. Write the chemical equation. (ii) While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?Answer.
(i) X is sodium hydroxide, NaOH.
When sodium chloride solution (brine solution) is electrolysed, sodium hydroxide solution is formed. H2 and Cl2 gases are liberated. This is chlor-alkali process.

$$2NaCl + 2H_2O \xrightarrow{electrolysis} 2NaOH + H_2 + Cl_2$$

$$\underset{\text{'X'}}{NaOH} + HCl \longrightarrow NaCl + H_2O$$

The above reaction is neutralization reaction.
(ii)It is because process is highly exothermic. If water is added to acid, bottle of acid will break.

8. (i) Draw a labelled diagram to show the preparation of hydrogen chloride gas in laboratory.
(ii) Test the gas evolved first with dry and then with wet litmus paper. In which of the two cases, does the litmus paper show change in colour?
(iii) State the reason of exhibiting acidic character by dry HCl gas/HCl solution.

Ans.(i) refer textbook for diagram

(ii) There is no change in the colour of 'dry' blue litmus paper but 'moist' blue litmus paper turns red if brought near the mouth of the test tube.
This shows that HCl gas does not show acidic behaviour in absence of water but it shows acidic behaviour in presence of water.

(iii) When HC1 gas dissolves in water, forms hydrochloric acid solution i.e., $HCl_{(aq)}$ which then produces $H^+_{(aq)}$ or $H_3O^+_{(aq)}$ ions.
$HCl + H_2O \rightarrow H_3O^+ + Cl^-$
Due to the presence of H^+ or H_3O^+ it shows acidic behaviour.

9. Why do HCl, HNO3, **etc. show acidic characters in aqueous solution while solutions of compounds like alcohol and glucose do not show acidic character?**
Ans: In their aqueous form, compounds like hydrochloric acid and nitric acid, release hydrogen ions, which signals acidic character.

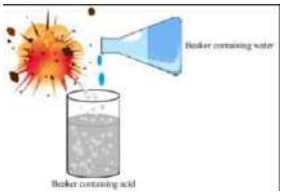
On the other hand, compounds like alcohol and glucose cannot release hydrogen ions. Therefore, they show no acidic properties.
(ii) An aqueous solution of an acid releases ions in aqueous solutions. These ions conduct electricity.
(iii) (a) Most acidic is A (pH = 6) and most basic is C (pH = 12).
(b) The increasing order of H^+ ion concentration is : C < B < D < A.
(c) The pH paper acquires dark purple colour in solution C and green in solution D.

10. A compound 'A' on heating at 370K**gives 'B' used as plaster for supporting defractured bones in the right position. 'B' on mixing with water changes to 'A'. Identify 'A' and 'B' and write the chemical reaction.**
Ans: The reaction can be given by:

$$CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4.2H_2O$$

'B'- Plaster of Paris 'A'- Gypsum

SOURCE BASED QUESTIONS



Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Mixing an acid or base with water results in decrease in the concentration of ions(H_3O^+/OH^-) per unit volume. Such a process is called dilution and the acid or the base is said to be diluted.

1.What is the process of adding acid or the base to water called?

Ans- The process of adding acid or base to water is called dilution.

2.The process of adding acid to water gives what kind of reaction?

Ans-The process of adding acid to water produces exothermic reaction.

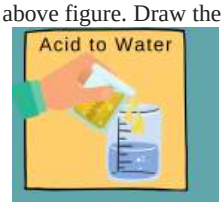
3.What happens to the concentration of ions per unit volume when water is added to acid or base?

Ans- The concentration of ions decreases per unit volume.

4. What are the precautions to be taken while working with acids in a laboratory?

Ans- Wearing lab coat, gloves and eye protecting goggles. One should wear long sleeve lab coat and shoes that cover the feet.

5.Identify the error in the above figure. Draw the correct figure.



Ans: Water should not be poured into a beaker containing acid. It causes an explosive reaction.

LONG ANSWER QUESTIONS

1. (a) Write the chemical name and formula of marble.
(b) It has been found that marbles of Taj are getting corroded due to development of industrial areas around it. Explain this fact giving a chemical equation.
(c) (i) What happens when CO_2 is passed through lime water?
(ii) What happens when CO_2 is passed in excess through lime? (Board Term I, 2013)
Answer:
(a) The chemical formula of marble (lime stone) is $CaCO_3$. Its chemical name is calcium carbonate. (b) Taj Mahal, one of the seven wonders of the world situated at Agra, is continuously losing its luster day by day due to rapid industrialisation which causes acid rain.
The sulphuric acid present in the acid rain causes the marble ($CaCO_3$) to be washed off as calcium sulphate ($CaSO_4$), leading to the deterioration of such a splendid piece of architecture.
$CaCO_{3(s)} + H_2SO_{4(aq)} \rightarrow CaSO_{4(aq)} + H_2O_l + CO_{2(g)}$

c) (i) When CO_2 is passed through lime water for short interval of time, it turns milky due to the formation of insoluble calcium carbonate.

$$\underset{\text{Calcium hydroxide (Lime water)}}{Ca(OH)_{2(aq)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}} \longrightarrow \underset{\text{Calcium carbonate (White ppt.)}}{CaCO_{3(s)}\downarrow} + \underset{\text{Water}}{H_2O_{(l)}}$$

(ii)If CO_2 is passed for long duration through lime water, the white precipitate formed dissolves due to the formation of soluble calcium hydrogen carbonate and the solution becomes clear.

$$\underset{\text{Calcium carbonate (insoluble)}}{CaCO_{3(s)}} + \underset{\text{Carbon dioxide}}{CO_{2(g)}} + \underset{\text{Water}}{H_2O_{(l)}} \longrightarrow \underset{\text{Calcium hydrogen carbonate (soluble)}}{Ca(HCO_3)_{2(aq)}}$$

2.Sugandha prepares HCl gas in her school laboratory using certain chemicals. She puts both dry and wet blue litmus papers in contact with the gas.
(i) Name the reagents used by Sugandha to prepare HCl gas.
(ii) State the colour changes observed with the dry and wet blue litmus papers.
(iii) Show the formation of ions when HCl gas combines with water. (Board Term I, 2013)
Answer:
(i) Dense white fumes of hydrogen chloride gas are evolved on heating solid sodium chloride with concentrated sulphuric acid.

$$\underset{\text{Sodium chloride}}{NaCl_{(s)}} + \underset{\text{Conc. sulphuric acid}}{H_2SO_4} \longrightarrow \underset{\text{Sodium hydrogen sulphate}}{NaHSO_{4(aq)}} + \underset{\text{Hydrogen chloride}}{HCl_{(g)}}\uparrow$$

(ii) There is no change in the colour of 'dry' blue litmus paper but 'moist' blue litmus paper turns red if brought near the mouth of the test tube.
This shows that HCl gas does not show acidic behaviour in absence of water but it shows acidic behaviour in presence of water.(iii) When HC1 gas dissolves in water, forms hydrochloric acid solution i.e., $HCl_{(aq)}$ which then produces $H^+_{(aq)}$ or $H_3O^+_{(aq)}$ ions.
$HCl + H_2O \rightarrow H_3O^+ + Cl^-$
Due to the presence of H^+ or H_3O^+ it shows acidic behaviour.

CHAPTER 3

METALS AND NON- METALS

Physical properties of Metals and Non-Metals

PROPERTY	METALS	NON- METALS
STATE OF EXISTENCE	Metals are solids at room temperature(Exception: - Mercury is a liquid at room temperature)	Non–metals exist in all three stages of matter. The most common state is gaseous
LUSTRE	Metals are having shiny appearance. (lustre)	Non-Metals appear dull (Exception: - Crystals of iodine have bright lustre)
HARDNESS	Metals like Iron, copper, and Aluminium are hard. (Exceptions: Sodium and potassium are soft. We can cut with knife. Mercury is in liquid state at room temperature.)	Coal and sulphur are not very hard.

SONOROSITY	Metals produce sound, when struck with some hard object	Non –Metals are non-sonorous
MALLEABILIY	Metals are malleable. It can be beaten into thin sheets.	Non-Metals are not malleable. If we beat them, they change into tiny particles. (powder)
DUCTILITY	Metals can be drawn into thin wires.	We can't make metals into wires.
ELECTRICAL CONDUCTIVITY MELTING POINT	Metals are good conductors of electricity. Metals have high melting point. But gallium and caesium have very low melting point. These two metals will melt if you keep them on your palm	Non-metals are poor conductors of electricity. Non-metals have low melting point

COMPARISON OF CHEMICAL PROPERTIES OF METALS AND NON-METALS

REACTION WITH	METALS	NON - METALS
OXYGEN Amphoteric Oxides	***Metal + Oxygen→Metal oxide*** **K, Na** and**Ca** React vigorously $4Na(s)+O_2(g) \rightarrow 2Na_2O(s)$ **Mg, Al** and **Zn** React with oxygen $4Al(s)+3O_2(g) \rightarrow 2Al_2O_3$ **Al** and **Zn** form **Amphoteric oxides** (They show the properties of both acidic and basic oxides) **Gold** and **Silver** are less reactive metals Metals form **Basic oxides** Most of the metal oxides are **insoluble** in water Some of them dissolve in water to form **alkali** $Na_2O(s)+H_2O(l) \longrightarrow 2NaOH(aq)$ $MgO\ (s) + H_2O\ (l) \rightarrow Mg(OH)_2\ (aq)$	***Non-metal + Oxygen → Non-metal oxide*** $C + O_2 \rightarrow CO_2$ $S+O_2 \rightarrow SO_2$ Non-metals form **acidic oxides**. CO and H_2O are **neutral** Nonmetal oxides are **soluble** in water. They dissolve in water to form **acids** $SO_2(g) + H_2O(l) \rightarrow H_2SO_3$ (Sulphurous acid)

WATER	***Metals + water→ metal oxides or metal hydroxide + H_2*** $2Na(s)+2H_2O(l)\rightarrow 2NaOH+H_2(g)+heat$ $2Mg + O_2 \longrightarrow 2MgO$ $Cu + H_2O$ ---□ No Reaction	Non-metals **do not** react with water or steam to evolve hydrogen gas. Because Nonmetals cannot give electrons to hydrogen in water
DILUTE ACIDS	***Metal +Acid→ Metal salt + H_2*** $2Na(s)+H_2SO\ 4\rightarrow Na_2SO\ 4(aq)+H_2(g)$ Metal + HNO_3→ H_2 gas is not released. **Reason**-HNO_3 is strong oxidizing agent **Exceptional** $Mn+2HNO_3\rightarrow Mn(NO_3)_2+ H_2(g)$ from HNO_3) Magnesium (Mg) and manganese (Mn) react with very dilute HNO3 to evolve H2 gas	Non-metals do not react with acids to release H_2 gas. **Reason**- Non-metals cannot lose electrons and give It to Hydrogen ions of acids so that the gas is released.
SALT SOLUTION	When metals react with salt solution, more reactive metal will displace a less reactive metal from its salt solution. $CuSO_4(aq) + Zn(s)\rightarrow ZnSO_4(aq) + Cu(s)$	When non-metals react with salt solution, more reactive non-metal will displace a less reactive nonmetal from its salt solution. $2NaBr(aq) +Cl_2(g)\rightarrow 2NaCl(aq)+Br_2(aq)$
CHLORINE	***Metal + Chlorine → Metal Chloride*** Ionic bond is formed. Therefore an Ionic compound is obtained $2\ Na\ (s) + Cl_2(g) \rightarrow 2\ NaCl\ (s)$	***Non-metal + Chlorine →Non-metal Chloride*** Covalent bond is formed. Therefore ia covalent compound is formed $H_2 + Cl_2 \rightarrow 2HCl$

Reaction of Metals and Non-metals: Many metals form ionic bonds when they react with non-metals. Compounds formed are known as Ionic Compounds.

Ions: Positive or negative charged atoms are known as ions. Ions are formed because of loss or gain of electrons

Positive ion: A positive ion is formed because of the loss of electrons by an atom.

Eg; Sodium forms sodium ions because of the loss of one electron. Because of the loss of one electron, one positive charge comes over sodium.

$Na \rightarrow Na^+ + e^-$

2, 8, 1→ 2,8

Magnesium forms a positive ion because of the loss of two electrons. Two positive charges come over magnesium because of loss of two electrons.

$Mg \rightarrow Mg^{2+} + 2e^-$

2, 8, 2 → 2, 8

Negative ion: A negative ion is formed because of the gain of an electron.

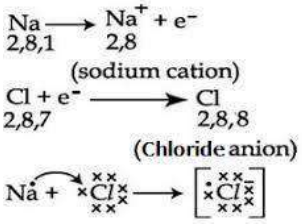
Eg;Chlorine gains one electron in order to achieve a stable configuration. After the gain of one electron, chlorine gets one negative charge over it forming chlorine ion.

$Cl + e^- \rightarrow Cl^-$

2, 8, 7 → 2, 8, 8

Ionic Bonds: Ionic bonds are formed because of transfer of electrons from metal to non-metal. In this course, metals get positive charge because of transfer of electrons and non-metal gets negative charge because of acceptance of electrons. In other words, bond formed between positive and negative ion is called Ionic Bond.

Eg; **Formation of Sodium Chloride (NaCl)**:



Formation of Magnesium Chloride

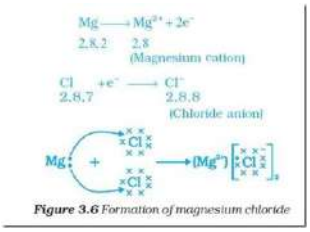


Figure 3.6 Formation of magnesium chloride

Properties of Ionic compound

(i)Physical nature: Ionic compounds are solid. Ionic bonds have a greater force of attraction because of which ions attract each other strongly.

(ii) Melting and boiling point: Ionic compounds have high melting and boiling points because the force of attraction between ions of ionic compounds is very strong.

(iii) Solubility: Ionic compounds generally dissolve in water.Ionic compounds are generally insoluble in organic solvents; like kerosene, petrol, etc.

Ionic compounds do not conduct electricity in the solid state.

(iv) Conduction of Electricity: The solution of ionic compounds in water conducts electricity. This happens because ions present in the solution of ionic compounds facilitate the passage of electricity by moving towards opposite electrodes. Ionic compounds conduct electricity in the molten state as in the molten state the electrostatic forces of attraction between the oppositely charged ions overcome due to the heat. Thus, the ions move freely and conduct electricity.

Occurrence and Extraction of Metals:

Source of metal: Metals occur in Earth's crust and in seawater; in the form of ores.

Mineral: Minerals are naturally occurring substances which have a uniform composition.

Ores: The minerals from which a metal can be profitably extracted are called Ores.

Metals found in the middle of reactivity series, such as Zn, Fe, Pb, etc. are usually found in the form of oxides, sulphides or carbonates.

Metals found at the top of the reactivity series are never found in free-state as they are very reactive, for example; K, Na, Ca, Mg and Al, etc.

Many metals are found in the form of oxides because oxygen is abundant in nature and is very reactive.

Extraction of Metals:
(Refer fig 3.10 Page No. 50)
Metals can be categorised into three parts on the basis of their reactivity:
i. Most reactive ii. medium reactive and iii. least reactive.
The three major steps involved in the extraction of a metal from its ore are

- ❖ Concentration or enrichment of ores.
- ❖ Conversion of concentrated ore into crude metal and
- ❖ Refining of impure or crude metal.

(i) Extracting Metals Low in the Activity Series:

$$2HgS_{(S)} + 3O_2 \xrightarrow{Heat} 2HgO_{(S)} + 2SO_{2(g)}$$

Cinnabar

$$2HgO_{(S)} \xrightarrow{Heat} 2Hg_{(l)} + O_{2(g)}$$

Mercury

$$2Cu_2S\,(s) + 3O_2\,(g) \xrightarrow{Heat} 2Cu_2O\,(s) + 2SO_2\,(g)$$

$$2Cu_2O + Cu_2S \xrightarrow{Heat} 6Cu\,(s) + SO_2\,(g)$$

(ii) Extraction of Metals of Middle Reactivity: The metals in the middle of the activity series such as iron, zinc, lead, copper, etc., are moderately reactive. These are usually present as sulphides or carbonates in nature. . It is easier to obtain a metal from its oxide, as compared to its sulphides and carbonates. Therefore, prior to reduction, the metal sulphides and carbonates are converted into metal oxides.

Roasting.
The sulphide ores are converted into oxides by heating strongly in the presence of excess air. This process is known as roasting.
Calcination: The carbonate ores are changed into oxides by heating strongly in limited air. This process is known as calcination.

Roasting

$$2ZnS(s) + 3O_2(g) \xrightarrow{Heat} 2ZnO(s) + 2SO_2(g)$$

Calcination

$$ZnCO_3(s) \xrightarrow{Heat} ZnO(s) + CO_2(g)$$

The metal oxides are then reduced to the corresponding metals by using suitable reducing agents such as carbon. For example, when zinc oxide is heated with carbon, it is reduced to metallic zinc.

$$ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$$

Thermite Reaction:
Ferric oxide; when heated with aluminium, is reduced to iron metal. In this reaction, a lot of heat is produced. This reaction is known as thermite reaction. It is used in the welding of electric conductors, iron joints, etc. such as joints in railway tracks.

$$Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s) + Heat$$

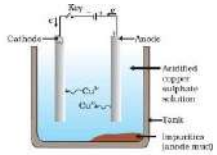
(iii) Extraction of Metals of High Reactivity:
Metals of high reactivity; such as sodium, calcium, magnesium, aluminium, etc. are extracted from their ores by electrolytic reduction. These metals cannot be reduced using carbon because carbon is less reactive than them.

Electrolytic Reduction:

Example: When an electric current is passed through molten state or solution of sodium chloride, sodium metal gets deposited over the cathode.Similarly, aluminium is obtained by the electrolytic reduction of aluminium oxide. Metals obtained from the process of electrolytic reduction are pure in form.

$$\text{At cathode} \quad Na^+ + e^- \rightarrow Na$$
$$\text{At anode} \quad 2Cl^- \rightarrow Cl_2 + 2e^-$$

Electrolytic Refining of Copper: A lump of impure copper metal and a thin strip of pure copper are dipped in the solution of copper sulphate. Impure lump of metal is connected with the positive pole and thin strip of pure metal is connected with negative pole. When electric current is passed through the solution, pure metal from anode moves towards the cathode and is deposited over it. Impurities present in metal are settled near the bottom of anode in the solution. Settled impurities in the solution are called Anode Mud.



Corrosion:

The surface of some metals, such as iron, is corroded when they are exposed to moist air for a long period of time. This phenomenon is known as corrosion

Rusting of Iron: When iron articles like the gate, grill, fencing, etc. come in contact with moisture present in the air, the upper layer of iron turns into iron oxide. Iron oxide is brown-red in colour and is known as Rust. The phenomenon is called Rusting of Iron.

Prevention of Rusting: For rusting, iron must come in contact with oxygen and water. Rusting is prevented by preventing the reaction between atmospheric moisture and the iron article. This can be done by:

**Painting *Greasing *Galvanization *Electroplating *Alloying*

Alloys: The homogeneous mixture of two or more metals, or a metal and a non-metal is called Alloy.
Amalgams: An alloy in which mercury (Hg) is present. For example Sodium amalgams [Na (Hg)] and Zinc amalgams [Zn(Hg)].

Properties of an Alloys

- Alloys are stronger than the metal from which they are obtained.
- It is harder than the constituent metals.
- More resistance to corrosion.
- The melting point of alloys is lower than the constituent metals.
- The electrical conductivity of alloys is lower than the constituent metals.

Some examples of Alloys: Brass (an alloy of copper and zinc),Bronze: (an alloy of copper and tin), Solder: (an alloy of lead and tin)
Alloys of Gold: Pure gold is said to be of 24 carats. Gold is alloyed with a small amount of silver or copper to make it hard.
Galvanization:Galvanisation is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.The layer of zinc protects the iron from corrosion.
Electroplating: In this method, an electric current is used to create a thin layer of metal over another metal. It is done to make cheaper metals more appealing as well as to protect them from corrosion.
Painting and Greasing: In this method, a layer is created over the metal surface by painting or greasing. This layer of paint or grease protects the metal from corrosion.

QUESTION BANK:

~~MULTIPLE CHOICE QUESTIONS~~

1. An aluminium strip is kept immersed in a freshly prepared ferrous sulphate solution taken in a test tube, the change observed is that

a) Green solution slowly gets decolourised with brown deposits.

b) Lower end of the test tube becomes slightly warm

c)A colourless gas with smell of burning sulphur is evolved

d)Light green solution changes to blue

2. . The chemical reaction between a piece of copper and nitric acid is given by the chemical equations,

$Cu + HNO_3 \rightarrow Cu(NO_3)_2 + H_2$

$H_2 + HNO_3 \rightarrow H_2O + NO_2$

What can be inferred from the chemical equation?

(a) Copper causes the oxidation of HNO_3 to form NO_2.

(b) Hydrogen gas gets oxidized by HNO_3 to form water.

(c) gas reacts with oxygen in the air to form water.

(d) Nitrate reacts with hydrogen to form NO_2 and H_2O.

3. Galvanisation is a method of protecting iron from rusting by coating with a thin layer of
(a) Gallium (b) Aluminium (c) Zinc (d) Silver

4.. The colour of aqueous solution of zinc sulphate as observed in the laboratory is: a) green b) Yellow c) Blue d) Colourless

5.What happens when calcium is treated with water?
(a) It does not react with water
(b) It reacts violently with water
(c) It reacts less violently with water
(d) Bubbles of hydrogen gas formed stick to the surface of calcium
a. (A) & (D) b. (B) & (C) c. (A) & (B) d. (C) & (D)

6. A student adds some metallic ash in water taken in a test tube. The ash gets completely dissolved in water and the solution changes its colour. What should the student do next to test the chemical properties of the product formed?

(a) Evaporate the solution to get crystals.

(b) Measure the temperature change using a thermometer.

(c) Test the acidity using a blue litmus paper. (d) Test the basicity using a red litmus paper.

7.Which of the following pair of metals exist in their native state in nature?

(a) Ag and Au (b) Ag and Zn (c) Au and Hg (d) Au and Fe

8. The process in which a carbonate ore is heated strongly in the absence of air to convert it into metal oxide is called_____

(a) Roasting (b) Reduction (c) Calcination (d) Smelting

9.Rusting of iron takes place in

a. Ordinary water b. Boiled water c. Both ordinary & boiled water d. None of these

10. An alloy can be one of the following types:

(a) Homogenous (b) Heterogeneous (c) Intermetallic (d) All of the above

ASSERTION/REASON TYPE QUESTION

Following Questions consist of two statements – Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

A. Both A and R are true, and R is the correct explanation of A

B. Both A and R are true, and R is not the correct explanation of A

C. A is true, but R is false

D. A is False, but R is true

1. ***Assertion (A):*** Rusting of iron involves formation of red brown flakes and wearing away of metal iron.
   Reason (R): Iron shows rusting on its reaction with the moist air around it in which it forms iron oxide hydrated
2. ***Assertion (A):*** Gas bubble are observed when sodium carbonate is added to dilute hydrochloric acid.
   Reason (R): Carbon dioxide is given off in the reaction
3. ***Assertion (A):*** $MgCl_2$, is a covalent compound.
   Reason (R):$MgCl_2$, is a good conductor of electricity in molten state.
4. ***Assertion (A):*** Sodium chloride conducts electricity in aqueous state but not in solid state.
   Reason (R): Sodium chloride is an ionic compound and it forms ions in aqueous solution.
5. ***Assertion (A):*** Ionic compounds and solids are somewhat hard.
   Reason (R): They are electrovalent compounds and have strong force of attraction between oppositely charged ions.

ANSWER KEY- MCQ PART 1

1. a 2. b 3.c 4.d 5.d 6. d 7. a 8. c 9.a 10. a

ANSWER KEY- ASSERTION REASON TYPE QUESTIONS

1.a 2.a 3.d 4.a 5.a

SHORT ANSWER QUESTIONS

1.An element A burns with golden flame in the air. It reacts with another element B, atomic number 17, to give a product C. An aqueous solution of product C on electrolysis gives a compound D and liberates

hydrogen. Identify A, B, C and D. Also, write down the equations for the reactions involved.

ANS: Element A is sodium metal (Na) as it burns with a golden flame.

Element B with atomic number 17 is chlorine (Cl).

Sodium and chlorine combine to form sodium chloride, NaCl(compound C).

We can write the reaction as $2\ Na + Cl_2 \rightarrow 2\ NaCl$.

An aqueous solution of NaCl on electrolysis gives the compound D, sodium hydroxide(NaOH). We can write the reaction as $2\ NaCl\ (aq) + 2\ H_2O\ (l) \rightarrow 2\ NaOH\ (aq) + Cl_2\ (g) + H_2\ (g)$

2. Two ores A and B were taken. On heating, ore A gives CO, whereas ore B gives SO_2. What steps will you take to convert them into metals?

ANS: A carbonate ore is calcinated to obtain the oxide of the metal. When a carbonate ore is heated, we get carbon dioxide. The following equation shows the calcination of zinc carbonate.
$ZnCO_3 \rightarrow ZnO + CO_2$

When a sulphide ore is roasted, we get Sulphur dioxide. Zinc sulphide is roasted to obtain zinc oxide.
$2\ ZnS + 3\ O_2 \rightarrow 2\ ZnO + 2\ SO_2$.

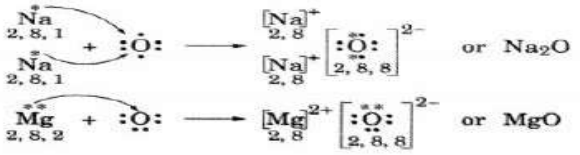
After any of the above steps, zinc oxide is reduced to obtain pure zinc.

$ZnO + C \rightarrow Zn + CO$

3. (i) Write the electron dot structures for sodium, oxygen and magnesium.
(ii) Show the formation of Na_2O and MgO by the transfer of electrons.
(iii) What are ions present in these compounds?

(i)

Element	Sodium (Na)	Oxygen (O)	Magnesium (Mg)
Electron dot structure	Na 2, 8, 1	O 2, 8, 6	Mg 2, 8, 2



iii) In Na_2O, ions present are Na^+ and O^{2-}.
In MgO, ions present are Mg^{2+} and O^{2-}.

4. When H_2 SO, reacts with zinc, hydrogen gas is released but this reaction does not takes place with silver. Explain reason and also write chemical reactions.
ANS: Position of zinc in electrochemical series is above hydrogen, thus it is more reactive than hydrogen and can displace hydrogen from sulphuric acid, whereas silver is placed below hydrogen, i.e., less reactive than hydrogen and hence no reaction takes place.

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$$

$$Ag + H_2SO_4 \rightarrow \text{No reaction}$$

5. A solution of $CuSO_4$ was kept in an iron pot. After few days the iron pot was found to have a number of holes in it. Explain the reason in terms of reactivity. Write the equation of the reaction involved.

ANS: Iron is more reactive than copper. Hence, when a solution of $CuSo_4$ is kept in an iron pot, iron slowly displaces copper from the solution and blue colour of the solution keeps fading away. Because of iron going into solution as iron sulphate, a number of holes are seen in the iron pot. The reaction is $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

6. Metals replace hydrogen from dilute acids, whereas non-metals do not. Why?
ANS: Hydrogen from dilute acids can only be replaced if electrons are supplied to H^+ ions of the acid.

$H_2SO_4\ (aq) \rightarrow 2H^+\ (aq) + SO_4^{2-}\ (aq)$; $2H^+ + 2e^- \rightarrow H_2\ (g)$

$HCl\ (aq) + H^+ \rightarrow (aq) + Cl^-(aq)$; $H^+ + e^- \rightarrow H$; $2H \rightarrow H_2\ (g)$

Metals have a tendency to lose electrons and hence they supply electrons, i.e., they are electron donors. That is why metals displace hydrogen from dilute acids.
On the other hand, non-metal is an electron acceptor. It cannot supply electrons to H^+ and hence, it does not displace hydrogen from dilute acids.

7. (i) Name a metal for each case :
(a) It does not react with cold as well as hot water but reacts with steam.
(b) It dos not react with any physical state of water.
(ii) When calcium metal is added to water the gas evolved does not catch fire but the same gas evolved on adding sodium metal to water catches fire. Why is it so ?
ANS: (i) (a) Aluminium,
(b) Copper.
(ii) In both cases, the gas evolved is H_2 When calcium reacts with water the heat evolved is not. sufficient for hydrogen to catch fire. On the other hand, sodium metal reacts with water violently and in this case a lot of heat is evolved which is sufficient for hydrogen to catch fire.

8. An ore gives carbon dioxide on treatment with a dilute acid. What steps will you take to convert such a concentrated ore into free metal ?
ANS: A metal carbonate reacts with a dilute acid to form carbon dioxide. Therefore, this ore is a carbonate ore. Carbonate ore is converted into free metal in the following two steps :
(i) Calcination : The carbonate ore is strongly heated in the absence of air to get the metal oxide.

$$\text{Metal carbonate} \xrightarrow{\text{Calcination}} \text{Metal oxide} + \text{Carbon dioxide}$$

(ii) Reduction : The metal oxideis reduced with carbon to get free metal.

$$\text{Metal oxide} + \underset{\text{(Coke)}}{\text{Carbon}} \xrightarrow{\text{Reduction}} \text{Metal} + \text{Carbon monoxide}$$

9. When a metal X is treated with cold water, it gives a basic salt Y with molecular formula XOH (Molecular mass = 40) and liberates a gas Z which easily catches fire. Identify X, Y and Z and also write the reaction involved.

ANS: Sodium (Na) and potassium (K) react with cold water to form basic salt NaOH and KOH respectively. The molecular mass of NaOH is 40. So, X is Na and Y is NaOH. The gas liberated during the reaction iş hydrogen (H_2). So Z is H_2.

$2Na + 2H_2O \rightarrow 2NaOH + H_2 + \text{Heat energy}$.

10. During extraction of metals, electrolytic refining is used to obtain pure metals.
(i) Which material will be used as anode and cathode for refining of silver metal by this process?

(ii) Suggest a suitable electrolyte also.
(iii) In this electrolytic cell, where do we get pure silver after passing electric current ?
ANS: (i) Anode : Impure silver
Cathode : Pure silver
(ii) Electrolyte : Silver salt, such as $AgNO_3$, AgCl, etc.
(iii) We get pure silver at cathode.

CASE STUDY BASED QUESTIONS

1. When a silvery grey powder of a solid (A) is mixed with a powder solid (B) no reaction occurs. But if the mixture is ignited and lighted using magnesium ribbon a reaction occurs with evolution of a large amount of heat forming product (C) which settles down as liquid metal and the solid product(D) formed floats on the liquid (C). (C)in solid form reacts with moisture to form rust. The amount of heat generated during the reaction is so high that the reaction is used in welding of electric conductors, joints in railway tracks. Based on this information, answer the following questions.

i.Identify A and C?

a) A- Al and C- Fe b) A-Fe and C—Al c) A-Mg and C -Al d) A-Al and C -Cu

ii. Identify B and D which are oxides of

a) B- Fe , D- Al b) B- Mg, D-Al c) B- Al , D- Cu d) B-Al , D –Fe

iii . Amphoteric oxides are

A. metal oxides which do not react with acids but react with bases

B. metal oxides which reacts with both acids as well as bases

C. metal oxides which reacts with acids but do not react with bases

D metal oxides which shows no reaction with either acids or bases

iv. Which of the following is amphoteric in nature?

A. both aluminium oxide and zinc oxide B. Only Zinc oxide

C. Only Aluminium oxide D. Neither of them

v. What do you mean by thermite reaction?

A thermite reaction is a reaction in which a metal oxide is reduced by using aluminium as the reducing agent.

Answers ; i. a, ii. a, iii. b , iv. a v

Long answer type questions

1. (a) Write the chemical name of the coating that forms on silver and copper articles when these are left exposed to moist air.

(b) Explain what galvanisation is? What purpose is served by it?

(c) Define an alloy. How are alloys prepared? How do the properties of iron change when:

(i) small quantity of carbon,

(ii) nickel and chromium are mixed with it.

Answer.

(a) Ag_2S (silver sulphide) is formed on silver, basic copper carbonate $CuCO_3$. $Cu(OH)_2$ is formed on copper.

(b) The process of coating zinc over iron is called galvanisation. It is used to prevent rusting of iron.

(c) Alloy is a homogeneous mixture of two or more metals. One of them can be non-metal. Alloys are prepared by melting two or more metals together.

(i) Iron does not rust on adding small,quantity of carbon.

(ii) When we form an alloy of iron with nickel and chromium, we get stainless steel which is malleable and does not get rusted.

2. Explain the following

(a) Reactivity of Al decreases if it is dipped in HNO3

(b) Carbon cannot reduce the oxides of Na or Mg

(c) NaCl is not a conductor of electricity in solid-state, whereas it does conduct electricity in aqueous solution as well as in the molten state

(d) Iron articles are galvanised.

(e) Metals like Na, K, Ca and Mg are never found in their free state in nature.

Answer:

(a) When aluminium is dipped in nitric acid, a layer of aluminium oxide is formed on the metal. It happens because nitric acid is a potent oxidising agent. The layer of aluminium oxide prevents further reaction of aluminium.

(b) Sodium and magnesium tend to react with oxygen rather than carbon because sodium and magnesium are highly reactive metals. Hence, carbon cannot reduce the oxides of sodium and magnesium.

(c) Ionic compounds do not conduct electricity in a solid-state but conduct in an aqueous and molten state due to the presence of free electrons. This property is shown by sodium chloride.

(d) Iron articles are galvanised to prevent them from rusting because, after galvanisation, the layer of zinc works as a protective layer.

(e) Metals such as Na, K, Ca and Mg are highly reactive metals, and hence they are not found in their free state.

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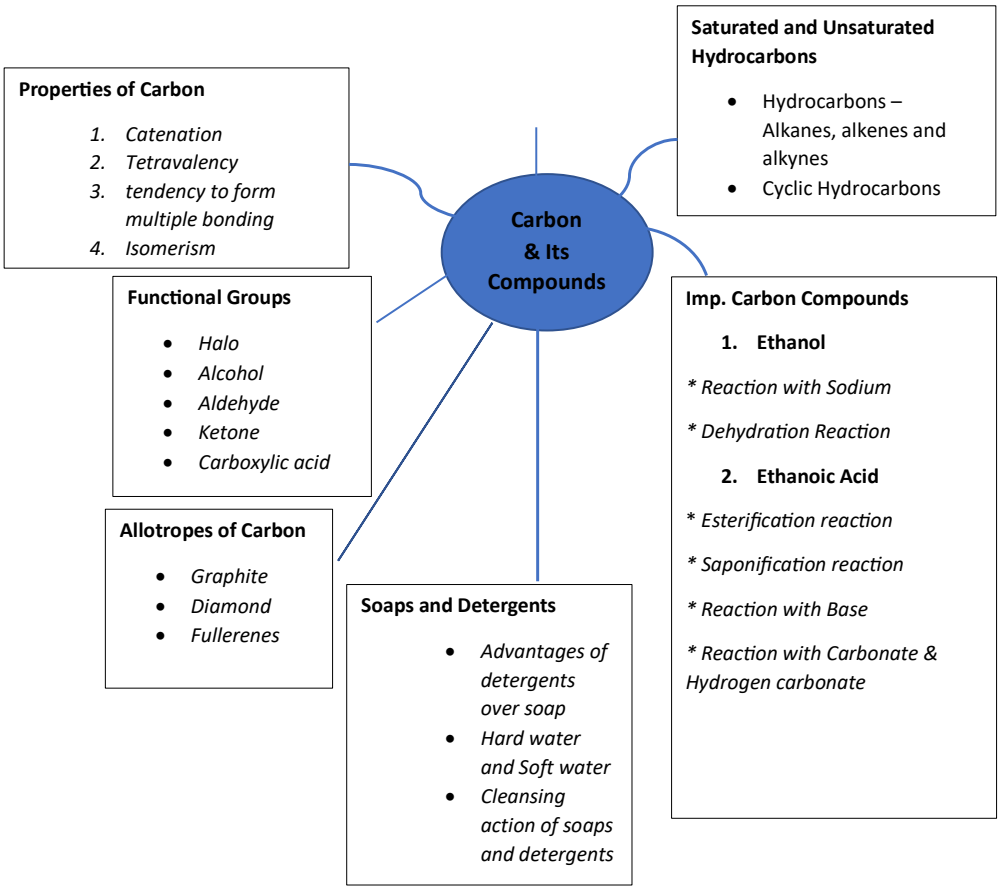
CHAPTER 4

CARBON AND ITS COMPOUNDS

Chemical properties of carbon compounds

1. *Combustion Reaction*



Properties of carbon:

- **Organic compounds** are made up of carbon and form the basis of life of living organisms.
- Carbon is a **versatile** element; it forms large variety of compounds because of its tetravalency and the property of catenation that it exhibits.
- Carbon is a **non-metal** which belongs to **group 14** of the periodic table.
- Carbon has **atomic number 6** and having **electronic configuration 2, 4**. So **valency** of carbon is **4**
- Thus, is **tetravalent** can complete its octet either by gaining 4 electrons or by losing 4 electrons.

- The chemical bond formed by the sharing of electrons from two atoms is known as a covalent bond.
- Carbon form **covalent bonds**, which is formed by sharing of electrons. Carbon forms it with oxygen, sulphur, nitrogen and chlorine.

2. ***Reactivity of elements*** – Tendency to attain a completely filled outer shell, i.e., attain noble gas configuration.

3. What is a Covalent Bond?

- The chemical bond formed by **sharing of electrons from two atoms** is known as a covalent bond.
- Covalently bonded molecules have **strong bonds within molecule**, but **intermolecular forces are small, giving rise to low melting point and boiling point.**
- Electrons are shared between atoms and no charged particles are formed – Covalent compounds are **poor conductors of electricity.**

4. ***Allotropy-***

- The phenomenon of existence of the same element in different physical forms with similar chemical properties is known as **allotropy.**
- Different forms of an element are called **allotropes.**
- **Carbon exists in two allotropic forms**.
  - The crystalline forms - diamond and graphite
  - amorphous forms - coal, charcoal, lamp black etc.
  - Fullerenes form another class of carbon allotropes.

Diamond is a good conductor of heat and a poor conductor of electricity. Graphite is a good conductor of electricity

5. Carbon has two unique features (hence, *Versatile nature of carbon*)- tetravalency and catenation.

- **Catenation -** the property of elements to form long chains or branched chains and rings of different sizes is called catenation.
- **This property of catenation is due to**
  - small size,
  - unique electronic configuration
  - Great strength of carbon -carbon bonds.

6. Isomers –

- Organic compounds having the same molecular formula but different structural formulae, and hence, different physical and chemical properties, are called isomers.
- Example, butane with a molecular formula **C_4H_{10}**has two isomers.

7. Hydrocarbon:

- Compounds made up of hydrogen and carbon is called **Hydrocarbons**.
- When there is a single bond between the carbon atoms it is **saturated hydrocarbons**.
- Alkanes are saturated hydrocarbons. It contains single bond throughout the compound. General formula is **CnH_2n+2**
- When there is a double or triple bond between carbon atoms then it comes in the category of **unsaturated hydrocarbons**.
- **Alkenes** are unsaturated hydrocarbons. General formula is **CnH_2n**
- **Alkynes** are also unsaturated hydrocarbons. General Formula is **CnH_2n-2**

8. Heteroatoms -

- In hydrocarbon chain, one or more carbon atoms are replaced by other atoms in accordance with their valancy. They are called **heteroatoms**.
- These heteroatoms which make carbon compounds reactive and decide properties of the compound are called **functional group**.

Refer to text – page number 66

- Carbon and its compounds are good **fuels** as they burn in air releasing lot of heat energy.
- **Saturated hydrocarbons** burn with **blue and non-sooty flame** but **unsaturated hydrocarbons** burn with **yellow and sooty flame** because of the percentage of high carbon and incomplete oxidation in air.

10. Carbon undergoes Combustion, Addition, substitution, and oxidation reactions:

i) *Combustion Reactions:* The complete combustion of carbon compounds in air gives carbon dioxide water, heat and light.

CH_3CH_2OH (l) + O_2 (g) → CO_2 (g) + H_2O (l) + Heat and light

ii)*Oxidation Reactions:*

- In a combustion reaction, carbon compounds are oxidized in the presence of oxygen.
- Though combustion is generally an oxidation reaction, **not all oxidation reactions are combustion reactions**.
- Oxidation is also carried out by using oxidizing agents (Oxidants)

CH_3CH_2OH + 2(O) →CH_3COOH+ H_2O (Oxidising agents are $KMnO_4$ or $K_2Cr_2O_7$)

iii) *Addition reactions:*

- Unsaturated organic compounds, like alkenes and alkynes, contain multiple bonds (C=C, C≡C) between their carbon atoms.
- They undergo addition reactions to become saturated in nature.

For example; ethene is converted into ethane when heated with the catalyst nickel.

CH_2=CH_2 + H_2 + (Nickel catalyst) ⇨ CH_3−CH_3

Hydrogenation

- The process by which unsaturated hydrocarbons can be transformed into saturated hydrocarbons.
- It is the process of addition of hydrogen to the unsaturated bonds of fatty acid chain.

IV) *Substitution Reaction:*

- A Substitution reaction is one in which an atom or a group of atoms (functional group) in the compound are replaced by another atom (or group of atoms).
- Substitution reactions are single displacement reactions.

For example, under the presence of Sunlight, Methane reacts with chlorine gas to produce chloromethane and hydrogen chloride.

CH_4 + Cl_2 + Sunlight ⇨ CH_3Cl + HCl

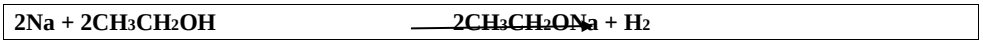
11. Ethanol and Ethanoic acids are chemicals of immense importance which is used in day-to-day life for various purposes.

i) Ethanol –

- Liquid at room temperature
- Commonly called alcohol - Active ingredient of alcoholic drinks
- It is used in medicine such as tincture iodine, syrups and tonics as it is a good solvent
- Soluble in water
- Consumption of small quantities causes drunkardness
- Intake of pure ethanol is lethal

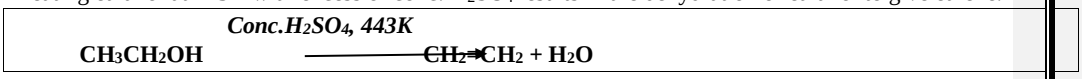
Reactions –

1. With Sodium



2. Dehydration reaction

Heating ethanol at 443K with excess of conc. H_2SO_4 results in the dehydration of ethanol to give ethene.

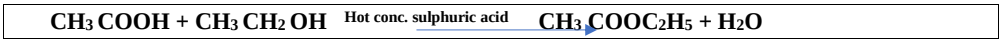


ii) Ethanoic Acid:

- Commonly called acetic acid
- Dil. Solution of ethanoic acid is called **vinegar (5-8%)**
- Characterised by **pungent smell**
- Good solvent
- Weak acid
- Also called **Glacial Acetic Acid** as the melting point of pure ethanoic acid is 290 K. Hence, it often freezes during winter in cold climates.

Reactions -

1. When **acid** and alcohol react in the presence of acid catalysts then it dehydrates to form **ester**. This process is called **esterification**.



1. Saponification Reaction

* Esters react in the presence of a base to give back alcohol and sodium salt of carboxylic acid.

- Used in the preparation of soap

2. Reaction with a base

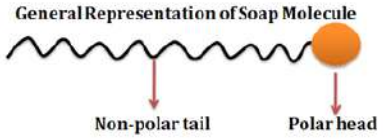
3. **Reaction with carbonates and hydrogen carbonates**

$$2\ CH_3COOH + Na_2CO_3 \rightarrow 2\ CH_3COONa + H_2O + CO_2$$

$$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2$$

12. ***Soaps & Detergents:***

- The action of **Soaps and detergents** is based on the presence of both **hydrophobic** and **hydrophilic** groups in the molecule. This helps to emulsify the oily dirt and hence its removal.



- **Micelles** are clusters of molecules in which the hydrophobic tails are in the interior of the cluster and ionic ends are on the surface of the cluster. **Soap** is the mixture of micelles

Refer to the image on page no.75

COMPARISON OF PROPERTIES OF IONIC COMPOUNDS AND COVALENT COMPOUNDS

IONIC COMPOUNDS	COVALENT COMPOUNDS
Ionic compounds are formed by complete transfer of electrons	They are formed by mutual sharing of electrons between two atoms.
Generally, solids	They may exist in solid, liquid or gases
Melting point and boiling points are high	Low melting point and boiling point
Soluble in water but insoluble in organic solvents.	Generally insoluble in water but soluble in organic solvents like alcohol
Ionic compounds do not conduct electricity in solid state	Covalent compounds do not contain ions and hence are generally bad conductors of electricity.

QUESTION BANK:

MULTIPLE CHOICE QUESTIONS

1. The following reaction shows the addition of chlorine to methane

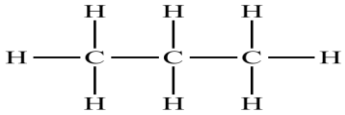
$$CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} X$$

What is the product of the reaction represented by 'X '

a) $CH_4 + H_2SO_4$ b) $CH_3Cl + HCl$

c) $CH_3Cl + H_2SO_4$ d) $CH_2Cl_2 + HCl$

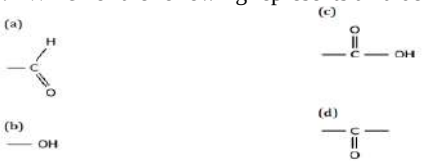
2. The image represents a carbon compound propane



Which of the following explains the naming of propane?

a. The presence of a functional group connected with a single bond.
b. As it contains three carbon atoms and the presence of single bonds between carbons.
c. Carbon compound with eight hydrogen.
d. Carbon compound with three carbons.

3. Which of the following represents an aldehyde group



4. How many single bonds and double bonds are present in benzene

a) 6,3 b) 3,6 c) 3,9 d) 9,3

5. Graphite is used as a lubricant in machines because

a) It is a good conductor of electricity

b) it is strong and soft

c) It has a high melting point and slippery layers

d) Its density ranges from 1.9 to 2.3g/cm^3

6. A few drops of ethanoic acid were added to solid sodium carbonate. The observation made was that

a) A hissing sound was produced b) brown fumes evolved

c) Brisk effervescence occurred d) a pungent smelling gas evolved

7. The process of the addition of hydrogen to an unsaturated compound is called:

a) Oxidation b) Reduction c) Substitution d) Addition

8. Which of the following is an example of an ester?

a) Ethene b) Ethane c) Ethanol d) Ethyl acetate

9. Which of the following is a pair of homologues?

a) CH_3OH, CH_3-O-CH_3 b) CH_3OH, CH_3NH

c) CH_3- O –CH_3, CH_3 -O – CH_2 – OH d) CH_3OH, CH_3CH_2OH

9. Vinegar is a solution of

(a) 30% - 40% acetic acid in alcohol (b) 5% - 8% acetic acid in alcohol

(c) 5% - 8% acetic acid in water (d) 15% - 20% acetic acid in water

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ANSWERS

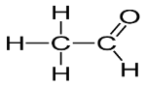
1. b 2. b 3. c 4. d 5. c 6. c 7. d 8. d 9. d 10. C

Short Answer Questions (2 marks)

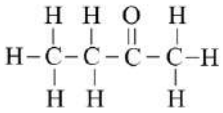
1. Which substance needs to undergo oxidation to produce acetic acid (ethanoic acid)?
   Write a test to distinguish ethanol and ethanoic acid other than a litmus test.
2. (a) Identify the aldehyde obtained from Ethane.
   (b) Name the ketone derived from butane.
3. Explain hydrogenation with its industrial application.
4. Which of the following hydrocarbons undergo addition reaction?
   C_2H_6, C_3H_8, C_3H_6, C_2H_2 , CH_4
5. Name the reaction of ethanoic acid with ethanol in presence of concentrated H_2SO_4. Also mention the products formed in this reaction.

ANSWERS

1. Ethanol (CH_3CH_2OH) is oxidised to prepare CH_3COOH (acetic acid/ethanoic acid).
   - A sodium bicarbonate test is used to distinguish between ethanol and ethanoic acid.
   - Ethanol does not react with Sodium bicarbonate.
   - Ethanoic acid gives brisk effervescence with Sodium bicarbonate.
2. (a) Ethanal



(b) Butanone



3. Addition of hydrogen to an unsaturated carbon compound is called hydrogenation reaction. In industry, hydrogenation reaction is used for preparing vegetable ghee from vegetable oils.
4. Only unsaturated compound can undergo addition reaction. C_3H_6 and C_2H_2 are the only unsaturated hydrocarbons among the given hydrocarbons. Therefore, only C_3H_6 and C_2H_2 undergo addition reaction.
5. Esterification. The reaction of Ethanoic acid and Ethanol in the presence of concentrated Sulphuric acid forms the ester that is Ethyl ethanoate and water.

Short Answer Questions (3 marks)

1. What is saponification? Differentiate between soaps and detergents.
2. Name two carbon compounds with molecular formula C_2H_6O. Draw their structural formula.
3. Why is ethyne mixed with oxygen for welding instead of using a combination of ethyne and air?
4. Why are compounds such as calcium carbide, carbon monoxide, carbon dioxide, calcium carbonate, etc. classified as inorganic compounds, despite containing carbon atoms in their molecules?
5. Meenakshi heated ethanol with a compound **A** in presence of a few drops of concentrated H_2SO_4 and observed a sweet smelling compound B is formed. When **B** is treated with sodium hydroxide it gives back ethanol and a compound **C**.
   a. Identify A, B and C.
   b. Write the chemical reactions involved and name the reactions.

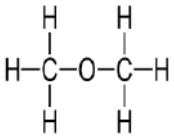
ANSWERS

1. Hydrolysis of an ester to give the salt of the corresponding acid and the alcohol is called saponification. Soaps are the fatty acid salts of potassium or sodium.

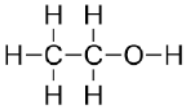
	Soap	Detergents
(i)	Soaps are sodium salts of long chain carboxylic acids.	Detergents are sodium salt of long chain benzene sulphonic acids.
(ii)	The ionic group in soap is $COONa^+$	The ionic groups in detergents is SO_3^-, Na^+
(iii)	Soaps are not useful when water is hard.	Detergent can be used for washing purpose even when water is hard.
(iv)	Soaps are biodegradable.	Some of the detergents are non- biodegradable.
(v)	Soaps have relatively weak cleansing action.	Detergents have strong cleansing action.

2. The two organic compounds which have the same molecular formula C_2H_6O are dimethyl ether ($CH_3{-}O{-}CH_3$) and ethanol ($CH_3\,CH_2{-}OH$).

Dimethyl ether



Ethanol



3. A mixture of ethyne and oxygen is used for welding as they both combine completely producing a clean flame. When ethyne is burnt with oxygen a high temperature is attained due to the complete combustion of ethyne. Thus, it is used in welding.

A mixture of ethyne and air is not used for welding as no high temperature is being attained when ethyne is burnt with air and it produces a sooty flame.

4. Organic molecules don't just contain carbon. They contain hydrocarbons or carbon bonded to hydrogen. As these compounds contain only carbon in them, they are called as inorganic compounds.

5.

a) A—Ethanoic acid/or any other carboxylic acid

B—Ester (ethyl ethanoate)

C—Sodium salt of ethanoic acid/sodium ethanoate

b) **Esterification reaction**

$$\underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow{\text{conc. } H_2SO_4} \underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5} + \underset{\text{water}}{H_2O}$$

Saponification reaction

$$\underset{\text{Ester}}{CH_3COOC_2H_5} + \underset{\text{Sodium Hydroxide}}{NaOH} \rightarrow \underset{\text{Sodium ethanoate}}{CH_3COONa} + \underset{\text{Ethanol}}{C_2H_5OH}$$

LONG ANSWER TYPE QUESTIONS

1. a. A salt X is formed, and a gas is evolved when ethanoic acid reacts with sodium hydrogen carbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one you have named. Also, write a chemical equation of the reaction involved.

b .How would you bring about the following conversions? Name the process and write the reaction.

i. Ethanol to Ethene.

ii. Propanol to Propanoic acid.

2. i. What are the characteristics of carbon that results in the vast diversity of carbon compounds observed in our surroundings?

ii.What is the total number of structural isomers that can be drawn for pentane?

ANSWERS

1. (a). The salt X is sodium ethanoate (CH_3COONa), and the evolved gas is carbon dioxide. Take a test tube and add ethanoic acid (CH_3COOH). Add sodium bicarbonate ($NaHCO_3$) to the acid, close the test tube's mouth with a cork, and attach a delivery tube. Take lime water in another test tube and attach it to the delivery tube. The lime water turns milky.

This indicates that the evolved gas is carbon dioxide.

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

The milkiness is due to the formation of $CaCO_3$.

Reaction Involved: $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2$ (g)

Diagram page no.20 fig.2.2

b. i. Ethanol is heated at 443 K in the presence of an excess of conc. Sulphuric acid. This reaction is known as dehydration.

$$CH_3CH_2OH \xrightarrow[\text{Conc. } H_2SO_4]{} CH_2 = CH_2 + H_2O.$$

ii. Propanol is treated with alkaline potassium permanganate or acidified potassium dichromate to get propanoic acid.

$$CH_3CH_2CH_2OH \xrightarrow[\text{Alkaline } KMnO_4 \text{ / Acidified } K_2Cr_2O_7]{} CH_3CH_2COOH + H_2O$$

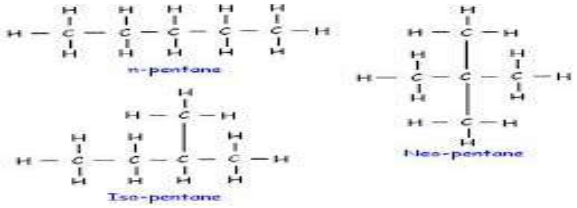
2. i. The two properties of carbon that lead to the enormous variety of carbon compounds around us are i) catenation ii) tetravalency

a. Self-linking of carbon atoms through covalent bonds is called catenation. Carbon has the unique ability to form stable covalent bonds with other carbon atoms, creating long chains, straight &branched chains of varying lengths and rings of different sizes. This increases number of carbon compounds.

b. Due to tetravalency of carbon, it can bond with other elements: Carbon can also form bonds with a wide range of other elements, including hydrogen, oxygen, nitrogen, halogens etc.

Carbon forms multiple bonds (double and triple bonds) with itself and other elements such as oxygen, sulphur etc .

ii. Three structures can be formed.



Case based question

Food, clothes, medicines, books, or many of the things are all based on this versatile element carbon. In addition, all living structures are carbon based. The earth's crust has only 0.02% carbon in the form of minerals. The element carbon occurs in different forms in nature with widely varying physical properties. Both diamond and graphite are formed by carbon atoms, the difference lies in the manner in which the carbon atoms are bonded to one another. Carbon has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. This property is called catenation.

Two statements are given -one labelled Assertion **(A)** and the other labelled Reason **(R)** .Select the correct answer to the following questions from the codes (a),(b),(c)and (d) as given below.

a. Both **A** and **R** are true and **R** is the correct explanation of the assertion.
b. Both **A** and **R** are true and **R** is not the correct explanation of the assertion.
c. **A** is true and **R** is false
d. **A** is false but **R** is true

1. Assertion: Diamond and graphite are allotropes of carbon.
Reason: Different forms of the same element, which have different physical properties but have identical chemical properties.

2. Which of the following statements is not correct?

a) Graphite is much less dense than diamond
b) Graphite is black and soft
c) Graphite has low melting point
d) Graphite feels smooth and slippery

3. Which of the following are isomers?

a) Butane and isobutene
b) Ethane and ethene
c) Propane and propyne
d) Butane and isobutane

4. Pentane has the molecular formula C_5H_{12}. It has

a) 5 covalent bonds
b) 12 covalent bonds
c) 16 covalent bonds
d) 17 covalent bonds

ANSWERS

1. (a)
2. (c)

3. (d) Butane and isobutane have same chemical formula but different arrangement of atoms and have different structure.
4. (c)

****

LIFE PROCESSES (Part 2)

KEY POINTS

- **Life processes** – for growth and repair of our body.

Essential life processes are nutrition, respiration, transportation and excretion.

- **Nutrition**

Steps – ingestion, digestion, absorption, assimilation and egestion.

Photosynthesis – steps (absorption of sunlight, conversion of light energy to chemical energy and splitting of water, reduction of carbondioxide to carbohydrates), equation, mechanism of stomatal opening and closing.

Heterotrophic nutrition – steps of nutrition in amoeba, paramecium, human beings.

Human alimentary canal

Buccal cavity (tongue, teeth, salivary glands – functions)

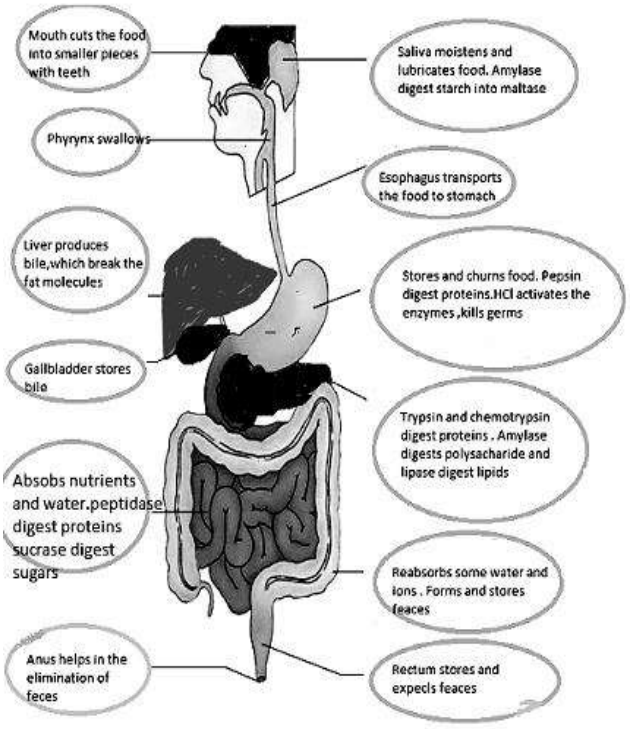
Pharynx (epiglottis)

Oesophagus (peristalsis)

Stomach (gastric juice – components- HCl, Pepsin, mucus, functions

Small intestine – enzymes, liver -functions, villi- absorption)

Large intestine (absorption of water and minerals, egestion)



- **Respiration**

Aerobic vs anaerobic respiration, fate of glucose (three pathways), difference between terrestrial and aquatic organisms, Human respiratory system (fig 6.9), respiratory pigment, transport of gases.

- **Transportation**

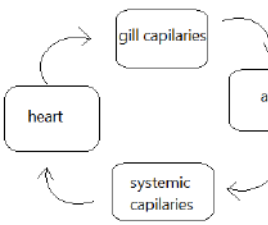
Human beings – heart, blood vessels, blood, lymph

Plants – ascent of sap (root pressure, transpiration pull), translocation

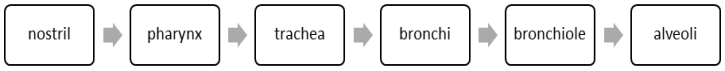
- **Excretion** Diagram of human excretory system, nephron, regulation of amount of urine, functions of nephron (osmoregulation, selective reabsorption, tubular secretion, ultrafiltration)

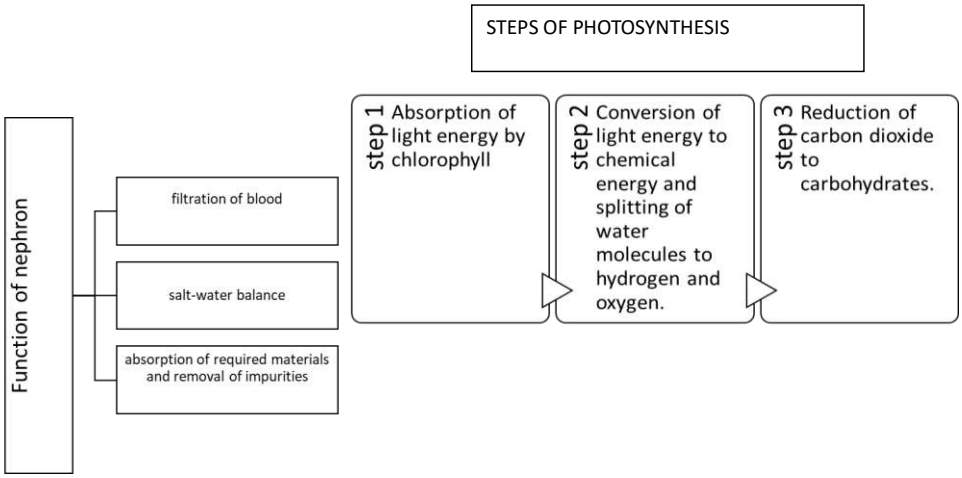
FLOW CHARTS

Circulation in fish



Human respiratory pathway





MULTIPLE CHOICE QUESTIONS

1. Nitrogenous wastes excreted through urine in humans is

(a) Carbon dioxide (b)Ammonia (c)Uric Acid (d)Urea

2. The _____ is a network of tiny blood vessels located at the beginning of a nephron.

(a) Renal vein (b) Renal tubules (c)Bowman's capsule (d)Glomerulus

3. Which option correctly shows the transport of oxygen to the cell?

(a) Lungs →pulmonary vein →left atrium →left ventricle →aorta → body cells

(b) Lungs →pulmonary vein →right atrium →right ventricle → aorta → body cells

(c) Lungs →pulmonary artery →left atrium → left ventricle → vena cava → body cells

(d) Lungs →pulmonary artery →right atrium → right ventricle→ vena cava → body cells

4. Which of the equations show correct conversion of CO_2 and H_2O into carbohydrates in plants?

(a)

$$6CO_2 + 6H_2O \xrightarrow[\text{Heat energy}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 12H_2O$$

(Glucose)

(b)

$$6CO_2 + 6H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 12H_2O$$

(Glucose)

(c)

$$6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2 + 6H_2O$$

(Glucose)

(d)

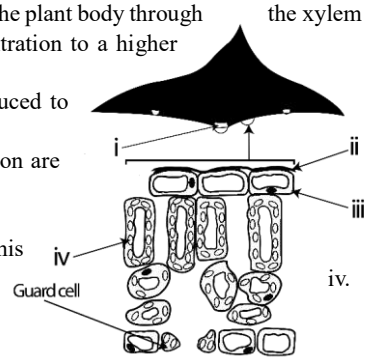
$$6CO_2 + 12H_2O \xrightarrow[\text{Heat energy}]{\text{Chlorophyll}} C_6H_{12} + 6O_2 + 6H_2O$$

(Glucose)

5. Identify the correct path of blood in a fish.
   (a) gills, atria, ventricle, body (b)Atria, ventricle, gills, body
   (c)Body, atria, ventricle, gills (d)Atria, gills, ventricle, body

6. How is food transported from the phloem to the tissues according to plants' needs?
   (a) Food is transported along with the water in the plant's body
   (b) Food is transported in only one direction, like water in the plant body through the xylem
   (c) Food is transported from a region with a low concentration to a higher concentration
   (d) Food is transported from the region where it is produced to other parts of the plants

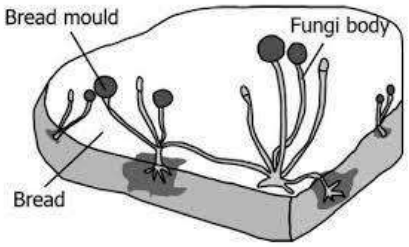
7. Choose the correct option where parts of the leaf section are correctly labelled.



   a) i. midrib ii. cuticle iii epidermis iv. Palisade cells
   b) i cuticle ii. midrib iii. Palisade cells iv. epidermis
   c) i. Palisade cells ii. epidermis iii. cuticle iv. midrib
   d)i. epidermis ii. cuticle iii. palisade iv. midrib

8. How does pH change in human alimentary canal?
   a) from acidic pH in stomach to basic pH in small intestine
   b) from basic pH in stomach to acidic pH in small intestine
   c) from neutral pH in stomach to acidic pH in small intestine
   d) from neutral pH in stomach to basic pH in small intestine

9. The following image shows the bread moulds on bread. How do these fungi obtain nutrition?



(a) By eating the bread on which it is growing

(b) By using nutrients from the bread to prepare their own food

(c) By breaking down the nutrients of bread and then absorbing them

(d) By allowing other organisms to grow on the bread and then consuming them.

10. Human skin cannot function as a respiratory organ because_____

(a)It is not permeable to O_2 and CO_2 (b)It is rather thick (c)It is dry (d)All of the above

Answers

1 d	2 d	3 a	4 c	5 b
6 d	7 a	8 a	9 c	10 d

ASSERTION REASON QUESTIONS

The following questions consists of two statements- Assertion (A) and Reason(R). Answer these questions selecting appropriate option given below:

(a) Both A and R are true and R is correct explanation of A

(b) Both A and R are true and R is not correct explanation of A

(c) A is true but R is false

(d) A is false but R is true.

1. Assertion : One of the end products of anaerobic respiration is alcohol.
   Reason : There is incomplete breakdown of glucose.
2. Bile is essential for digestion of lipids.
   Reason : Bile juice contains enzymes.
3. Assertion : The rate of photosynthesis in plants is low both at lower and higher temperature.
   Reason : Photosynthesis is an enzymatic process.
4. Assertion: The purpose of making urine is to filter out undigested food from intestine.
   Reason: Kidneys filter the waste and produce urine.
5. Assertion: Arteries are thick-walled in nature.
   Reason: Arteries have to transport blood away from the heart.

1 a	2 c	3 a	4 d	5 c

TWO MARK QUESTIONS

1.
   a) Photosynthesis converts energy X into energy Y. What are X and Y?
   b) State the various steps involved in the process of photosynthesis.

Answer

a. X is solar energy, Y is chemical energy

b. Absorption of light energy, conversion of light energy to chemical energy and splitting of water molecule, reduction of CO_2 to carbohydrates.

2. In the process of Photosynthesis food A is prepared which gets converted into food B. What are A and B? Why is A converted to B?
   Ans. Food A is glucose and food B is Starch.

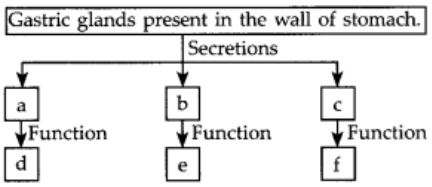
   A is converted to B as B is insoluble form of carbohydrate. It is more compact and hence, suitable for storage.

3. Wrtie the significance of peristaltic movement that occurs all along the gut during digestion.
   Answer: Peristaltic movement or peristalsis is a wave of alternate contraction and expansion that passes through the gut from oesophagus to large intestine. It moves the food forward in a regulated manner along the digestive tract for processing in each part properly.

4. How desert plants perform photosynthesis if their stomata remain closed during the day?
   Answer: Carbon dioxide is absorbed during night when stomata are open. It is fixed in malic acid from which the same is released during day time for performing Calvin cycle in light.

THREE MARK QUESTIONS

1. Identify a,b,c,d,e and f of the following diagram.
   Ans. a. HCl b. pepsin c. mucus d. kills bacteria, making food acidic, activating pepsinogen e. digest proteins to amino acids f. protects lining of stomach.



2. What are the modes of excretion in plants?
   Ans. Modes of excretion in plants are –
   a) The plants get rid of excess water by transpiration.
   b) The only major gases excretory product of plants in oxygen. It is released from plants into the environment by diffusion.
   c) Organic wastes of plants are stored within dead permanent tissues such as wood or within leaves or bark which are periodically removed.
   d) The plants also excrete some wastes substances into the soil around them.
   e) Many wastes products of plants are stored in cellular vacuoles.

3. Root pressure and transpiration pull are important in the conduction of water and minerals in plants. Evaluate this statement.
   Ans. Root pressure is more effective during night. Roots actively absorb minerals from soil increasing osmotic pressure. This cause entry of water into roots. From high pressure, water moves up to low pressure. Transpiration pull is caused by transpirational loss of water to atmosphere creating a suction pull.

4. Comment upon the role of the following in digestion.
   a) Bile b) Salivary amylase c) HCl

   Ans. a) Bile – emulsification of fats b) Salivary amylase – digest starch in mouth

c) HCl – Activate pepsinogen by making medium acidic in stomata.

5. In parasitic mode of nutrition, nutrients are taken from the host without killing them. Explain with two examples.
   In parasitic mode of nutrition one living being (parasite) obtains food from another living being (host).

   Eg. Ascaris in human beings, cuscuta in plants

6. Tooth enamel is the hardest substance in our body. Name the compound of which it is made up of. At what pH of the mouth it gets corroded? State the role of bacteria present in the mouth. Suggest a method to prevent tooth decay.
   Ans. Enamel is chemically hydroxypetite (calcium phosphate) along with some proteins. It gets corroded in acidic pH. The acid produced by bacteria form plaques above teeth if not cleaned after every meal.

LONG ANSWERS

1. (a) State the form in which the following are stored:

   (i) Unused carbohydrates in plants.

   (ii) The energy derived from food in humans,

(b) Describe the process of nutrition in Amoeba with the help of diagram.

Answer:

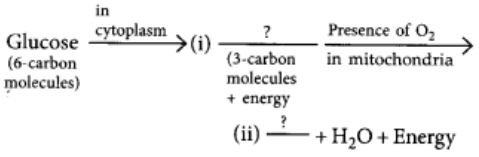
(a) (i) Unused carbohydrates in plants are stored in the form of complex sugar known as starch. They are later broken down into simple sugars (glucose) when energy is needed.

(ii) The assimilated food molecules hold energy in their chemical bonds. Their bond energy is released by oxidation in the cell. This energy is trapped by forming bonds between ADP (adenosine diphosphate) and inorganic phosphate (Pi) to synthesize ATP (Adenosine triphosphate) molecules.

b) Amoeba is a unicellular animal. Amoeba eats tiny (microscopic) plants and animals which float in water. The mode of nutrition in Amoeba is holozoic. When a food particle comes close to Amoeba, it ingests the food particle by forming temporary finger-like projections called pseudopodia around it. The food is engulfed with a little surrounding water to form a food vacuole inside the Amoeba. The food is digested inside food vacuole by digestive enzymes and absorbed directly into the cytoplasm of Amoeba cell by diffusion. When considerable amount of undigested food collects inside Amoeba then its cell membrane ruptures at any place to throw out this undigested food. This process is called egestion.

Diagram – refer textbook fig 6.5

2. i. complete the following diagram



ii. Draw a diagram of human respiratory system and label – pharynx, trachea, lungs, diaphragm and alveolar sac on it.

iii. Give reasons for the following:

a. Lungs always contain residual volume.
b. Nostrils are lined with mucus.

Ans. i. pyruvate, carbon dioxide

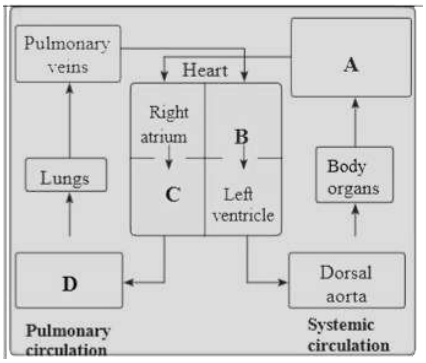
ii. diagram refer textbook fig 6.9

iii. (a) Lungs always contain residual volume so that during the breathing cycle, when air is inhaled and exhaled, there must be sufficient time for oxygen to be absorbed and for the carbon dioxide to be released. It is also important as it prevents the lungs from collapsing.

(b) Mucus and hair present in nostrils help in filtration of inhaled air. It traps harmful substances and germs present in air.

CCT

All living cells need nutrients, Oxygen, and other essential substances. Also, the waste and harmful substances need to be removed continuously for healthy functioning of cells. So, a well developed transport system is mandatory for living organisms. Complex organisms have special fluids within their bodies to transport such materials. Blood is the most commonly used body fluid by most of the higher organisms. Lymph also helps in the transport of certain substances.



1. How is lymph different from blood?
2. Why is double circulation not found in fish?
3. Identify A,B,C and D of the flow chart of double circulation.

Answer.

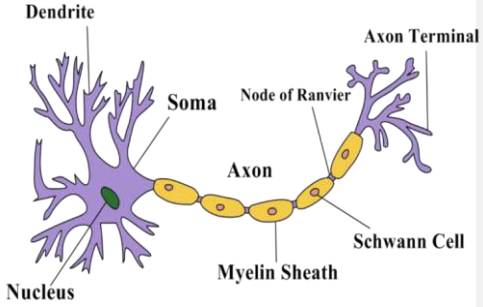
a. Lymph is not in red colour due to absence of haemoglobin. There is less protein.
b. Fish is a cold blooded animal. Its body temperature is not constant. It require less energy to adjust with external environment.
c. A-venacava B-left atrium C-right ventricle D- pulmonary artery.

PART 2

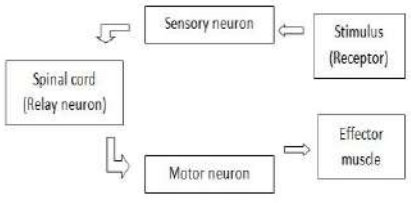
CONTROL AND COORDINATION

Stimuli :- The changes in the environment to which living organisms respond are called stimuli.
Coordination :- The working together of various organs in an organism to produce a proper response to a stimulus is called coordination.
Coordination in animals: In animals control and co ordination is done by the nervous system and endocrine system.
Parts of the nervous system:
i) **The central nervous system** :- consists of the brain, and spinal cord.
ii) **The peripheral nervous system**:- consists of cranial nerves arising from the brain and spinal nerves arising from the spinal cord.

Nerve cell (Neuron): Neuron is the structural and functional unit of the nervous system. It has a cell body called **cyton** containing a nucleus and cytoplasm. It has several branched structures called **dendrites.** It has a long nerve fibre called **axon** which is covered by a protective covering called **Myelin sheath.** The junction between two neurons is called **synapse**



Brain :-The brain is the main coordinating centre in the human body. It is protected by the cranium. It is covered by three membranes called meninges filled with a fluid called cerebrospinal fluid which protects the brain from shocks.The brain has three main parts.
Fore brain :- consists of the cerebrum and olfactory lobes. It controls voluntary actions like touch, smell, hearing, taste, sight, mental activities like thinking, learning, memory, emotions.
Mid brain :- controls involuntary actions and reflex movements of head, neck, eyes etc.
Hind brain :- consists of cerebellum, pons and medulla.
Cerebellum :- controls body movements, balance and posture.
Pons :- controls respiration.
Medulla :- controls heart beat, blood pressure, swallowing, coughing, sneezing, vomitting etc
Spinal cord :- The spinal cord starts from the brain and extends through the vertebral column. It carries messages to and from the brain. It also controls reflex actions.
Reflex arc: The pathway of a reflex action is called reflex arc.



Reflex action :-Reflex action is a sudden, unconscious and involuntary response of the effectors to a stimulus. Eg:- We suddenly withdraw our hand if we suddenly touch a hot object.

Coordination in plants :-

In plants control and coordination is done by chemical substances called plant hormones or phytohormones.

i) **Auxins** :- help in cell division, cell elongation and growth.

ii) **Gibberillins** :- help in growth of stem and branches.

iii) **Cytokinins:**- help in cell division, formation of fruits and seeds.

iv) **Abscisic acid** :- inhibits growth and affects wilting of leaves.

vi) **Ethylene** :- helps in flowering and ripening of fruits.

Movements in plants :-Movements in plants are of two main types.

They are :-**Tropic movements:** are directional movements towards or away from the stimulus and it depends on growth. They are of different types like Phototropism, Geotropism, Chemotropism, Hydrotropism etc.

Nastic movements :- are non directional movements which are neither towards or away from the stimulus and it does not depend on growth. Eg :- If we touch the leaves of touch me not plant, its leaves fold up and droops down immediately

Endocrine glands in human beings

Sl No	Gland	Hormone	Location	Function	Target site
1.	Hypothalamus	i)Releasing hormone(RH) ii)Inhibiting hormones (IH)	Part of forebrain	Regulates secretion of pituitary hormones.	Pituitary gland
2.	Pituitary Gland	i) Growth hormone (GH) ii) Tropic hormones	Part of forebrain	-Controls growth- dwarfism & gigantism Controls other organs	-Most tissues
3.	Thyroid Gland	i) Thyroxin	Neck/Throat region	Regulates carbohydrate, protein and fat metabolism	-Body tissues
4.	Adrenal Gland	i) Adrenaline	Above the kidney	Prepares the body for emergency situations and hence is also called 'Fight and flight' hormone.	-Body tissues
5.	Pancreas	i) Insulin	Below the stomach	Regulates blood sugar level.	-Tissues
6.	Testis	i) Testosterone	Genital/ Lower abdominal area	-helps in the development of male reproductive organs & secondary sexual characters. -influence male sexual behaviour.	Male body tissue
7.	Ovary	i) Oestrogen	Genital/ Lower abdominal area	helps in the development of female reproductive organs, secondary sexual characters & female secondary sexual behaviour.	Female body tissue

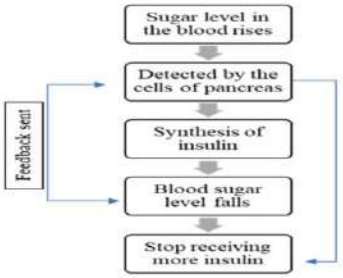
Feedback Mechanism: A feedback mechanism tends to accelerate or inhibit the hormonal secretion. The excess or deficiency of hormones has a harmful effect on our body. Feedback mechanism makes sure that hormones are secreted in precise quantities and at right time.

QUESTION BANK

SECTION 1 – MCQ

1. Nerves throughout the body other than Brain and spinal cord form ___.

A) CNS B) PNS C) ANS D) AAS



2. The growth of pollen tubes towards ovules is due to____.

A) hydrotropism B) phototropism C) chemotropism D) geotropism

3. In reflex action, the reflex arc is formed by

A) Muscles - receptor – brain B) Muscles - effector – brain

C) Receptor - spinal cord – muscles D) Spinal cord - receptor – muscles

4.Which of the following statements are true about brain?

i. The main thinking part of brain is hind brain

ii. Centers of hearing, smell, memory, sight etc. are located in fore brain

iii. Involuntary actions like salivation, vomiting, blood pressure are controlled by the medulla in the hind brain

iv. Cerebellum does not control posture and balance of the body

A. (i) and (ii) B. (i), (ii) and (iii) C. (ii) and (iii) D. (iii) and (iv)

5. Posture and balance of the body is controlled by

A) Pons B) Medulla oblongata C) Cerebellum D) Cerebrum

6.Artifical ripening of fruit is carried out by

A) Auxins B) Ethylene C) Abscisic acid (ABA) D) Gibberellins

7. _____ are also known as ductless gland

A) Salivary gland B) Endocrine gland C) Exocrine gland D) Both B & C

8.An example of a sex hormone is _____.

A) testosterone B) Insulin C) Thyroxin D) thymosin

9.Iodine is necessary for the synthesis of which hormone?

A) Adrenaline B) Thyroxin C) Auxin D) Insulin

10. The longest fibre on the cell body of a neuron is called

A) sheath B) cytoplasm C) axon D) dendrites

SECTION 1- ANSWERS

1	2	3	4	5	6	7	8	9	10
B	C	C	C	C	B	B	A	B	C

SECTION 2 – SHORT ANSWER QUESTIONS

1.A potted plant is made to lie horizontally on the ground. Which part of the plant will show (i) positive geotropism? (ii) negative geotropism?

2. Hema brought some unripe tomatoes and left half of them in brown paper bag and the other half in an open tray. after two days she noticed that the tomatoes in the paper bag had ripened, but the ones in the open tray had not.

(a)what hormone facilitated the ripening of tomatoes?

(b) why did the tomatoes in the bag ripen faster?

3. (a) Name one plant hormone that controls directional growth

(b) Plant hormones are also called as growth regulators and can be controlled by a number of stimuli. Mention one point of difference between the functioning of animal growth hormone and plant growth regulators with respect to such control.

4. (a) Name the hormones that are released in human males and females when they reach puberty.

(b) Name a gland associated with brain. Which problem is caused due to the deficiency of the hormone released by this gland ?

5. What causes a tendril to encircle or coil around the object in contact with it is? Explain the process involved.

6. There are four major types of phytohormones A, B, C & D. 'A' promotes the wilting and falling of leaves, 'B' is responsible for the phenomenon of phototropism in plants, 'C' is involved in shoot extension and 'D' helps in breaking the dormancy of seeds and buds. Identify A,B,C and D

7.Sheila saw a snake and instantly jumped back. She then slowly moved away from the snake. When receives a sudden stimulus, our body shows a strong reaction. Explain the process.

8. What events take place between the synapse of two neurons?

9.(a) Draw neat diagram of human brain and label on it the following parts :

i) Midbrain (ii) Pituitary gland

(b) How is brain and spinal cord protected from injury and shock?

10. Write the difference between cerebellum and cerebrum

ANSWER -SHORT ANSWER QUESTIONS

1. (i) Root (ii) Shoot.
2. (a) Ethylene

   (b) ethylene is a gaseous hormone and the paper bag prevented it from diffusing into the air, hence the tomatoes ripened faster

3. (a) Auxin

(b) Animal growth hormone cannot promote growth under the influence of external stimuli like light, gravity etc. while plant growth regulators do.

4. (i) Testes in males produces hormone testosterone.

Ovaries in females produces hormone oestrogen.

(ii)Pituitary gland present in the brain is responsible for body growth, development of bones and muscles (if excess-gigantism) (if less-dwarfism).

5. Tendrils are sensitive to touch. When they come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it.

6. A-Abscisic acid, B-Auxin, C- Gibberellin, D- Cytokinin

7. Reflex action is a type of involuntary, rapid and automatic response to stimuli. The jump was an involuntary quick reflex action, but walking away was a voluntary slow action.

8. A synapse is a gap between two neurons. In between synapses, nerve impulses are conducted by a chemical process with the help of neurotransmitters (acetylcholine). within the axon, a nerve impulse travels by an electric signal. When it reached to synapse, the neurotransmitters are released in the synaptic cleft. These neurotransmitters act as stimuli for the next neuron

9. (a) refer text book diagram

(b) Brain is covered by a three layered membrane called meninges. In between the layers of meninges and brain, cavity fluid named Cerebro Spinal Fluid (CSF) is filled. The hard skull covers the meninges. Thus Meninges, CSF and Skull protects our brain for a certain extent. The spinal cord is protected by vertebral column

10.

	Cerebrum	Cerebellum
I.	It is the part of forebrain.	It is the part of hindbrain.
II.	It forms the front, superior and lateral sides of the brain.	It lies in the posterior region of the brain.
III.	It has two cerebral hemispheres.	It has two cerebellar hemispheres and one central vermis.
IV.	Cavity is nearly absent.	It has two cavities called lateral ventricles.
V.	It is the seat of intelligence and memory.	It coordinates muscular activity.
VI.	It maintains posture equilibrium of the body.	It controls sight, smell, taste, hearing, etc.

LONG ANSWER QUESTIONS

1.A person is advised by a doctor to take less sugar in his diet. Name the disease from which the man is suffering. For this disease which hormone is responsible? Name the endocrine gland which secretes this hormone. Which glands secrets growth hormone? What will be the consequences of Deficiency and Excess secretion of growth hormone?

2. List in tabular form three differences between nervous system and Endocrine system.

Answer.

LONG ANSWER QUESTION -ANSWER

1. (a)Disease- Diabetes mellitus, Hormone – Insulin, Gland- Pancreas

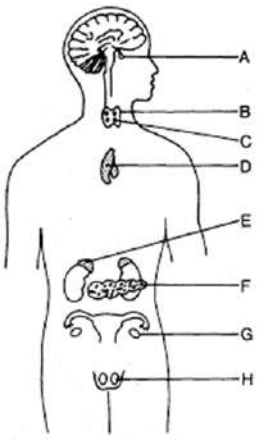
Gland- Pancreas Gland- Pituitary Gland, Excess secretion: Gigantism, Deficiency: Dwarfism

2.

	Nervous system mechanism		Hormonal system mechanism
1.	The information is conveyed in the form of electric impulse.	1.	The information is conveyed in the form of chemical messengers.
2.	The axons and dendrites transmit the information through a coordinated effort.	2.	The information is transmitted or transported through blood.
3.	The flow of information is rapid and the response is quick.	3.	The information travels slowly and the response is slow.
4.	Its effects are short lived.	4.	It has prolonged effects.

CCT BASED QUESTION

The endocrine system is made up of the endocrine glands that secrete hormones. Although there are eight major endocrine glands scattered throughout the body, they are still considered to be one system. Some glands also have non-endocrine regions that have functions other than hormone secretion. For example, the pancreas has a major exocrine portion that secretes digestive enzymes and an endocrine portion that secretes hormones. The ovaries and testes such secrete hormones and also produce the ova and sperm. Some organs, as the stomach, intestines, and heart, produce hormones, but their primary function is not hormone secretion.



1.Identify endocrine glands A, B, E and F
2. Write the chemical produced by gland G and its effect
3.which gland secretes digestive enzyme as well as hormones?
4. Which of the following endocrine gland is unpaired?
A. Adrenal B. Testes C. Pituitary D. Ovary
5.What is feedback mechanism of hormonic regulation. Take the example of insulin to explain the phenomenon

ANSWERS

1. A- Pituitary, B-Thyroid , E-Adrenal ,F- Pancreas,
2.Gland G is ovary. It secretes estrogen which controls production of ovum/secondary sexual character
3.pancreas
4.C-Pituitary
5.Mechanism by which the amount of any chemical increases or decreases resulting in secretion of the related hormone.
Eg: when sugar level rises, insulin secretion increases.
When sugar level falls, insulin secretion reduces

Reproduction is the biological process that ensures continuity of life on earth. It is the process by which living organisms produce new individuals similar to themselves.
Reproduction may be sexual or asexual. Sexual reproduction give rise to new genetic combinations by fusion of gametes and leads to variation and promotes evolution. Variations are useful for the survival of the individual and species over time as well as basis for evolution.

Types of Reproduction:

A. Asexual Reproduction

a) It involves only one parent.
b) There is no formation and fusion of gametes.
c) The young ones formed are almost identical to each other as well as to the parent cell.
d) Asexual reproduction generally occurs during favourable environmental conditions and when there is an abundance of food.

B. Sexual Reproduction

a) Two individuals i.e., one male and one female are needed to give rise to new individual.
b) Gametic fusion takes place.
c) Since gametes are derived from two different organisms, it results in a new combination of genes which increases the chances of genetic variations.
d) Sexual reproduction results in the origin of new species.
e) Adopted by higher organisms
f) Asexual.
g) Fission.

Binary Fission in Ameoba:

a) Reproduction in amoeba: When the amoeba cell reaches its maximum size, then first the nucleus of amoeba lengthen and divide into two parts following the division of cytoplasm of parent to form two smaller daughter cells.

b) Multiple fission: When fission results in many daughter cells, it is called multiple. For example - Plasmodium.

c) Fragmentation: The organism breaks-up into smaller pieces; upon maturation, each piece develops into new individual. E.g., Spirogyra.

d) Regeneration: In this, a few organisms may give rise to new individual organisms from their body parts. For example - Hydra and Planaria

Budding:
In some organisms, a bud is formed which develops into tiny individual. It detaches from parent body upon maturation and develops into a new individual. For example: Hydra

Vegetative Propagation:
Method by which plants reproduce by their vegetative parts such as roots, stems, and leaves.
Types of Vegetative Propagation: It is two types

- Natural vegetative propagation.
- Artificial vegetative propagation (Tissue culture).

Mint reproduces naturally by roots. Sugarcane, jasmine by stems and Bryophyllum by leaves. In bryophyllum buds are produced in the notches along the leaf margins and when they fall on the soil, they develop into new plants.

Importance of Vegetative Propagation

- Plants are genetically almost similar to the parent plant..
- Plants which have lost the ability to produce viable seeds can also reproduce by vegetative propagation.
- All plants can bear flowers and fruits earlier
- Seedless varieties of plants can be obtained.
- The property of vegetative propagation is used by horticulturists in developing methods like layering, grafting to grow many plants like sugarcane, roses, or grapes.

Spore Formation:

Spore, a reproductive cell, capable of developing into a new individual without fusion with another reproductive cell. Spores are agents of asexual reproduction, whereas gametes are agents of sexual reproduction. Spores are produced by bacteria, fungi, algae and Plants.

Rhizopus (Bread mould) grows as filamentous, branched structure. The filamentous structure that grows above it is called Hyphae, which are not the reproductive parts. Hyphae give rise to a Globular structure called Sporangia, which contains spores. The spores are covered by thick wall that protect them from any adverse conditions and the spores are lighter so they get dispersed to another places easily. It will provide better chances for them to survive and grow up.

MULTIPLE CHOICE QUESTIONS

1) The number of chromosomes in parents and offsprings of a particular species remains constant due to

a) doubling of chromosomes after zygote formation
b) halving of chromosomes during gamete formation
c) doubling of chromosomes after gamete formation
d) halving of chromosomes after gamete formation

2) Variations occur as a result of

a) Asexual reproduction b)Vegetative propagation
c) Sexual reproduction d) Regeneration

3) Reproduction is essential for living organisms in order to ……

a) Keep the individual organism alive b) Fulfill their energy requirement
b) Maintain growth d) Continue the species generation after generation

4) How do spores develop into Rhizopus?

a) spores divide and grow into new individual
b) spores combine with other spores and grow
c) spores enlarge in size for the growth of new individual
d) spores land on other organisms and increase with their growth in size.

5) Cloning is a mode of :

a) sexual reproduction b)asexual reproduction c) both a and b d) none

6) Vegetative propagation refers to formation of new plants from————-.

a) stem, roots, flowers b) stem, roots, leaves

c) stem, flowers, fruit d) stem, leaves, flowers

7) The ability of a cell to divide into several cells during reproduction in Plasmodium is called
a) budding b) reduction division c) binary fission d) multiple fission

8) A feature of reproduction that is common to Amoeba, leishmania and Spirogyra is that
a) they reproduce asexually b) they are all unicellular
c) they reproduce only sexually d) they are all multicellular
9) Identify the organism that can divide in only one plane
a) Plasmodium b) Leishmania c) Amoeba d) Spirogyra

10) Bryophyllum can be propagated vegetatively by the

a) stem b) leaf c) root d) flower

11) When an animal is cut into pieces and each piece grows into a complex organism. What is the process?
a) Budding b) Fragmentation c) Spore formation d) Regeneration

12) Hydra usually reproduces by:
a) fragmentation and budding
b) regeneration and budding
c) multiple fission and fragmentation
d) Regeneration

13) In the list of organisms given below, those that reproduce by the asexual method are
(i) banana (ii) cat (iii) spirogyra (iv) Amoeba
a) (ii) and (iv) b) (i), (iii) and (iv) c) (i) and (iv) d) (ii), (iii) and (iv)

14) Offspring formed by asexual method of reproduction have greater similarity among themselves because
(i) asexual reproduction involves only one parent
(ii) asexual reproduction does not involve gametes
(iii) asexual reproduction occurs before sexual reproduction
(iv) asexual reproduction occurs after sexual reproduction

(a) (i) and (ii) b) (i) and (iii) c) (ii) and (iv) d) (iii) and (iv)

15) In Spirogyra, asexual reproduction takes place by
(a) breaking up of filaments into smaller bits (b) division of a cell into two cells
(c) division of a cell into many cells (d) formation of young cells from older cells.

Answer key

1) b, 2)c, 3) d, 4) a 5) b, 6) b 7) d,8) a, 9) b, 10) b, 11) d, 12) b
13) b 14) a, 15) a

ASSERTION AND REASON

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

16) Assertion : clones of an organism are formed by asexual reproduction
Reason: Clones have exact copies of genes as parental organism.
17) Assertion : Asexual reproduction is a type of reproduction in primitive organisms
Reason : Asexual reproduction is a simple process involving only one parent.
18) Assertion : Variations are prominent in sexual reproduction
Reason : in sexual reproduction the offsprings are exactly similar to parents.
19) Assertion: Regeneration is a process of reproduction in certain organisms
Reason: spirogyra reproduces by regeneration
Answer key

16) b 17) a 18) c 19) c

SHORT ANSWER QUETIONS

20) Newly formed DNA copies may not be identical at times. Give one reason.
21) Define reproduction. How does it helps in providing stability to the population of species?
22) How does Plasmodium reproduce. Is this method sexual or asexual?
23) Name the part of Bryophyllum where the buds are produced for vegetative propagation.
24) Name the causative agent of the disease "kala- azar" and its mode of asexual reproduction
25) How do Plasmodium and Leishmania reproduce? Write one difference in their mode of reproduction.
26) Name an organism which reproduces by spore formation. List three conditions favourable for spores to germinate and grow

LONG ANSWER QUESTIONS

27) Name the mode of reproduction of the following organisms and state the important feature of each mode :

I. Planaria
II. Hydra
III. Rhizopus
a) We can develop new plants from the leaves of Bryophyllum. Comment.
b) List two advantages of vegetative propagation over other modes of reproduction. (2020)
28) A) What is the importance of variation in the survival of individuals?
B) What are the limitation of the asexual mode of reproduction?
C)Differentiate between asexual reproduction and sexual reproduction.

ANSWER KEY

20) When a cell reproduces, DNA replication occurs which results in formation of two similar copies of DNA. The process of copying the DNA leads to some variations each time. As a result, the DNA copies produced are similar to each other but sometimes may not identical.

21) The production of new organisms by the existing organisms of the same species is known as reproduction. It is linked to the stability of population of a species. DNA replication during reproduction ensures transfer of specific characters or body design features that is essential for an individual of a population to live and use that particular niche. Some variations present in a few individuals of population caused due to reproduction which also helps in their survival at changing niches.

22) Plasmodium reproduces through multiple fission method. In this method, the parent organism splits to form many new organisms at the same time. This is an asexual method of reproduction.

23) Bryophyllum propagates vegetatively by the buds produced at the margins of leaves.

24) Causative agent of the disease Kala-azar is Leishmania. It reproduces asexually by binary fission.

25) Plasmodium and Leishmania reproduce by the process of fission which is an asexual mode of reproduction. Plasmodium reproduces by multiple fission. About 1000 daughter cells are produced by the multiple fission of a Plasmodium. Leishmania reproduces by the process of binary fission. In Leishmania, the splitting of parent cell takes place in a definite plane (longitudinally) with respect to flagellum at its end to produce two daughter cells.

26) Rhizopus reproduce by the method of spore formation.
The three conditions favourable for spores to germinate and grow are moisture, suitable temperature and food (nutrition).

27) (i) Planaria – Regeneration
Regeneration of organism from its cut body parts occurs by the process of growth and development. Regeneration is an asexual mode of reproduction common in lower plants and animals.
(ii) Hydra – Budding
In budding, a small part of the body of the parent organism grows out as a bud which on detaching forms a new organism.
Budding occurs in yeast, some protozoans and certain lower animals.
(iii) Rhizopus – Spores
Spores are usually produced in sporangia.
Spore formation is a common method of an asexual reproduction in bacteria and most of the fungi.
a) The leaves of a Bryophyllum have special type of buds in their margins. These buds may get detached from the leaves, fall to ground and then grow to produce new Bryophyllum plants. The buds can also drop to the ground together with the leaf and then grow to produce new plants.
b) Advantages of vegetative propagation are : Useful in plants that do not produce viable seeds
It is a quick method of propagation.
The new plants produced by artificial vegetative propagation are exactly like the parent plants.

28)A) Variations help in survival of the organism by many different ways-

(i) It helps a species to survive

(ii) It also helps organisms to adapt to their environment as well as to changes which do occur in the environment.

(iii) It also helps a species to emerge strong if favoured by natural selection. (iv)Variation helps a species to be resistant to diseases.
B) In asexual reproduction very little variation occurs within generation. Asexual reproduction has a lesser significance for evolution of species. Asexual reproduction involves only a single individual. It does not require two sexes.
Sexual reproduction involves two different individuals, male and female sexes. The offspring is produced due to fission of male and female gametes.

CASE STUDY BASED QUESTION
29) Read the following and answer the questions:
Preeti is very fond of gardening. She has different flowering plants in her garden. One day few naughty children entered her garden and plucked many leaves of Bryophyllum plant and threw them here and there in the garden. After few days, Preeti observed that new Bryophyllum plants were coming out from the leaves which fell on the ground.

i) What does the incidence sited in the paragraph indicate?
(a). Bryophyllum leaves have special buds that germinate to give rise to new plant.
(b). Bryophyllum an propagate vegetatively through leaves.
(c). Bryophyllum is a flowering plant that reproduces only asexually
(d). Both (a) and (b).
ii) Which of the following plants can propagate vegetatively through leaves like Bryophyllum?
(a) Guava (b) Begonia (c) Ginger (d) Mint
iii) Do you think any other vegetative part of Bryophyllum can help in propagation? If yes, then which part?
(a) Roots (b) Stems (c) Flowers (d) Fruits
iv) Which of the following plant is artificially propagated (vegetatively) by stem cuttings in horticultural practices?
(a). Potato (b) Snake plant (c) Rose (d) Water hyacinth
v) Vegetative propagation is comparatively faster method than sexual method. Do you agree? Why?
Answer key

29) i) d ii) b iii) b iv) c v)Yes, production of new plant through seed production takes more time compared to reproduction through vegetative propagation.

CHAPTER 9

HEREDITY

Genetics deals with the study of-

HEREDITY — The transmission of between the parent and offspring.

VARIATION — The differences in the characters/traits characters/traits from or generation to the next generation.

VARIATION

Somatic variation	**Gametic variation**
• Takes place in the body reproductive cells.	• Takes place in the gametes/ cells.
• Neither inherited nor transmitted.	• Inherited as well as transmitted.
• Also known as acquired traits.	• Also known as inherited traits.
• Example, boring of pinna, cutting of tails in dogs.	• Example, human height, skin colour.

Accumulation of Variation during Reproduction

Asexually	Sexually
• Variations are fewer.	• Variations are large.
• Occurs due to small copying. **(Mutation)**	• Occurs due to crossing over during separation of chromosomes, mutation.

Importance of Variations:

(i) Depending upon the nature of variation, different individuals would have different kinds of advantages.

Example, Bacteria that can withstand heat will survive better in a heat wave.

(ii) Main advantage of variation to species is that it increases the chances of its survival in a changing environment.

KEY POINTS

Traits - characteristic features of an organism, manifested in a physical form that is visible or in a physiological aspect of the organism. Sexually reproducing individuals have two copies of genes for the same trait.

Dominant traits - The traits that express themselves in an organism in every possible combination and can be seen are called Dominant traits.

Recessive traits - A trait which is not expressed in the presence of a dominant allele is known as recessive.

Gene – It is the basic unit of inheritance. It consists of a sequence of DNA, which is the genetic material. Genes can mutate and can take two or more alternative forms.

Alleles – The alternative forms of genes. They affect the same characteristics or traits in alternate forms. They are located on the same place of the chromosome.

Homozygous – Each organism has two alleles for every trait.In homozygous, both the alleles are same. For Example, "TT" is the homozygous expression for tallness trait.

Heterozygous – If the two alleles are different from each other, then they are heterozygous in nature. For Example, "Tt" is the heterozygous expression for tallness trait.

Chromosomes – These are thread-like structures made up of nucleic acids (DNA) and proteins. They are mostly found in the nucleus of the cells. They carry the hereditary or genetic information in the form of genes.

Genotype – It is the complete heritable genetic identity of an organism. It is the set of alleles that are carried by the organism. It also includes non-expressed alleles.

Phenotype – It is the description of the actual physical characteristics of an organism or the expressed form of the genotype.

Mendel and His Work on Inheritance

- **Gregor Johann Mendel (1822 & 1884):** Started his experiments on plant breeding and hybridisation. He proposed the laws of inheritance in living organisms. Mendel was known as **Father of Genetics.**
- **Plant selected by Mendel:** *Pisum sativum* (garden pea). Mendel used a number of contrasting characters for garden pea.

Dihybrid Cross

A cross between two plants having two pairs of contrasting characters is called dihybrid cross. (Example: cross between Round green(RRyy) and Wrinkled Yellow(rrYY) produces plants with Round & yellow seeds(RrYy) in F1 generation)

F2 Phenotypic Ratio

Round Yellow : 9 Round Green : 3

Wrinkled Yellow : 3 Wrinkled Green :1

How do traits get expressed

Cellular DNA (Information source)→ For synthesis of Proteins →Works efficiently→ More Hormone→ Produced tallness of plants

Therefore, genes control characteristics or trait

SEX DETERMINATION

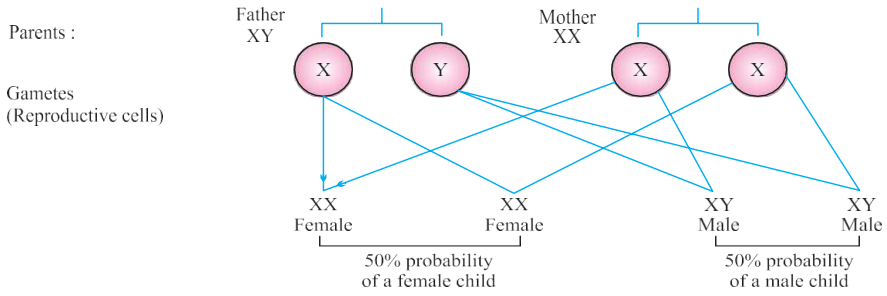
Determination of sex of an offspring.

FACTORS Responsible for Sex Determination

Environmental	**Genetic**
In some animals, the temperature eggs are gender.	In some animals like humans the gender of the individual is determined by the pair of sex chromosomes. which the fertilised kept decides
E.g: Turtle	XX – Female XY – Male

Sex Chromosomes : In human beings, there are 23 pairs of chromosome. Out of these 22 chromosomes pairs are called autosomes and the last pair of chromosome that help in deciding gender of that individual is called sex chromosome.

Sex determination in Human Beings



This shows that half the children will be male and half will be female. All children will inherit an X chromosome from their mother regardless whether they are boys or girls. Thus, sex of children will be determined by what they inherit from their father, and not from their mother.

Multiple Choice Questions:

1. The process where characteristics are transmitted from parent to offspring is called
   a) Variation b) Heredity c) Gene d) Allele
2. Exchange of genetic material takes place in

a) Vegetative reproduction b)Asexual reproduction

c)Sexual reproduction d)budding

3. The following results were obtained by a scientist who crossed the F_1 generation of pure-breeding parents for round and wrinkled seeds.

Dominants trait	**Recessive trait**	**No. of F_2 offspring**
Round seeds	Wrinkled seeds	7524

From these results, it can be concluded that the actual number of round seeds he obtained was: a) 1881 b) 22572 c) 2508 d) 5643

4. In peas, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plants to pure short plants in F_2 generation will be:
a) 1 : 3 b) 3 :1 c) 1 : 1 d) 2 : 1

5. What will be the number of chromosomes present in each gamete produced by the plants if the palisade cells of a species of plant contain 28 chromosomes in all?
a) 56 b) 28 c) 14 d) 4

Assertion (A) and Reason (R) type questions.
Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
1. Assertion(A) : Variations are seen in offspring produced by sexual reproduction.
Reason (R) : DNA molecule generated by replication is not exactly identical to original DNA.

2. Assertion (A) : When pea plants (pure line) having round yellow seeds are crossed with pure line plants having wrinkled green seeds, then all pea plants obtained in F1, generation bear wrinkled green seeds.
Reason (R): Round and yellow seeds are dominant to wrinkled and green seeds.

3. Assertion (A): Selfing of a plant for several generations helps plant breeders to obtain pure breeding varieties.
Reason (R): Pure breeding plants are heterozygous for many traits.

4.Assertion(A): The sex of a child is determined by the mother.
Reason (R): Humans have two types of sex chromosomes: XX and XY.

5. Assertion (A): Mendel chose a number of varieties of garden pea as plant material for his experiments.
Reason(R): Garden pea has well defined characters and is bisexual.

Case study questions

Read the given information and answer the following questions.

Pea plants can have smooth seeds or wrinkled seeds. One of the phenotypes is completely dominant over the other. A farmer decides to pollinate one flower of a plant with smooth seeds using pollen from plant with wrinkled seeds. The resulting pea pod has all smooth seeds.

1. Which of the following conclusions can be drawn?
   (1) The allele for smooth seeds is dominated over that of wrinkled seeds.
   (2) The plant with smooth seeds is heterozygous.
   (2) The plant with wrinkled seeds is homozygous
   (3) (a) 1 only (b) 1 and 2 only (c) 1 and 3 only (d) 1, 2 and 3
2. Which of the following crosses will give smooth and wrinkled seeds in same proportion?
   (a) RR X rr (b) Rr X rr (c) RR X Rr (d) rr X rr
3. Which of the following cross can be used to determine the genotype of a plant with dominant phenotype?
   (a) RR X RR (b) Rr X Rr (c) Rr X RR (d) RR X rr
4. On crossing of two heterozygous smooth seeded plants (Rr), a total of 1000 plants were obtained in F_1generation. What will be the respective number of smooth and wrinkled seeds obtained in F_1 generation?
   (a) 750, 250 (b) 500, 500 (C) 800, 200 (d) 950, 50

Short Answer Type Questions

1.How do Mendel's experiments show that traits may be dominant or recessive?

2. How do Mendel's experiments show that traits are inherited independently?

3. How is the equal genetic contribution of male and female parents ensured in the progeny? Explain

4. The chromosome number of the sexually reproducing parents and their offspring is same."" Justify the statement.

5. What is DNA copying? State its importance

6. A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other.
(a) List your observations regarding:
(i) Colour of stem in their F1 progeny
(ii) Percentage of brown stemmed plants in F2 progeny if F1 plants are self-pollinated.
(iii)Ratio of GG and Gg in the F2 progeny.
(b) Based on the finding of this cross, what conclusion can be drawn?

7. A blue colour flower plant denoted by BB is cross bred with that of white colour flower plant denoted by bb.

(a) State the colour of flower you would expect in their F1 generation plants.
(b) What must be the percentage of white flower plants in F2 generation if flowers of F1 plants are self-pollinated?
(c) State the expected ratio of the genotypes BB and Bb in the F2 progeny.

8. With the help of a flow chart explain in brief how the sex of a newborn is genetically determined in human beings. Which of the two parents, the mother or the father, is responsible for determination of sex of a child?

9.What is variation? How is variation created in a population? What is the importance of variation for survival of a species?

Long Answer Type Questions [5 marks]

1.a) Why did Mendel choose garden pea for his experiments? Write two reasons.
b) 'Different species use different strategies to determine sex of a new born individual. It can be environmental cues or genetically determined.' Explain the statement by giving example for each strategy.

2.If we cross pure-bred tall (dominant) pea plant with pure-bred dwarf (recessive) pea plant we will get pea plants of F1 generation. If we now self- cross the pea plant of F1 generation, then we obtain pea plants of F2 generation.
(a) What do the plants of F2 generation look like?
(b) State the ratio of tall plants to dwarf plants in F2 generation.
(c) State the type of plants not found in F2 generation but appeared in F2 generation, mentioning the reason for the same.

ANSWERS

Multiple Choice Questions

1. b) Heredity 2.c) Sexual reproduction 3. d) 5643 4. c) 1 : 1 5. c) 14

Assertion (A) and Reason (R) type questions.

1.A 2. D 3. C 4. D 5. A

Case study questions

i (c) 1 and 3 only ii (b) Rr x rr iii (d) RR x rr iv (a) 750, 250

Short Answer Type Questions

1. Mendel selected true breeding tall (TT) and dwarf (tt) pea plants. When a tall pea plant is crossed with a short (dwarf) pea plant, all the F1 hybrids are tall. (i.e., in this case, the gene causing tallness is dominant while the gene causing dwarfness is recessive.).The trait expressing itself in the hybrid is the dominant one.

(Mendel's first law of inheritance states that when a pair of contrasting factors is brought in a hybrid, one factor inhibits the appearance of the other. The one which inhibits is the dominant one and which is inhibited is recessive.)

2. Mendel performed an experiments in which he took a tall plant with round seeds and a short plant with wrinkled-seeds. In F1, They were all tall and had round seeds. Tallness and round seeds were thus dominant traits. When, he used these F1 progeny to generate F2 progeny by self-pollination, he found that some F2 progeny were tall plants with round seeds, and some were short plants with wrinkled seeds. At the same time there tall plants, but had wrinkled seeds, while others were short, but had round seeds. Thus,Mendel's experiments show that the tall/short trait and the round seed/wrinkled seed trait are independently inherited.

3. Equal genetic contribution of male and female parents in the progeny is ensured by the equal inheritance of chromosome from each parent.Human possesses 23 pairs of chromosomes, of which 22 pairs are autosomes and 1 pair is the sex chromosomes. The two sex chromosomes in human are X and Y. Females have 2 X chromosomes and males have a X and Y chromosome. During the process of fertilization, a haploid sperm fuses with a haploid ovum to produce a diploid zygote. Zygote receives equal amount of genetic material from each parent and thus, retains the diploid nature on fertilization.

4. In sexually reproducing organisms, male and female gametes / reproductive cells with only half the number of chromosomes (as in the parent cell) are produced. during fertilization, when male and female gametes fuse to give to a zygote, original number of chromosomes are restored.

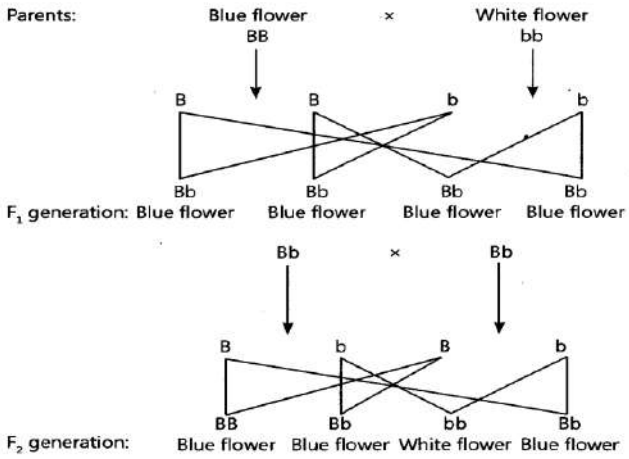
5.DNA copying is the process of producing two identical replicas from one original DNA molecule during cell division. DNA is necessary to make all the RNA and proteins needed for cells to carry out necessary reactions and cellular processes in order to survive.

6. (a) (i) Colour of the stem in F1 progeny: All green
(ii) Percentage of brown stem: 25 %

(iii) GG: Gg is 1: 2

(b) Based on the above cross, it can be concluded that green colour is dominant and get expressed in F1 generation. The brown stem, which does not get express itself in the F1 generation, is the recessive character.

7.



(*a*) The colour of all the flowers in F_1 generation will be blue.
(*b*) Percentage of white flower plants in F_2 generation will be 25.
(*c*) The ratio of genotype BB and Bb in F_2 progeny will be 1 : 2.

8. In human beings, the sex of the individual is genetically determined. Sex chromosome of male is XY and of female is XX. Sex of a child depends on what happens at fertilisation. The woman produces eggs having X chromosome while the man produces 50% sperms having X chromosome and 50% sperms having Y chromosome. Man therefore, actually determines the sex of the new born baby. (Refer the NCERT Text book figure 9.6)

9. The differences in the traits shown by the individuals of a species and also by the offsprings (siblings) of the same parents are referred to as variation. New variation may arise during the process of DNA copying that already has variations accumulated from previous generations. Species having suitable variations have more chance of survival if there is change in environmental conditions.

Long Answer Type Questions
1.(a) Reasons:

(i) Pea plant is small and easy to grow.

(ii) A large number of true breeding varieties of pea plant are available.

(iii) Both self and cross-pollination can be made possible. Because this plant has a short life cycle, the results may be gathered and evaluated more quickly.

(iv) The garden pea possesses a number of features that are diametrically opposed to one another.

b) Environmental Cue: (i) In some animals, the temperature at which fertilised eggs are kept determines whether the developing animal in egg is male or female.

(ii) In some animals like snail, individual can change sex.

Genetical Cue: A child who inherits an X-chromosome from her father will be a girl and one who inherits a Y- chromosome from the father will be a boy.

2. a) All plants of F1 generation will be tall plants.
(b) 3:1
(c) Dwarf trait is recessive trait which was not expressed in the F1 generation, the recessive trait gets expressed in the F2 generation after self pollination.

OUR ENVIRONMENT (Part 2)

Environment: Our surrounding is called environment.

Ecosystem: This is a system of interdependencies among various living beings and nonliving things in a given habitat.

Components of Ecosystem: An ecosystem has two types of components, viz. biotic component and abiotic component.

Abiotic Component: All the non-living things make the abiotic component of an ecosystem. Air, water and soil are the abiotic components.

Biotic Component: All living beings make the biotic component of an ecosystem.

- Green plants play the role of producers; because they prepare the food by photosynthesis.
- Animals and other living beings play the role of consumers; because they take food (directly or indirectly) from plants.
- Bacteria and fungi play the role of decomposers; as they decompose dead remains of plants and animals so that raw materials of organisms can be channelized back to the environment.

Food Chain- food chain is a simple representation of transfer of energy from the sun to different biotic components of an ecosystem. Sun is the ultimate source of energy. Green plants convert solar energy into chemical energy during photosynthesis

Producer → Primary Consumer → Secondary Consumer

Food Web: In any ecosystem, there can be many food chains which are interlinked at various levels. Thus, many food chains form a network which is called food web.

Transfer of Energy through a food chain: Different levels in the food chain are called trophic level. Out of the energy consumed by an organism at a particular trophic level, 90% is utilized for its own need and rest 10% is left for the organism of the next trophic level.

Balance in the Ecosystem: There is a delicate balance in an ecosystem; as far as number of organisms at a particular trophic level is concerned. An increase or decrease in population of any organism can disturb this balance. For example in the following food chain:

Plant----→ Deer----→ Lion

If all the deer are killed in a jungle, the lions would be left with no food. This would endanger the existence of lions. Once the lions and deer would be finished, it would result in population explosion of green plants. If all the lions die in a jungle, it would create another problem. Since no lion would be left to kill the deer, the population of deer would increase substantially. This will finish off all the green plants and finally even the deer would be left with no food for them.

Biodegradable Substances: Substances which can be decomposed by microorganisms are called biodegradable substances. All the organic substances are biodegradable.

Non-biodegradable: Substances which cannot be decomposed by microorganisms are non-biodegradable. All inorganic substances are non-biodegradable.

Ozone Layer Depletion: Ozone layer is also known as stratosphere. When ultraviolet radiations act on oxygen, the oxygen gets converted into ozone. Ozone layer works like a protective shield for living beings.

$$O_2 \xrightarrow{UV\ radiation} O + O$$

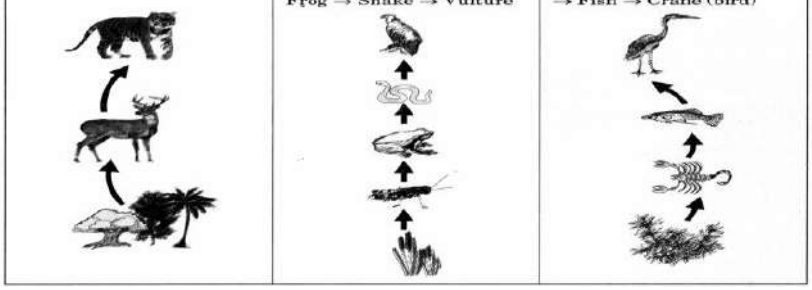
$$O + O_2 \rightarrow O_3$$

Effect of CFCs: Use of CFCs (Chlorofluorocarbon) has damaged the ozone layer. It is used in refrigerators and aerosol spray.

Problems of Waste Disposal -Plastic waste is a serious concern because plastic is nonbiodegradable. Proper segregation of wastes before disposal helps us to save our environment.

Examples of Food Chain

Forest	Grassland	Pond
Plants → Deer → Lion	Plants → Grasshopper → Frog → Snake → Vulture	Aquatic plants → Scorpion → Fish → Crane (bird)



GIST OF THE LESSON/FLOW CHART

OUR ENVIRONMENT

ECOSYSTEM
Interacting Organisms of an area
+ Non living Constituents.

WASTE

TYPES
- **NATURAL**
  - **TERRESTRIAL**Eg: Forest, Grasslands.
  - **Aquatic**. Pond, Lakes, Oceans
- **ARTIFICIAL**
  Eg. Crop field ,Garden, Aquarium ,Space craft.

COMPONENTS
- **BIOTIC** Living components Eg. Plants, Animals and Microbes.
- **ABIOTIC** Non-living components, Physical factors like temperature, rainfall, wind, soil etc.

REPRESENTATION
of relation between different biotic components.

- **FOODS CHAIN**
  A series of organisms feeding on one another taking part at various levels.

- **FOOD WEB**
  A network of interconnected food chains.

FLOW OF ENERGY
1 % energy available from the sun to the terrestrial plants is converted into food.

10 % energy in food is transferred to next level of consumer.90% is lost.

No of steps of food chain is only 3 or 4 as very little energy is available to higher levels.

No of organisms decrease as we move up in a food chain.

Flow of energy in a food chain is unidirectional.

Bio magnificationof pollutants: Progressive accumulation of harmful substances like pesticides takes place

TROPHIC LEVELS
It is each step or level of the food chain.

I-TROPHIC LEVEL: Producers Eg green plants, Blue green algae (Cyanobacteria), Phytoplankton's (Microscopic free floating aquatic plants)

II- TROPHIC LEVEL:Primary consumers or herbivores

III- TROPHIC LEVEL:Secondary consumers or small carnivore.

IV- TROPHIC LEVEL:Tertiary consumers or large carnivore

WASTE

TYPES OF WASTE
BIODEGRADABLE Can be broken down by the enzymes of bacteria or fungi Eg. Plant & animal waste, paper, wood.

NON BIODEGRADABLE Can't be broken down by the enzymes of bacteria or fungi (Decomposers) Eg. Plastics,

EFFECT OF WASTE
OZONE DEPLETION: CFC damage ozone layer.

PROBLEM OF WASTE DISPOSAL

POLLUTION Bio magnificationof pollutants: Progressive accumulation of harmful substances like pesticides takes place in a food chain.

WASTE MANAGEMENT
LAND FILLS:

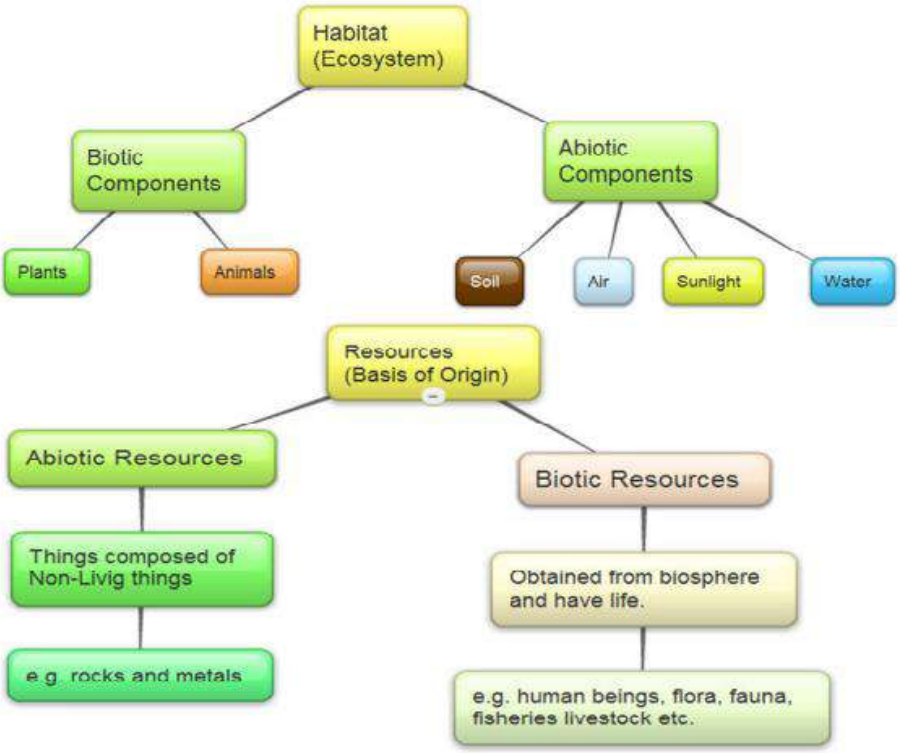
RECYCLING

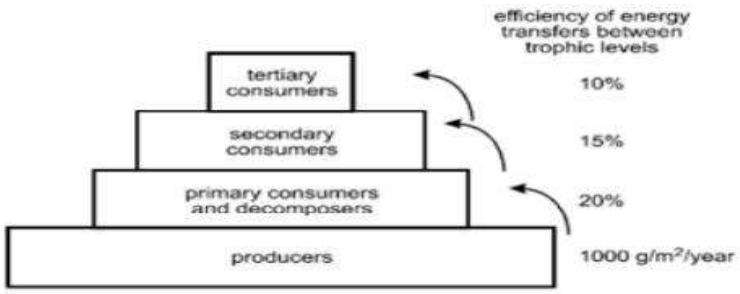
SEWAGE TREATMENT

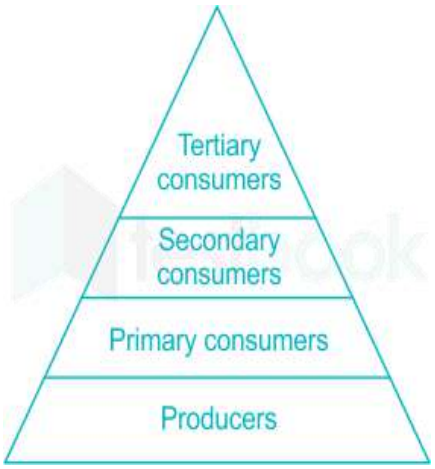
INCINERATION

USE OF DISPOSABLE PAPER CUPS

FLOW CHART


Habitat (Ecosystem)
Biotic Components
Abiotic Components
Plants
Animals
Soil
Air
Sunlight
Water
Resources (Basis of Origin)
Abiotic Resources
Biotic Resources
Things composed of Non-Livig things
Obtained from biosphere and have life.
e.g. rocks and metals
e.g. human beings, flora, fauna, fisheries livestock etc.


efficiency of energy transfers between trophic levels
tertiary consumers
secondary consumers
primary consumers and decomposers
producers
10%
15%
20%
1000 g/m²/year



TROPHIC LEVELS

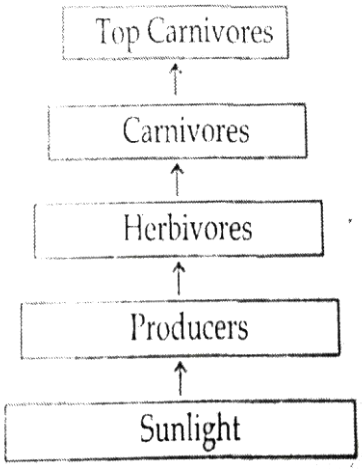


Diagram showing flow of energy in an ecosystem

MULTIPLE CHOICE QUESTIONS

1.Environment includes:

(a) Land, air, water (b)Light, temperature, rainfall

(c) Plants, animals, microbes (d)All of these

2.Which group of waste materials can be classified as non-biodegradable ?

(a) Plant waste, used tea bags (b)Polyethene bags, plastic toys

(c) Used tea bags, paper straw (d)Old clothes, broken footwear

3. The % of solar radiation absorbed by all green plants for photosynthesis is about ————.

(a) 1% (b) 5% (c) 8% (d) 10%

4. If a grasshopper is eaten by frog, then the energy transfer will be from:

(a) producers to decomposers (b) producer to primary consumer

(c) primary consumer to secondary consumer (d) secondary consumer to primary consumer

5. The transfer of Energy in a food chain is always:

(a) Unidirectional (b) Multidirectional (c) Bi-directional (d) Random

6. Which of these is a greenhouse gas?

(a) Hydrogen sulphide (b) Methane (c) Ozone (d) Carbon monoxide

7. What will happen if Deer is missing in the food chain given below?

Grass → Deer → Tiger

(a) The population of tiger increases (b) The population of grass decreases

(c) Tiger will start eating grass

(d) The population of tiger decreases and the population of grass increases.

ASSERTION-REASON TYPE OF QUESTIONS

(a) Both Assertion and reason are true and Reason is the correct explanation of assertion.

(b) Both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) Assertion is false and Reason is true.

8. Assertion - There is generally greater number of individuals at the lower trophic levels of an ecosystem.

Reason - Green plants are the producers in an ecosystem.

9. Assertion - Ozone is formed by three atoms of oxygen.

Reason - UV rays are needed to form ozone molecule.

10. Assertion – Substances that are broken down by biological process are biodegradable.

Reason- Some Pesticides and chemicals are non-biodegradable.

SHORT ANSWER TYPE

Q.1 Using Kulhads as disposable cups to serve tea in trains, proved to be a bad idea. Why?

Q.2 Why is plastic not degraded by bacteria?

Q.3 DDT has entered food chain. Which food habit is safer- vegetarian or nonvegetarian?

Q 4. How can we help in reducing the problem of waste disposal? Give any two methods.

Q5. What is the advantage of disposable paper cup use over plastic cups?

6. Give any two ways in which non-biodegradable substance would affect the environment.

7. What are trophic levels? Give an example of a food chain and state the different trophic levels in it.

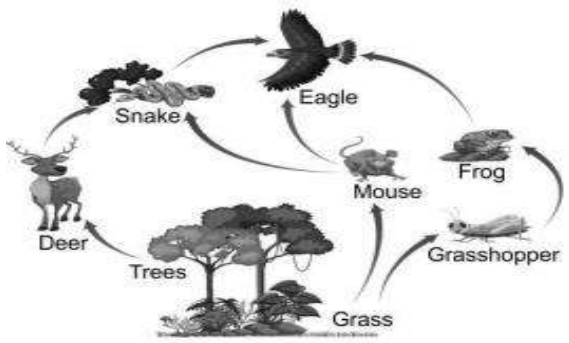
8. What will happen if we kill all the organisms in one trophic level?

9. Study the food chain given below.

I Wheat ----→Rat -----→Snake--→Hawk

Which of the two consumers snake/hawk will get more available energy and why?

10. Study the food web shown below.



(a) Identify and write the food chain from the food web shown, in which the eagle will receive the highest percentage of the energy from the producers.

(b) Which organism will be the most affected when a non-biodegradable pesticide is introduced into the soil? What is the phenomenon responsible for this called?

LONG ANSWER TYPE- 5M

11. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

12. "Energy flow in an ecosystem is always unidirectional".Justify this statement .Explain how the pesticides enter a food chain and subsequently get into our body.

CASE STUDY QUESTIONS

POLLUTION OF RIVER GANGA

The belief the Ganga River is "holy" has not, however prevented over-use, abuse and pollution of the river. All the towns along its length contribute to the pollution load. It has been assessed that more than 80 per cent of the total pollution load (in terms of organic pollution expressed as biochemical oxygen demand (BOD)) arises from domestic sources, i.e., from the settlements along the river course. Due to over-abstraction of water for irrigation in the upper regions of the river, the dry weather flow has been reduced to a trickle. Rampant deforestation in the last few decades, resulting in topsoil erosion in the catchment area, has increased silt deposits which, in turn, raise the river bed and lead to devastating floods in the rainy season and stagnant flow in the dry season. Along the main river course there are 25 towns with a population of more than100,000 and about another 23 towns with populations above 50,000. In addition, there are 50 smaller towns with populations above 20,000. There are also about 100 identified major industries located directly on the river, of which 68 are considered as grossly polluting. Fifty-five of these industrial units have complied with the regulations and installed effluent treatment plants (ETPs) and legal proceedings are in progress for the remaining units. The natural assimilative capacity of the river is severely stressed. The principal sources of pollution of the Ganga River can be characterized as follows:

• Domestic and industrial wastes. It has been estimated that about 1.4 × 106 m3 d-1 of domestic wastewater and 0.26 × 106 m3 d-1 of industrial sewage are going into the river.

• Solid garbage thrown directly into the river.

• Non-point sources of pollution from agricultural run-off containing residues of harmful pesticides and fertilizers.

• Animal carcasses and half-burned and unburned human corpses thrown into the river.

• Defecation on the banks by the low-income people.

• Mass bathing and ritualistic practices.

1. Accumulation of toxic substances at higher trophic levels of an ecosystem

through the food chain in water bodies affects which of the following

organisms more?

(a) Phytoplankton (b)Zooplankton (c) Small fishes (d)Large fishes

2. When toxic chemicals and nutrients get deposited in the water bodies,

which of the following gases get depleted in the water bodies?

(a) Oxygen (b)Carbon dioxide (c) Both oxygen and carbon dioxide (d)Nitrogen

3. Which of the following activities may pollute the river water more?

(a) Bathing using detergent and soap (b)Discharging animals excreta

(c) Deposit flowers and leaves as the part of puja (d)Bathing without soap and detergent

4. Which of the following organisms grow abundant in water when the water get mixed with nutrients like sulphates, phosphates etc.?

(a) Algae (b)Zooplankton (c) Small fishes (d)Large fishes

5 .Green Algae and Diatoms are the major producers of Aquatic ecosystem. Which of the following will be more in the aquatic ecosystem:

(a) Small fishes (b)Large fishes (c) Algae and phytoplankton (d)Tadpole

ANSWERS

MULTIPLE CHOICE QUESTIONS

1	2	3	4	5	6	7	8	9	10
D	B	A	C	A	B	D	B	A	A

SHORT ANSWER TYPE

1. Since kulhads are made using clay, making of kulhads on a large scale to serve tea to passengers in the train was leading to the loss of this top fertile soil.

2. The enzymes in the microorganisms that break down biodegradable materials don't break down the bonds that hold polymers together.

3. Vegetarian habit is safer. Being closer to producers, less DDT will accumulate in our body.

4. By minimizing the use of disposable items and promoting the use of recycled articles.
Separating biodegradable and non-biodegradable waste before dumping them.
Recycling the non-biodegradable waste material.

5. Disposable paper cups are easily decomposed by microorganisms. Hence, they create lesser pollution issues and can be easily buried as compost or can be easily burned causing less pollution compared to disposable plastic cups.

6. (i) As the non-biodegradable waste cannot be broken down into simpler forms hence, they keep on accumulating in nature causing pollution.

(ii) They cause diseases.

(iii) It also causes biological magnification.

7. Each step or level of the food chain forms a trophic level.

	Grass----→Deer-----→Lion		
Trophic level	I	II	III

8. If we kill all the organisms of one trophic level, it will lead to an increase in the number of organisms at the lower trophic level and decrease in the number of organisms at the higher trophic level.

9.The snake will get more energy because it is at a lower trophic level.

10. (a) The food chain connecting grass, mice, and eagle will be the one in which the eagle receives the maximum proportion of energy from producers.

(b) The organism that will be mostly affected when a non-biodegradable pesticide is introduced into the soil is the Eagle

LONG ANSWER TYPE

11.Damage to the layer could lead to the death of a large number of phytoplanktons, resulting in increased global warming. CFCs (chlorofluorocarbons) are chemicals that deplete the ozone layer. The release of CFCs into the atmosphere must be curtailed to limit the harm to the ozone layer. CFCs should be replaced with environmentally friendly replacements in refrigerants and fire extinguishers. The release of CFCs from industrial processes should be regulated.

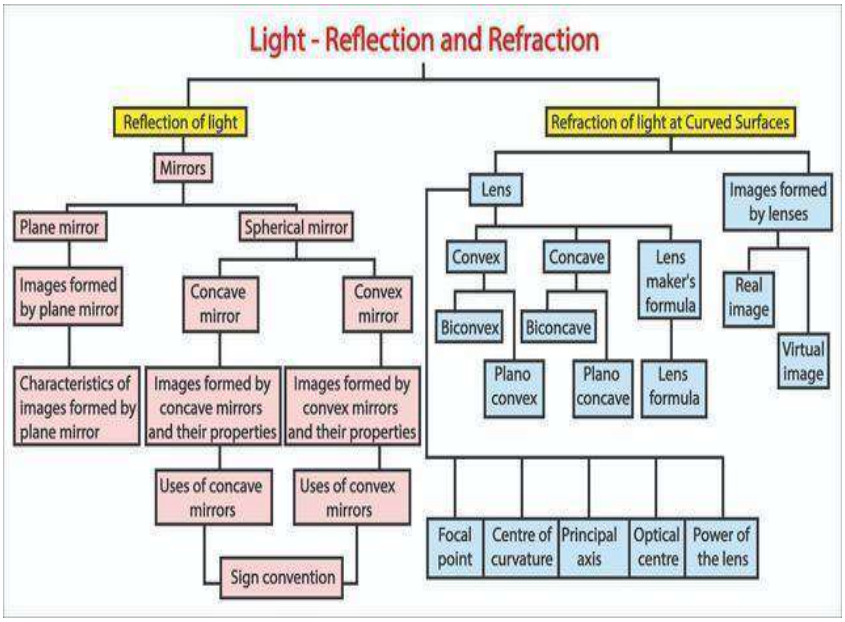
12. The flow of energy in the ecosystem is unidirectional because the energy lost as heat from the living organisms of a food chain cannot be reused by plants in photosynthesis. During the transfer of energy through successive trophic levels in an ecosystem, there is a loss of energy all along the path.

CASE STUDY

1. d 2. c 3. a 4. a 5. c

LIGHT

Mind Map



Important Points to remember

REFLECTION OF LIGHT

When light falls on an object it is sent back into the same medium. This is called reflection oflight.

LAWS OF REFLECTION OF LIGHT:-

i)The angle of incidence is equal to the angle of reflection.
ii)The incident ray, the reflected ray and the normal to the mirror at the point of incidence all liein the same plane.

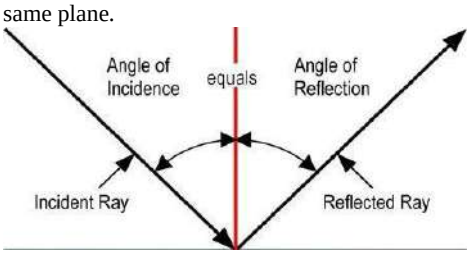


IMAGE FORMATION BY A PLANE MIRROR

- The image is virtual (image cannot be obtained on a screen). And erect.
- The image is the same size as the object.
- The image is at the same distance from the mirror as the object is in front of it

- The image is laterally inverted.

SPHERICAL MIRRORS:

It is a curved mirror which is a part of a hollow sphere. Spherical mirrors are of two types'concave mirror and convex mirror.

a) Concave mirror (converging mirror):-

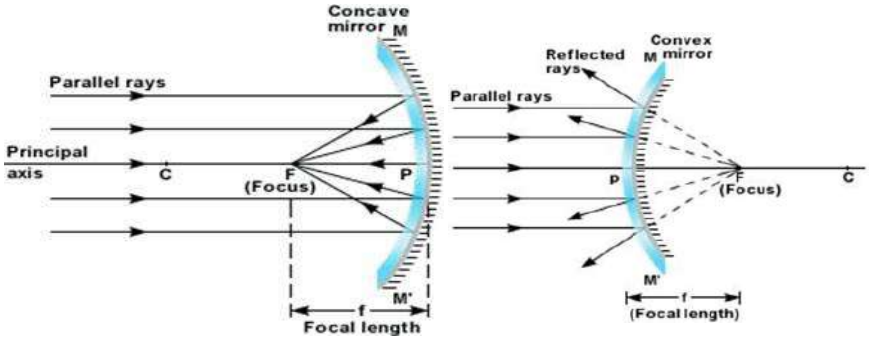
- Concave mirror is a spherical mirror whose reflecting surface is curved inwards.
- Rays of light parallel to the principal axis after reflection from a concave mirror meet ata point (converge) on the principal axis.

b) Convex mirror (diverging mirror) :-

- It is a spherical mirror whose reflecting surface is curved outwards.
- Rays of light parallel to the principal axis after reflection from a convex mirror get diverged and appear to come from a point behind the mirror.

(a) Concave mirror *(b) Convex mirror*

TERMS USED IN THE STUDY OF SPHERICAL MIRRORS:



i) **Centre of curvature(C):** -It is the centre of the sphere of which the mirror is a part.
ii) **Radius of curvature**: - It is the radius of the sphere of which the mirror is a part (CP).
iii) **Pole**: -It is the centre of the spherical mirror (P).
iv)**Principal axis**: - It is the straight line passing through the centre of curvature and the pole.
v) **Principal focus**:- In a concave mirror, light rays parallel to the principal axis after reflection meet at a point on the principal axis called principal focus(F).

In a convex mirror, rays of light parallel to the principal axis after reflection get diverged andappear to come from a point on the principal axis behind the mirror called principal focus (F).

vi) **Focal length:** - is the distance between the pole and principal focus
(f) In a spherical mirror the radius of curvature is twice the focal length. **R = 2f**

IMAGE FORMATION BY CONCAVE MIRROR

POSITION OF THE IMAGE FOR VARIOUS POSITIONS OF THE OBJECT FOR A

CONCAVE MIRROR

Sno	Position of object	Position of image	Nature of image	uses
1	At infinity	At F	Real,inverted and point sized	Collect solar radiations in solar devices
2	Beyond C	Between Cand F	Real,inverted and diminished	
3	At C	At C	Real,inverted and same size	Reflecting mirror for projector lamp
4	Between Cand F	Beyond C	Real,invertedandenlarged	
5	At F	At infinity	Real,inverted and highly enlarged	Torches and headlights
6	Between Fand P	Behind the mirror	Virtual erect and magnified	Shaving mirror,dentist mirror

POSITION OF THE IMAGE FOR VARIOUS POSITIONS OF THE OBJECT FOR A CONVEX MIRROR

SNo	Position of object	Position of image	Nature of image	uses
1	At infinity	At focus F	Virtual erect and point sized	Used as rear view mirror
2	Between infinity and pole	Between Fand P	Virtual erect and diminished	Used as rear view mirror

Uses of Spherical Mirrors

Concave mirrors:-

- Concave mirrors are used in torches, search lights and head lights of vehicles to get parallel beams of light.
- They are used as shaving mirrors to see larger image of the face.
- They are used by dentists to see larger images of the teeth.
- Large concave mirrors are used to concentrate sunlight to produce heat in solar furnaces.

Convex mirrors:-

- Convex mirrors are used as rear-view mirrors in vehicles because they formerect diminished images of objects. They also have a wider field of view.

NEW CARTESIAN SIGN CONVENTION FOR SPHERICAL MIRRORS:-

i) The object is always placed on the left of the mirror and light from the object falls from the left to the right.

ii.All distances parallel to the principal axis are measured from the pole.
iii.All distances measured to the right of the pole are taken as + ve.
iv.All distances measured to the left of the pole are taken as – ve.
v.The height measured upwards perpendicular to the principal axis is taken as + ve. vi)The height measured downwards perpendicular to the principal axis is taken as – ve.

MIRROR FORMULA FOR SPHERICAL MIRRORS:-

The mirror formula for spherical mirrors is the relationship between the object distance (u),image distance (v) and focal length (f).
The mirror formula is expressed as :-

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

b) Magnification for spherical mirrors:-

Magnification for spherical mirrors is the ratio of the height of the image to the height ofthe object.

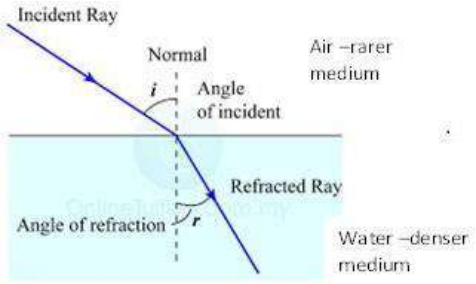
$$\text{Magnification} = \frac{\text{Height image}}{\text{Height object}} \qquad m = \frac{hi}{ho}$$

The magnification is also related to the object distance and image distance. It is expressed as :-

$$\text{Magnification} \quad m = -\frac{hi}{ho} = -\frac{v}{u} \qquad m = -(v/u)$$

REFRACTION OF LIGHT

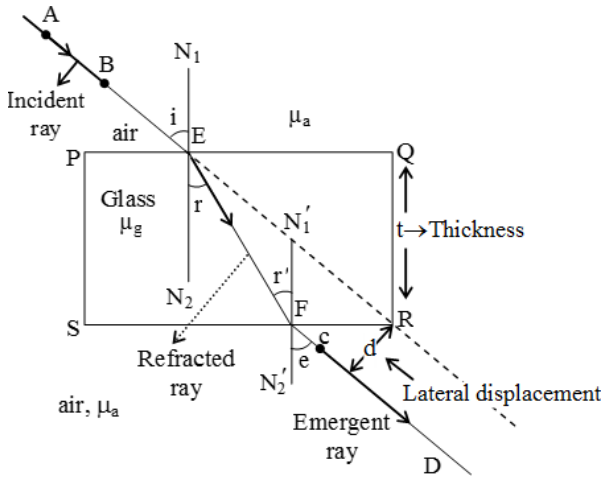
- **When light travels <u>obliquely</u> from one transparent medium into another it gets bent. This bending of light is called refraction of light.**
- When light travels from a rarer medium to a denser medium, it bends towards the normal.
- When light travels from a denser medium to a rarer medium it bends away from the normal.



REFRACTION OF LIGHT THROUGH A GLASS SLAB

When a ray of light passes through a rectangular glass slab, it gets bent twice at the air- glass interface and at the glass- air interface.

The emergent ray is parallel to the incident ray and is displaced through a distance. This displacement is called the lateral shift.



LAWS OF REFRACTION OF LIGHT:

i) The incident ray, the refracted ray and the normal to the interface of two transparent media atthe point of incidence, all lie in the same plane.

II) The ratio of the sine of angle of incidence to the sine of angle of refraction is a constant, forthe light of a given colour and for the given pair of media.(This law is also known as Snell`s lawof refraction.)

sine i/sine r=constant

Refractive index:-

The absolute refractive index of a medium is the ratio of the speed of light in air orvacuum to the speed of light in a given medium.

Refractive index = Speed of light in air or vacuum / Speed of light in the medium Or

***n*= c/v**

The relative refractive index of a medium 2 with respect to a medium 1 is the ratio ofthe speed of light in medium 1 to the speed of light in medium 2.

n21=v1/v2 (refractive index of medium 2 with respect to 1)

$n_{12}=v_2/v_1$ (refractive index of medium 1 with respect to 2)

SPHERICAL LENS

A spherical lens is a transparent material bounded by two surfaces one or both of which are spherical.

Spherical lenses are of two main types. They are convex and concave lenses.

i) Convex lens: - It is thicker in the middle and thinner at the edges. Rays of light parallel to the principal axis after refraction through a convex lens meet at a point (converge) on the principal axis.

ii) Concave lens: - It is thinner in the middle and thicker at the edges. Rays of light parallel to the principal axis after refraction get diverged and appear to diverge from a point on the principal axis on the same side of the lens.

NATURE OF IMAGE FORMED BY A CONVEX LENS

SNo	Position of object	Position of image	Nature of image
1	At infinity	At F_1	Real, inverted and point sized
2	Beyond $2F_1$	Between F_2 and $2F_2$	Real, inverted and diminished
3	At $2F_1$	At $2F_2$	Real, inverted and same size
4	Between F_1 and $2F_1$	Beyond $2F_2$	Real, invertedand enlarged
5	At F_1	At infinity	Real, inverted and highly enlarged
6	Between $F_1$and Optical centre O	Same side of the lens as the object	Virtual erect and magnified

NATURE OF IMAGE FORMED BY A CONCAVE LENS

SNo	Position of object	Position of image	Nature of image	uses
1	At infinity	At F_1	Virtual erect and point sized	Used for correcting Myopia
2	Between infinity and O	Between $F_1$and O	Virtual erect and diminished	Used for correcting Myopia

LENS FORMULA

The lens formula is expressed as :-

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

b) Magnification for lens :-

Magnification for lens is the ratio of the height of the image to the height of the object.

Height image **h**

Magnification = ----------m = -

Height object **h_o**

The magnification is also related to the object distance and image distance. It is expressed as :-

$$\text{Magnification } m = -\frac{h_i}{h_o} = -\frac{v}{u}$$

INTERPRETING NATURE OF IMAGE FORMED

- If the magnification of a lens or mirror is negative, then the image formed is inverted and real.
- If the magnification of a lens is positive, then the image formed is erect and virtual.
- If m>1 image is magnified

m=1 image is same size as objectm<1 image is diminished

POWER OF LENS

- Power is defined as the degree of convergence or divergence of light rays by a lens. It is represented by 'P'.
- It is the reciprocal of the focal length. Therefore power of convex lens is always positive and that of concave lens is negative
- SI unit of Power is dioptre denoted by (D).
- P=1/f where f is expressed in meters
- 1 dioptre is defined as the power of a lens whose focal length is 1m.
- $1D=1m^{-1}$

MULTIPLE CHOICE QUESTIONS

1. A mirror and a lens each have focal length of -15 cm. The mirror and the lens are likelyto be-

   a) both concave b) both convex
   c) the mirror is concave and the lens is convex
   d) the mirror is convex, but the lens is concave

2. No matter how far you stand from a mirror, your image appears erect. The mirror is likelyto be

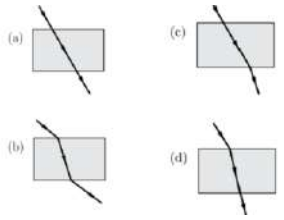
(a) Plane (b) Concave. (c) Convex (d) either plane or convex

3. As light travels from a rarer to a denser medium it will have

   (a) Increased velocity (b) Decreased velocity

(c) Decreased wavelength (d) both (b) and (c)

4. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students is shown in figure. Which one of them is correct?



5. When light travels from one medium to another which of the following factors changes?

(a) Wavelength (b) Frequency (c) Amplitude. (d) None of these

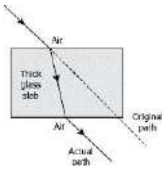
6. The velocity of light is maximum in a medium of

(a) glass (b) water (c) vacuum (d) diamond

7. A student conducts an activity using a flask of height 15 cm and a concave mirror. An inverted image formed is 45 cm in height. What is the magnification of the image?

(a) -3 times. (b) -1/ 3 times(c) 1/ 3 times. (d) 3 times

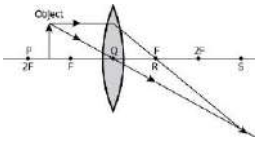
8. The image shows the path of light travelling through a glass slab.What causes the ray of light to deviate from its original path?



(a) change in the amount of light (b) change in the direction of wind flow

(c) change in the temperature of the air (d) change in the density of the medium

9. Observe the ray diagram for image formed by a convex lens. Where is the image most likely to form?



(a) position P (b) position R (c) position Q (d) position S

10. A student conducts an experiment using a convex lens of focal length 20 cm and an object of height 15 cm. He placed the object at 25 cm from the lens. Can the image be formed on a screen?

(a) yes, because a real image will be formed
(b) no, because a virtual image will be formed
(c) yes, because an erect image will be formed
(d)No because the image is inverted

11. A full length image of a distant tall building can definitely be seen by using

(a) a concave mirror. (b) a convex mirror

(c) a plane mirror (d) both concave as well as plane mirror

12. A student conducts an experiment using a convex lens. He places the object at a distance of 60 cm in front of the lens and observed that the image is formed at a distance of 30 cm behind the lens. What is the power of the lens?

(a) 0.005 dioptre (b) 0.05 dioptre
(c) 5 dioptre (d) no, because an inverted image will be formed

13. Rakhi conducts an experiment to produce an image of an object on a screen which is placed at 20 cm from the lens. She uses a convex lens of focal length 15 cm for the experiment. Where should she place the object in order to produce the sharpest image?

(a) 8 cm (b) 15 cm (c) 20 cm (d) 60 cm

14. Which of the following can make a parallel beam of light when light from a point source is incident on it?

(a) Concave mirror and convex lens (b) Convex mirror and concave lens

(c) Two plane mirrors (d) Concave mirror and concave lens

15. A 10 mm long awl pin is placed vertically in front of a concave mirror. A 5 mm long image of the awl pin is formed at 30 cm in front of the mirror. The focal length of this mirror is

(a) -30 cm. (b) -20 cm. (c) -40cm. (d) -60 cm

16. Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.
(d) A is false but R is true.

Assertion (A) : A ray passing through the centre of curvature of a concave mirror after reflection, is reflected back along the same path.
Reason (R) : The incident rays fall on the mirror along the normal to the reflectingsurface.

17. **Assertion (A) :** Light does not travel in the same direction in all the media.
Reason (R) : The speed of light does not change as it enters from one transparent medium to another.

18. **Assertion (A)** A ray of light travelling from a rarer medium to a denser medium slows down and bends away from the normal. When it travels from a denser medium to a rarer medium, it speeds up and bends towards the normal.
Reason (R) : The speed of light is higher in a rarer medium than a denser medium.

19. **Assertion(A) :** Light travels faster in glass than in air.
Reason (R) : Glass is denser than air.

20. **Assertion(A)** :When power of lens increases focal length decreases

Reason (R) :Power of lens is inversely proportional to its focal length

ANSWERS FOR MULTIPLE CHOICE QUESTIONS

1. a) 2.(d) 3. (d) 4. (b) 5(a) 6. (c) 7. (a) 8. (d) 9. (d) 10. (a) 11.(b) 12. (c)

13(d) 14. (a) 15. (b) -20 cm. 16 (a) 17. (c) 18. (d) 19. (d) 20. (a)

SHORT ANSWER TYPE QUESTIONS (2MARKS)

1. Three mirrors, one plane, one concave and one convex are lying on the table. Identify them without touching them or using any other apparatus or device?

Ans. Plane mirror produces the image of same size. Concave mirror produced themagnified image while the convex mirror will produce a diminished image

2. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards or away from the normal? Why?

Ans. The light bends towards the normal on entry into water. It is due to the fact that ascompared to air, the water is optically denser medium.

3. The radius of curvature of a spherical mirror is 20 cm. what is its focal length?
Ans. Focal length (f)= R/2 = 20 cm/2 = 10 cm.

4. A concave mirror produces three times magnified real image of an object placed at 10 cm in front of it. Where is the image located?

Ans. Distance of object from concave mirror (u)= -10 cm.
Magnification (m) = -3m = -v/u
v = -mu = -(3) x (-10) = -30 cm

5. An object 1 cm high produces a real image 1.5 cm high, when placed at a distance of 15 cm from concave minor. Calculate the position of the image.

Ans. —v/u=h'/h, -v/-15= -l.5v = - 15x
1.5 = -22.5 cm

6. Which phenomenon occurs when light falls on
(a) highly polished surface (b) a transparent medium?
Ans. (a) Reflection of light.(b) Refraction of light.

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in closed contact with each other. Calculate the lens power of the combination.

Ans: f_1=25cm=0.25 m f_2= -10cm= - 0.1m
Power of convex lens, $P_1 = 1/f_1=1/0.25=+4D$ Power of concave lens, $P_2 = 1/f_2=1/ - 0.1m=-10D$
Power of combination, $P = P_1 + P_2 = 4D – 10D = -6D$

2. List two possible ways in which a concave mirror can produce a magnified image of an object placed in front of it. State the difference if any between these two images.

Ans: A concave mirror can produce a magnified image of an object when object isplaced:
(1) In between its pole and its focus
(2) In between its focus and its centre of curvature.
Difference, between these two images:
The image produced in first case will be virtual and erect. The image produced in second case will be real and inverted.

3. An object is placed at a distance of 12 cm in front of a concave mirror of radius of curvature 30 cm. List four characteristics of the image formed by the mirror

Ans: Radius of curvature (R) = 30 cm, object distance is 12 cm in front of the mirror. Thus we can say that object is placed between focus and pole. Four characteristics of theimage formed by the given concave mirror when object is placed between pole and focusare:
(i) Virtual. (ii) Erect. (iii) Enlarged(iv) Image is formed behind the mirror

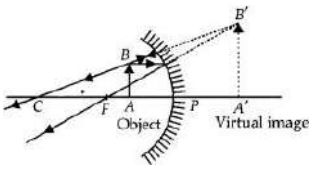
4. "The magnification produced by a spherical mirror is -3". List all information you obtain from this statement about the mirror/ image.

Ans. Negative sign of magnification indicates that the image is real and inverted. Since the image is real and inverted, the mirror is concave and magnification of -3 indicates thatthe image is magnified.

5. The linear magnification produced by a spherical mirror is +3. Analyse this value and state the (i) type of mirror and (ii) position of the object with respect to the pole of the mirror. Draw a ray diagram to show the formation of image in this case.

Ans: Positive value of the magnification indicates that image is virtual and erect.

(i) Since the image is magnified, the mirror is concave.
(ii) The object is between pole and focus of the mirror as shown



6. A convex lens of focal length 2.0 m can produce a magnified virtual as well as real image. Is this a correct statement? If yes, where shall the object be placed in each case for obtaining these images?

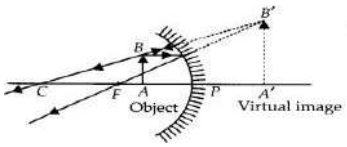
Ans: Yes, it is correct. If the object is placed within 2.0 m from the lens in then it forms magnified virtual image .Between 2 m and 4 m it will form a real inverted and magnifiedimage.

LONG ANSWER TYPE QUESTIONS (5 MARKS)

1. A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm?
(a) Position of the image(b) Size of the image(c) Nature of the image
Draw a labelled ray diagram to justify your inferences.

Ans: Given, f = -15 cm, u = -10 cm.
Thus the object is placed between the principal focus and pole of the mirror.

(a) The position of the image will be behind the mirror.
(b) The size of the image will be highly enlarged.
(c) The nature of the image will be virtual and erect.



2. A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 50 cm from the mirror.

(a) Write the type of mirror.

(b) Find the distance of the image from the object.

(c) What is the focal length of the mirror?

Answer:

(a) Concave mirror. Negative magnification that is real and inverted images are formedonly by concave mirrors

(b) m = -1, u = -50 cm,

$$m = \frac{h'}{h} = \frac{-v}{u} \qquad \Rightarrow -1 = \frac{-v}{-50}$$

∴ v=-50 cm

(c)

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f} \quad \Rightarrow \quad \frac{1}{-50} - \frac{1}{50} = \frac{1}{f}$$ ∴ f = -25 cm

3. Define power of a lens. What is its unit? One student uses a lens of focal

length 25 cm and another of – 25 cm. What is the nature of the lens and itspower used byeach of them?

Ans: Power of a lens is its ability to converge or diverge the rays of light falling on it.P = 1/f

where f is in metre. Its unit is Dioptre.

Dioptre is the power of a lens whose focal length is 1meter

Lens is convex in the first case as f is positive and concave in the second case as f isnegative.
P_1=1/0.25= 4 D P_2=1/-0.25=-4D

Case Study Based Questions:

1. We know that lenses form different types of images when objects are kept at varying positions. When a ray is incident parallel to the principal axis, then after refraction, it passes through the focus or appears to come from the focus. When a ray goes through the optical centre of the lens, it passes without any deviation. If the object is placed between the focus and optical centre of the convex lens, erect and magnified image is formed. As the object is brought closer to the convex lens from infinity to focus, the image moves away from the convex lens from focus to infinity. Also the size of the image goes on increasing and the image is always real and inverted. A concave lens always gives a virtual, erect and diminished image irrespective of the position of the object.

i).The location of image formed by a convex lens when the object is placed at infinity is

(a) at focus. (b) at 2F(c) at optical center. (d) betweenFand 2F

ii). When the object is placed at the focus of concave lens, the image formed is

(a) real and smaller. (b) virtual and smaller(c) virtual and inverted. (d) real and erect

iii). What will be the nature of image formed by a convex lens when the object is placedat the focus of convex lens?

2. The Snell's law of refraction states that: The incident ray, the refracted ray and the normal at the point of incidence, all lie in the same plane. The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for the pair of the given media and given colour of light. $\sin i / \sin r = n$ Where n is the refractive index

The refractive index is the measure of bending of a light ray when passing from one medium to another. It can also be defined as the ratio of the velocity of a light ray in vacuum to the velocity of light in a medium, n = c/v. Refractive index of a medium is theratio of the speed of light in vacuum to the speed of light in the medium. Therefore, it has no units.

Material	Index of Refraction (n)
Vacuum	1.000
Air	1.000277
Water	1.333333
Ice	1.31
Glass	About 1.5
Diamond	2.417

i) The optically denser medium from the table is

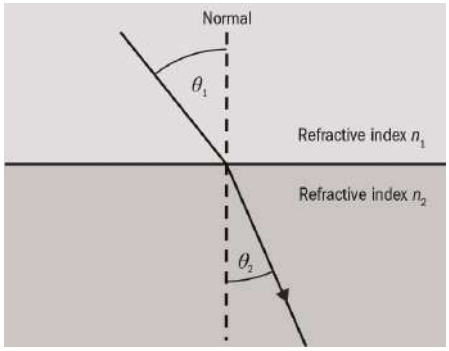
a)Air b) diamond c) water d) ice

ii) Light travels the fastest in

a) Water b) ice c) glass d) diamond

iii) Light travels through air with a speed of 3 x 10^8 m/s. If the refractive index of water is 1.5 what is the speed of light in water?

3. A ray of light that travels obliquely from one transparent medium into another will change its direction in the second medium. The extent of the change in /direction that takes place in a given pair of media may be expressed in terms of the refractive index, In optics, the refractive index (also known as refraction index or index of refraction) of a material is a dimensionless number that describes how fast light travels through the material . It is defined as n = c / v where c is the speed of light in vacuum and v is the phase velocity of light in the medium. For example, the refractive index of water is 1.333, meaning that light travels 1.333 times slower in water than in a vacuum. Increasing the refractive index corresponds to decreasing the speed of light in the material.

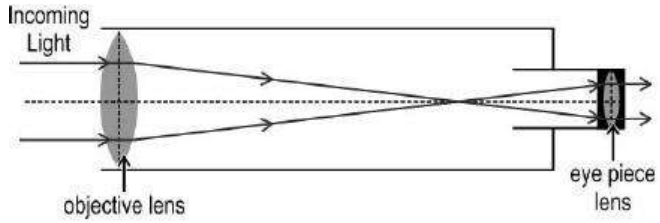


(i). Out of water, glass and diamond, Which material is having the highest refractive index?

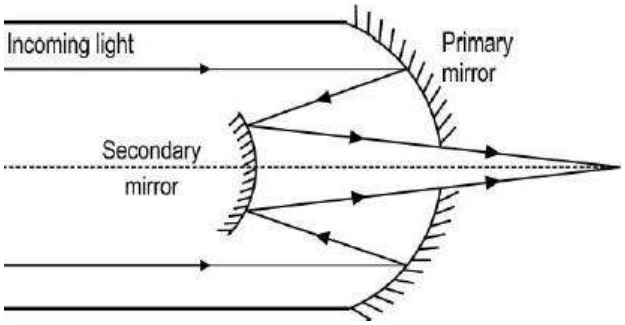
(ii). What happens to the speed of light as the refractive index of the medium increases?

(iii) Write down the law says the relation between angle of incidence and angle of refraction.

4. The image below shows the design of a refracting telescope.



When light passes through a prism different colours split and dispersion takes place. Thesame thing happens with a lens but to a much lesser degree. This is called chromatic aberration and causes the different colours of light to focus at different points. To overcome this problem, the reflecting telescope was invented. One design of the reflecting telescope is shown below.



(a) Why is there no chromatic aberration in reflecting telescopes?

(b) One of the critical factors affecting a telescope is the amount of light it can gather. The more light a telescope can gather, the better the image it produces. What can be done to the lens to increase the amount of light a telescope gathers?

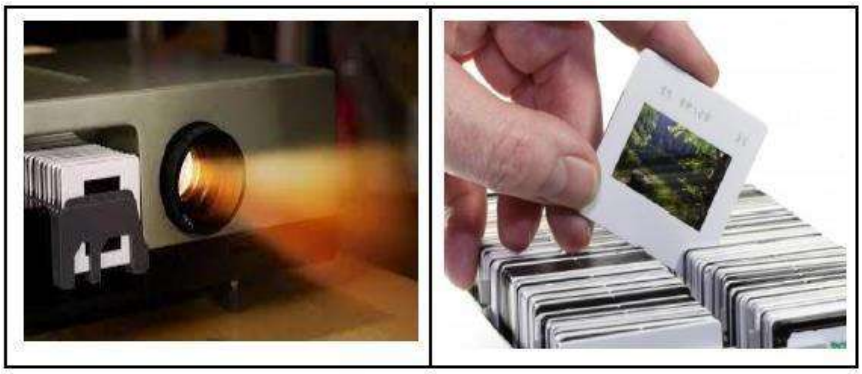
(c) In the refracting telescope given in the passage, what should be the distance between the two lenses? (Use the first ray diagram in the passage to answer it.)

(d) The light that reaches the telescopes comes from very far away celestial objects. Draw a ray diagram to show what happens when light from a far away object falls on a convex lens and a concave lens.

OR

(d) The light that reaches the telescopes comes from very far away celestial objects. Draw a ray diagram to show what happens when light from a far away object fallson a convex mirror and a concave mirror.

5.



The above images are that of a specialized slide projector. Slides are small transparencies mounted in sturdy frames ideally suited to magnification and projection, since they have a very high resolution and a high image quality. There is a tray where theslides are to be put into a particular orientation so that the viewers can see the enlarged erect images of the transparent slides. This means that the slides will have to be inserted upside down in the projector tray.
To show her students the images of insects that she investigated in the lab, Mrs. Iyerbrought a slide projector. Her slide projector produced a 500 times enlarged andinverted image of a slide on a screen 10 m away.

(a) Based on the text and data given in the above paragraph, what kind of lens must the slide projector have?

(b) If *v* is the symbol used for image distance and *u* for object distance then with one reason state what will be the sign for v/u in the given case?

(c) A slide projector has a convex lens with a focal length of 20 cm. The slide is placed upside down 21 cm from the lens. How far away should the screen be placed from the slide projector's lens so that the slide is in focus?

OR

(c) When a slide is placed 15 cm behind the lens in the projector, an image is formed 3 m in front of the lens. If the focal length of the lens is 14 cm, draw a ray diagram to show image formation. (not to scale)

Answer of Case Study Based Questions:

1. (i) a (ii) b

(iii) The image formed is real, inverted, highly enlarged (magnified), and at infinity.

2. (i) b (ii) b

(iii) $n_W = c/v$

$1.5 = \frac{3\times10^8}{v}$

$v = 2\times 10^8$ m/s

3. (i) Daimond (ii) Decreases.

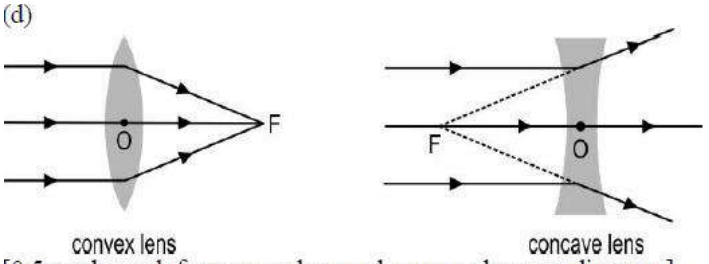
(iii) Snell's law. States that the ration between sine of the angle of incidence and sign ofangle of refraction is a constant.

4. (a) Light does NOT pass through a second medium and hence there is no refraction andsplitting of colours. [1 mark]

(b) Increase the diameter/aperture of the objective lens/ primary mirror. [1 mark]

(c) equal to the sum of the focal length of the objective and eyepiece. [1 mark]

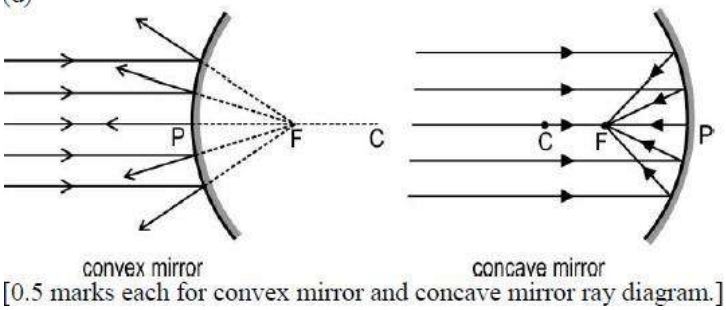
(d)



[0.5 marks each for convex lens and concave lens ray diagram.]

OR

(d)



[0.5 marks each for convex mirror and concave mirror ray diagram.]

5. (a) Convex Lens (1mark)

(b) Negative as the image is real and inverted. (1mark)

(c) 1/f= 1/v- 1/u

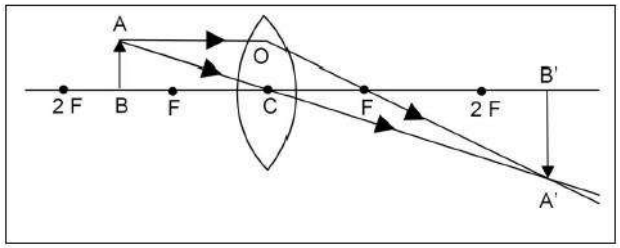
1/20 = 1/v- 1/-20

1/v = 1/20 - 1/21= (21 - 20)/420 = 1/420

v= 420 cm (2 marks)

OR

(c)



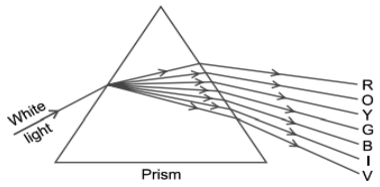
(2 marks)

HUMAN EYE AND THE COLOURFUL WORLDI DISPERSION

OF WHITE LIGHT BY GLASS PRISM

Dispersion: Splitting of light into its component colours is called dispersion of light. When light is passed through a glass prism, it undergoes dispersion.
Spectrum: When white light undergoes dispersion, it splits into seven colours. The band of seven colours obtained is called a spectrum.

- The seven colours are VIBGYOR-Violet, Indigo, Blue, Green ,Yellow, Orange, Red. [Fig 10.5 page 167 new text book]

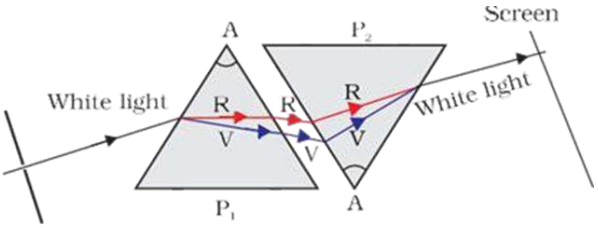


Dispersion of white light

What causes dispersion of light ?
When white light passes through a glass prism, different colours of light bend through different angles.Thus the rays of each colour emerge out distinctly.

- The red light bends the least while the violet bends the most.
- The scientist who first demonstrated dispersion of white light through prism – Issac Newton

Recombination of spectrum of white light:
White light is passed through a triangular glass prism, splits into seven colours. If a second identical prism is placed in an inverted position with respect to the first prism, all the colours recombine to form white light.This proves that sunlight /white light is made up of seven colours.



Rainbow formation :
After a rain shower, when sunlight passes through tiny rain drops suspended in the atmosphere, it undergoes refraction, dispersion, internal reflection , once again refraction and reach the observers eye. This results in visualizing a rainbow.

- The water droplets act like small prisms.
- A rainbow is always formed in a direction opposite to that of the Sun.
- Sun should be behind the observer.

[fig 10.8 page no 167 new textbook]

: **II ATMOSPHERIC REFRACTION**

Refraction/bending of light as it passes through different layers of atmosphere having varying optical density.

Twinkling of stars:

- Twinkling of stars is due to atmospheric refraction of starlight.
  [fig10.9 page no 168 new textbook]

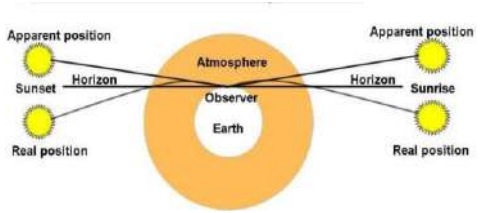
Stars appear to us as point-sized sources of light as they are very far away. The starlight, on entering the earth's atmosphere having varying optical density, undergoes continuous refraction.So the star is seen slightly higher from its actual position. This apparent position of the star fluctuates since the physical conditions of the earth's atmosphere are not stationary. So the amount of starlight entering the eye flickers. Star sometimes appears brighter, and some times fainter. This produces a twinkling effect.

Planets do not twinkle:

The planets are much closer to the earth, and are thus seen as extended sources of light. If we consider a planet as a collection of a large number of point-sized sources of light, the total variation in the amount of light entering our eye from all the individual point-sized sources due to atmospheric refraction will average out to zero, thereby nullifying the twinkling effect.

Advance sunrise and delayed sunset:

- The Sun is visible to us about 2 minutes before the actual sunrise, and about 2 minutes after the actual sunset because of atmospheric refraction.



[fig 10.10 page no 168 new text book]

Actual sunrise is actual crossing of the horizon by the Sun. From two minutes well before the actual sunrise, the rays of sun entering the atmosphere of earth undergoes refraction and reach the eye of the observer. So Sun becomes visible at an apparent position with respect tothe horizon before actual sun rise.

After the actual sunset, the rays of sun enters the atmosphere of earth undergoes refraction and reach the eye of the observer. So Sun becomes visible at an apparent position with respect to the horizon for two minutes after the actual sun set.

- The time difference between actual sunrise and the apparent sunrise is about 2 minutes.
- The time difference between actual sunset and the apparent sunset is about 2 minutes.

III SCATTERING OF LIGHT:

Tyndall effect:

The phenomenon of scattering of light by the colloidal particles is called Tyndall effect.

Eg: 1.When a fine beam of sunlight enters a smoke-filled room through a small hole, the pathway of light becomes visible due to the scattering of light

2. When sunlight passes through a canopy of a dense forest, the pathway of light becomes visible due to the scattering of light by tiny mist particles of the atmosphere.

- The colour of the scattered light depends on the size of the scattering particles:

Very fine particles-- scatter shorter wavelength, mainly blue light.
Larger-sized particles-- scatter light of longer wavelengths.

- The amount of scattering of light depends on the Wavelength of light—

Longer the wavelength—less scattering
Shorter the wavelength --- more scattering

The colour of sky is blue:

- Due to scattering of blue light.

When sunlight passes through the atmosphere of earth, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. When these scattered blue light enters our eyes ,sky appears blue.

Sky appears dark to passengers flying at very high altitudes:
Thickness of air is less at high altitudes. As scattering is not prominent at such heights, sky appears dark.

Moon's sky appears to be dark:
Moon has no atmosphere , no scattering of sunlight light takes place there. So moon's sky appears dark.

'**Danger' signal lights are red in colour:**
Red light, having longer wavelength, is the least scattered by fog or smoke. Therefore, it can be seen in the same colour at a maximum distance.

Sl no	Observation/phenomenon	Reason behind
1.	Rainbow formation	Light when enters tiny raindrops in the atmosphere, undergoes Refraction, dispersion, internal reflection, again refraction
2	Twinkling of stars	Atmospheric refraction
3	Early sunrise, Delayed sunset	Atmospheric refraction
4	Pathway of light visible in a foggy atmosphere or a dusty room/smoke filled room	Tyndall effect/scattering of light
5	Reddening of sun's disc in the early morning and late evening	Scattering away of smaller wavelength of light by particles of atmosphere
6	Sky appears blue	Scattering of sunlight
7	Flattening of sun's disc at sunrise and sunset	Atmospheric refraction

REVISION QUESTIONS1.MCQ

1) Which of the following is a natural phenomenon caused by the dispersion of sunlight in the sky?

(a) Twinkling of stars (b) Stars seem higher than they actually are
(c)Rainbow (d) Advanced sunrise and delayed sunset

2)Red light is used as danger signal because red light can travel maximum distance as it

(a) is the most scattered (b) is the least scattered
(c) undergoes maximum refraction (d) does not undergo refraction

3) A rainbow is observed when the Sun is

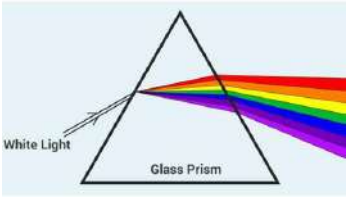
(a) Vertically above the observer (b) Behind the observer

(c) In front of the observer (d) At any position

4)When white light passes through a prism, the component colour which undergoes maximum bending is

(a) red (b) green (c) violet (d) blue

5) In the given diagram, the white light splits into seven colours by dispersion.



A student kept an optical device on the pathway of the dispersed light to get back the white light. The device used by the student for the recombination of seven colours is

(a) concave lens (b) a smaller prism in the erect position

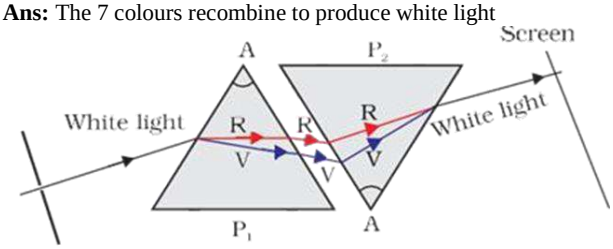
(c) glass slab (d) inverted identical prism

MCQ ANSWERS 1.c 2.b 3.b 4.c 5. d

2.SHORT ANSWER TYPE QUESTIONS

1) When we place a glass prism in the path of a narrow beam of white light, a spectrum is obtained. What happens when a second identical prism is placed in an inverted position with respect to the first prism? Draw a labelled ray diagram to illustrate it.

Ans: The 7 colours recombine to produce white light



2)Write the factor which affects the colour of scattered light? How?

Ans: Size of the particle.Very fine particle –scatter shorter wavelength like blue. Larger-sized particles scatter longer wavelengths.

3)What is Tyndall effect?

Ans: Scattering of light by colloidal particles.

4)If the earth had no atmosphere, how the sky would have looked like? Why?

Ans: black. No atmosphere, no scattering of light.

5)Write the basic phenomenon behind the following:

i)The apparent position of stars look raised from earth

ii)one cannot see long distance through fog/smoke

Ans:i)atmospheric refraction ii)scattering of light

1) A student took a thick sheet of cardboard, and made a narrow hole in the middle of it. He passed a narrow beam of sunlight through a prism, with the help of this slit. He got a beautiful band of colours on a screen.

i) What is this band of colours called? **ii)**Name the basic phenomenon behind his observation

iii) What is the sequence of colours he got? Why?

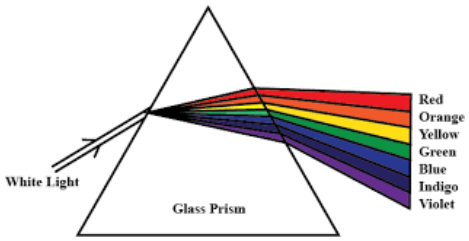
iv) How can he convert this band of seven colours back to white light?

Ans: i)spectrum **ii)**dispersion of light **iii)**violet, indigo,blue, green, yellow, orange, red Because when white light passes through the glass prism, the component colours undergo refraction at different angles and emerge distinctly.

iv)by keeping an inverted identical glass prism on the pathway of dispersed light.

3. CASE STUDY

Dispersion of Light happens when white light is split into its constituent colours due to refraction. Dispersion of Light can be achieved through various means but the most common way to achieve dispersion of light is through Prism. Dispersion of light by a prism results in the breaking of white light into its seven constituents due to the difference in their angle of bending.The Violet light bends most, and the Red bends the least. As a result, white light coming out from the prism breaks into the spectrum of the light.



i) A beam light falling on a glass prism.The colour which bends the least is
a)red b)blue c)violet d) green

ii) Which of the given colour is the most deviated by a prism
a)yellow b)orange c)indigo d)blue

iii) If we keep an identical inverted glass prism on the pathway of dispersed light, the colour of the emerged light is
a)VIBGYOR b)white c)red d)violet

iv) The above phenomenon happens in nature is responsible for a)twinkling of stars b)rainbow formation c)early sunrise d)sky look blue**v)**Name the scientist who first explained the above phenomenon.

CASE STUDY ANSWERS

i) a) ii)c) iii)b iv)b) v)Issac Newton

ASSERTION REASON TYPE

Instructions:

A statement of assertion followed by a statement of reason is given.

Choose the correct answer out of the following choices.

(A) Both Assertion and Reason are true and the reason is the correct explanation of assertion.

(B) Both Assertion and Reason are true and the reason is not the correct explanation of assertion.

(C) Assertion is true but the Reason is false.

(D) Assertion is false but Reason is true.

1) Assertion: A rainbow is a natural spectrum appearing in the sky after a rain Shower.

Reason : A rainbow is always formed in a direction opposite to that of theSun.

2) Assertion: White light is dispersed into its seven-colour components by a prism.

Reason : Different colours of light bend through different angles with respect to theincident ray, as they pass through a prism.

3) Assertion: When a beam of light strike fine particles of smoke, the path of the beam becomes visible.

Reason : Fine particles of smoke scatter light.

4) Assertion: The sky appears dark to passengers flying at very high altitudes.

Reason: scattering of light is prominent at such high altitudes.

5) Assertion: When sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red.

Reason: The red light has a wavelength about 1.8 times greater than blue light.

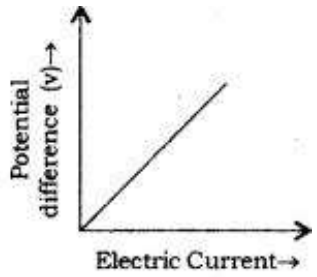
ASSERSION REASON TYPE 1.B 2.A 3.A 4.C 5.A

ELECTRICITY

If a net electric charge (Q) flows through a cross-section of a conductor in time t, then,

$$\text{Electric current (I)} = \frac{\text{Net charge (Q)}}{\text{Time (t)}} \quad \text{or,} \quad \boxed{I = \frac{Q}{t}}$$

Where I is electric current, Q is a net charge and t is a time in second.
SI unit of Electric Charge-coulomb (C). One coulomb is nearly equal to charge of6×10^{18} electrons.
S.I. unit of electric current is ampere (A). 1 A = 1 C/1 s,.
Electric Potential: The amount of electric potential energy at a point is called electric potential. **Potential Difference:** Electric potential difference is known as voltage, which is equal to the amount ofwork done to move a unit charge between two points against static electric field.
Therefore, Voltage = work done
charge
Voltage or electric potential difference is denoted by V'. Therefore,
V = W/Q
Where, W = Work done and Q = Charge
S.I. unit of electric potential difference is volt and denoted by 'V'
When1 joule of work is done to move a charge of 1 coulomb from one point to another in an electric circuit thepotential difference is said to be 1 volt.
1V = 1Joule/1Coulomb = 1J/1C
Voltmeter: An apparatus to measure the potential difference or electric potential difference between two pointsin an electric circuit.
Electric Circuit: Electric circuit is a continuous and closed path of electric current.
Ohm's Law V a I , V = RI Therefore I = V/R.
R = V /I
Where, R is constant for the given conductor at a given temperature and is called resistance.
Resistance: Resistance is the property of conductor which resists the flow of electric current through it.
S.I. unit of resistance is ohm. Ohm is denoted by Greek letter Ω.
1 Ohm: 1 ohm of resistance is equal to the flow 1A of current through a conductor between two points having a potential difference equal to 1V.
$1\Omega = \frac{1V}{1A}$
The graph of V (potential difference) versus I (electric current) is always a straight line.



Factors on Which Resistance of a Conductor Depends:
Nature of Material
Length of Conductoror, R a l …(i)
Area of Cross Section, Ra$\frac{l}{A}$….(ii)

From equations(i) and (ii)
R a $\frac{l}{A}$
R=ρ $\frac{l}{A}$
Where, ρ (rho) is the proportionality constant. It is called the electrical resistivity of the material of conductor.
or ρ = $\frac{RA}{l}$

Resistivity: It is defined as the resistance offered by a cube of a material of side 1m when current flows perpendicular to its opposite faces.

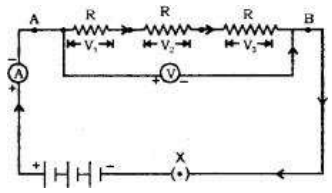
The S.I. unit of Resistivity: (ρ) = $\frac{\Omega \times m^2}{m}$ Thus,
S.I. unit of resistivity (ρ) Ωm.
Resistivity depends on the nature of the material and temperature.
Materials having a resistivity in the range of 10^{-8} Ωm to 10^{-6} Ωm are considered as very good conductors.
Insulators have a resistivity in the order of 10^{-12} Ωm to 10^{-8} Ωm.

Variable Resistance: The component of an electric circuit which is used to regulate the current, without changing the voltage from the source, is called variable resistance.

Rheostat: This is a device which is used in a circuit to provide variable resistance.

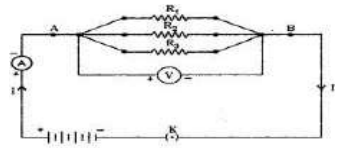
<u>Combination of resistors</u>

Resistors in Series: $R_S = R_1 + R_2 + R_3$



When the resistors are connected in series, the current flowing through each resistor is the same and is equal tothe total current

Resistors in Parallel:



$1/R_P = 1/R_1 + 1/R_2 + 1/R_3$

Heating Effect of Electric Current: The heating of resistor because of dissipation of electrical energy is commonly known as Heating Effect of Electric Current. Heating effect is used in many appliances, such as electric iron, electric heater, electric geyser, etc.

Joule's Law Of Heating: It states that heat produced in a resistor is directly proportional to the square of current given to the resistor, directly proportional to the resistance for a given current and directly proportional to the time for which the current is flowing through the resistor

$H = I^2Rt$

Electric Power

The rate of doing work or rate of consumption of electrical energy is called Electric Power. If W is workdone in time t, then

$P=W/t$.

S.I unit is Watt (W).

One watt of power is consumed when 1 A of current flows at a potential difference of 1 V.$P=VI$ or $P=I^2R$ or $P=V^2/R$

The commercial unit of electrical energy is a kilowatt-hour (kWh) or unit.

$1kWh = 3.6\times10^6$ J

One kilowatt-hour is defined as the amount of energy consumed when 1kW of power is used for 1 hour.

Multiple choice Questions

1. The resistivity does not change if
   a) The material is changed
   b) The temperature is changed
   c) The shape of the resistor is changed
   d) Both material and temperature are changed
2. Two resistors of resistances 2 Ω and 4 Ω when connected to a battery will have
   a) Same current flowing through them when connected in parallel
   b) Same current flowing through them when connected in series
   c) Same potential difference across them when connected in series
   d) None of these
3. In an electric circuit three incandescent bulbs of rating 40W, 60W and 100W respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness
   a) Brightness of all the bulbs will be the same

b) Brightness of bulb A will be the maximum
c) Brightness of bulb B will be more than that of A
d) Brightness of bulb C will be less than that of B

4. A cylindrical conductor of length l and uniform area of cross section A has resistance R. Another conductor of length 2l and resistance R of the same material has area of cross section
   a) A / 2 (b) 3A / 2 (c) 2A (d) 3A
5. The resistance of an electric iron drawing a current of 4A when connected to a 220V mains would be

a) 1000 Ω (b) 55 Ω (c)44 Ω (d)64 Ω

6. Ohm's law states the relationship between
   (a) Electric current and heat produced in it (b) Electric power and work do e
© Electric current and potential difference (d) Electric current and electric charge
7. The unit of resistivity is
   a) Ohm (b) Ohm metre^2 (c) Ohm metre (d) Ohm per metre
8. An electric kettle consumes 1kW of electric power when operated at 220V. The rating of fuse wire that must be used would be

a) 1A (b) 2A (c) 4A (d) 5A

9. Unit of electric power may also be expressed as
   a) Volt ampere (b)Kilowatt hour (c) Watt second (d) Joule second
10. If 25 joule of work is done in moving a charge of 5C across two points A and B the potential difference between these points would be

a) V (b) 125V (c) 5V (d) 625V

Answers: 1. (c) 2. (b) 3. (c) 4. (c) 5. (b) 6. (c) 7. (c) 8. (d) 9. (a) 10. (c)

Assertion and reasoning questions

The following questions consists of two statements –Assertion(A)and Reason (R). Answer these questions selecting the appropriate option given below.

a) Both A and R are true and R is the correct explanation for A
b) Both A and R are true and R is not the correct explanation for A
c) A is true but R is false
d) A is false but R is true.

1. Assertion (A): Longer wires have greater resistance and the smaller wires have lesser resistance.
   Reason(R): Resistance is inversely proportional to the length of the wire.
2. Assertion (A): Alloys are commonly used in electrical heating devices.
   Reason(R): Alloys do not oxidize at high temperatures.
3. Assertion (A): If a graph is plotted between potential difference and current the graph is a straight line passing through the origin.
   Reason(R): current is directly proportional to the potential difference.
4. Assertion (A): A cell converts chemical energy into electrical energy.

Reason(R): A cell maintains a potential difference across its terminals due to chemical reactions.

5. Assertion (A): When resistances are connected between the same two points they are said to be in series.

Reason(R): When resistors are connected in series the current through each resistor is the same.Ans) 1. (c)

2. (a) 3. (a) 4. (b) 5, (d)

Answer in a word or sentence (1 mark)

1. What is the resistance of an ideal voltmeter?

   Ans. Infinite

2. Mention the conditions under which current can flow in a conductor?

Ans. a) Circuit is closed b) There is a potential difference along the conductor.

3. When do we say that potential difference between two points in a circuit is 1 volt?

Ans. When 1 joule of work is done to move a charge of 1 coulomb from one point to the other.

4. What is the amount of charge when a current of 4A flows in a circuit for 10 minutes?

   Ans. Q = I x t = 4x 10x 60 = 2400C

5. How will be the resistance of a conductor change if its area is doubled?

   Ans. Resistance will become half as R is inversely proportional to area.

Short Answer Questions (3 marks)

1. Two wires of equal length, one of copper and the other of manganin (an alloy) have the same thickness. Which one can be used for i) electrical transmission ii) electrical heating devices?Why?

Ans) i) Copper wire can be used for electrical transmission lines because copper has very lowresistivity and hence it is a very good conductor of electricity.

ii) Manganin can be used for electrical heating devices because it has very high resistivity andhence produces lot of heat when current passes through it,

2. In an electrical circuit two resistors of 2 Ω and 4 Ω respectively are connected in series to a 6 V battery. What will be the heat dissipated by the 4 Ω resistor in 5 s?

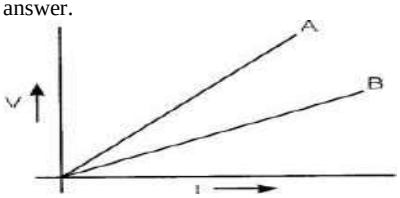
Ans) I = V / R = 6 / (2+4) = 1AH = I^2 R t =
1x 4 x5 = 20 J

3. In a household circuit an electric iron of 100 W is used for 10 hours and an electric oven of 1000 W is used for 2 hours every day. Calculate the cost of using them for 30 days if the costof one unit of electrical energy is Rs 5.

Ans) electrical energy consumed by the electric iron = 100 / 1000 x 10 = 1kWh.electrical energy consumed by the electric oven = 1000/ 1000 x 2 = 2kWh.
Total energy consumed in 1 day = 1+2 = 3kWh.

Cost of electrical energy consumed 30 days = 3 x 30 x 5 = Rs 450

4. V-I graph for two wires A and B are shown in the figure. If both wires are of same length and same thickness, which of the two is made of a material of high resistivity? Give justification for your answer.



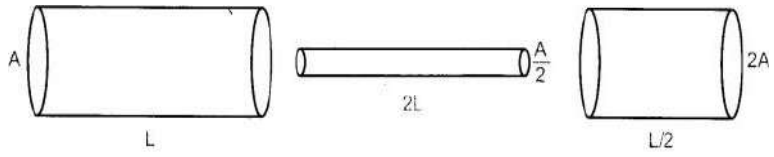
Answer. Greater than slope of V-I graph, greater will be the resistance of given metallic wire. In thegiven graph, wire A has greater slope then B. Hence, wire A has greater resistance. For the wires ofsame length and same thickness, resistance depends on the nature of material of the wire,

$$R_1 = \rho_1 \frac{l}{A} \quad \text{and} \quad R_2 = \rho \frac{l}{A}$$

$$\Rightarrow \quad \frac{R_1}{R_2} = \frac{\rho_1}{\rho_2} \quad \text{or} \quad R \propto \rho$$

Hence, wire 'A' is made of a material of high resistivity.

5. The figure below shows three cylindrical copper conductors along with their face areas and lengths. Discuss in which geometrical shape the resistance will be highest.



(*i*) (*ii*) (*iii*)

Answer.

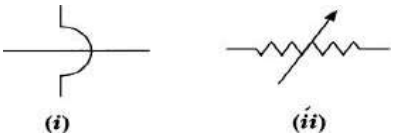
For geometrical shape shown in

Figure (*i*) $R_1 = \rho \frac{L}{A}$

Figure (*ii*) $R_2 = \rho \frac{2L}{A/2} = 4\left(\rho \frac{L}{A}\right) = 4R_1$

Figure (*iii*) $R_3 = \rho \frac{L/2}{2A} = \frac{1}{4}\left(\rho \frac{L}{A}\right) = \frac{R_1}{4}$

6. (a) What do the following circuit symbols represent?



(i) (ii)

(b) The potential difference between the terminals of an electric heater is 60 V when it draws a current of 4 A from the source. Find the resistance of heater when in use.

Answer.

(a) (i) Wires crossing without touching each other.

(ii) Rheostat/Variable resistor

(b) Given: V = 60 V, I = 4 A, R = ?

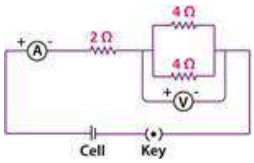
From Ohm's law, V = IR

60 = 4 x R = 15 Ω

Long Answer Type Questions (5 Mark)

1. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of 2 Ω in series with a combination of two resistors (4 Ω each) in parallel and a voltmeter across the parallel combination. Will the potential difference across the 2 Ω resistor be the same as that across the parallel combination of 4 Ω resistors? Give reason.

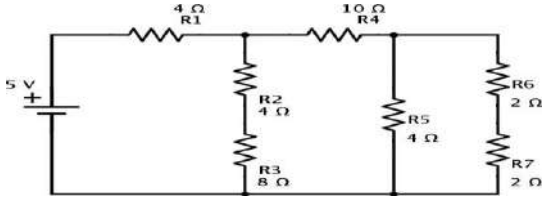
Ans) Circuit diagram



Effective resistance of the two 4 Ω resistors in parallel = 2 Ω. Since now they are in series same current will flow through both and hence potential difference will be the same across both.

2. i) In the following circuit calculate:

a) The resultant resistance in the circuit
b) The total current in the circuit



Ans) a) resultant resistance = R6 + R7 = 2 Ω + 2 Ω = 4 Ω1 / R5 + 1 /
4 = 2 Ω
R4 + 2 Ω = 12 Ω
R2 + R3 = 4 Ω + 8 Ω = 12 Ω1 / 12 + 1 / 12 =
6 Ω
R1 + 6 Ω = R = 10 Ω
b) I = V / R = 5 / 10 = 0.5A

ii) Why should we connect different devices in parallel in our domestic circuit?Ans) 1) Each appliance gets the same voltage as the supply power line.

2) Overall resistance of the circuit is less.

3) Even if one appliance stops working others are not affected.

3. (a)Write two points of difference between electric energy and electric power. Out of 60 W and 40 W lamps, which one has higher electrical resistance when in use.
(c) What is the commercial unit of electric energy? Convert it into joules.
Answer. (a) Difference between electric energy and electric power:

Electrical energy	Electric power
(*i*) The work done or energy supplied by the source in maintaining the flow of electric current is called electrical energy. It appears in the form of heat given by $H = VIt = \frac{V^2 t}{R} = I^2RT$	(*i*) The time rate at which electric energy is consumed or dissipated by an electrical device is called electric power and is given by $P = VI = \frac{V^2}{R} = I^2R$
(*ii*) It is equal to the product of power and time $E = P \times t$	(*ii*) it equal to the rate of doing work by an energy source. $P = \frac{W}{t}$
(*iii*) Its SI unit is jule (J) $1\ J = 1\ W \times 1s$	(*iii*) Its SI unit is watt (W) $1\ W = 1\ J\ s^{-1}$

(*b*) For the same applied voltage, $P \propto \frac{1}{R}$

i.e. lesser the power of electrical device, higher is its electrical resistance. Hence 40W lamp hashigher resistance.

(c) Kilowatt hour – Commercial unit of electrical energy
1 kWh = 1000 Wh = 1000 J/S x 3600 sec = 3600000 J = 3.6 x10^6J

4. a) A given length of a wire is doubled on itself and this process is repeated once again. By what factor does the resistance of the wire change?
Answer. Am. Length becomes one-fourth of the original length and area of cross-section becomes four times that of original.

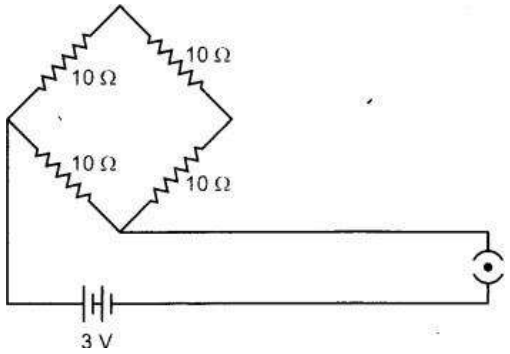
i.e. $$l_2 = \frac{1}{4} l_1 \text{ and } A_2 = 4A_1$$

$$\therefore \quad \frac{R_2}{R_1} = \frac{l_2}{l_1} \times \frac{A_1}{A_2} = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$$

$$\Rightarrow \quad R_2 = \frac{1}{16} R_1$$

So, new resistance is (1/16)th of original resistance.

Find the current drawn from the battery by the network of four resistors Shown in the figure.



Answer.

Equivalent resistance the given network is

$$\frac{1}{R} = \frac{1}{R_4} + \frac{1}{R_1 + R_2 + R_3}$$

$$= \frac{1}{10} + \frac{1}{10+10+10} = \frac{1}{10} + \frac{1}{30} = \frac{3+1}{30} = \frac{4}{30}$$

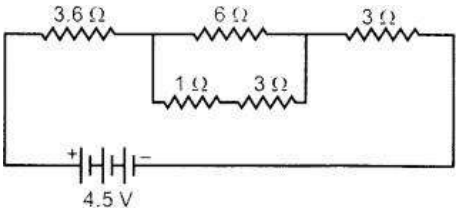
$$\therefore \quad R = \frac{30}{4} = 7.5\ \Omega$$

Current drawn from the battery

$$I = \frac{V}{R} = \frac{3}{7.5} = \frac{30}{75} = \frac{2}{5}$$

$$\Rightarrow \quad I = 0.4\ \text{A}$$

5 a) Find the current flowing through the following electric circuit.



Answer.

Series combination of 1 Ω and 3 Ω resistance is in parallel combination with 6 Ω. Their equivalent resistance is

$$\frac{1}{R_P} = \frac{1}{6} + \frac{1}{3+1} = \frac{1}{6} + \frac{1}{4} = \frac{2+3}{12}$$

$$\therefore \quad R_P = \frac{12}{5} = 2.4\ \Omega$$

Now, 3.6 Ω, 2.4 Ω and 3 Ω are in series, their equivalent resistance be

$$R_S = R_1 + R_2 + R_3$$
$$= 3.6 + 2.4 + 3 = 9\ \Omega$$

Hence, the current flowing through the circuit is

$$I = \frac{V}{R} = \frac{4.5}{9} = \frac{45}{90} = \frac{1}{2} = 0.5\ \text{A}.$$

b) A 9Ω resistance is cut into three equal parts and connected in parallel. Find the equivalentresistance of the combination.

Answer.

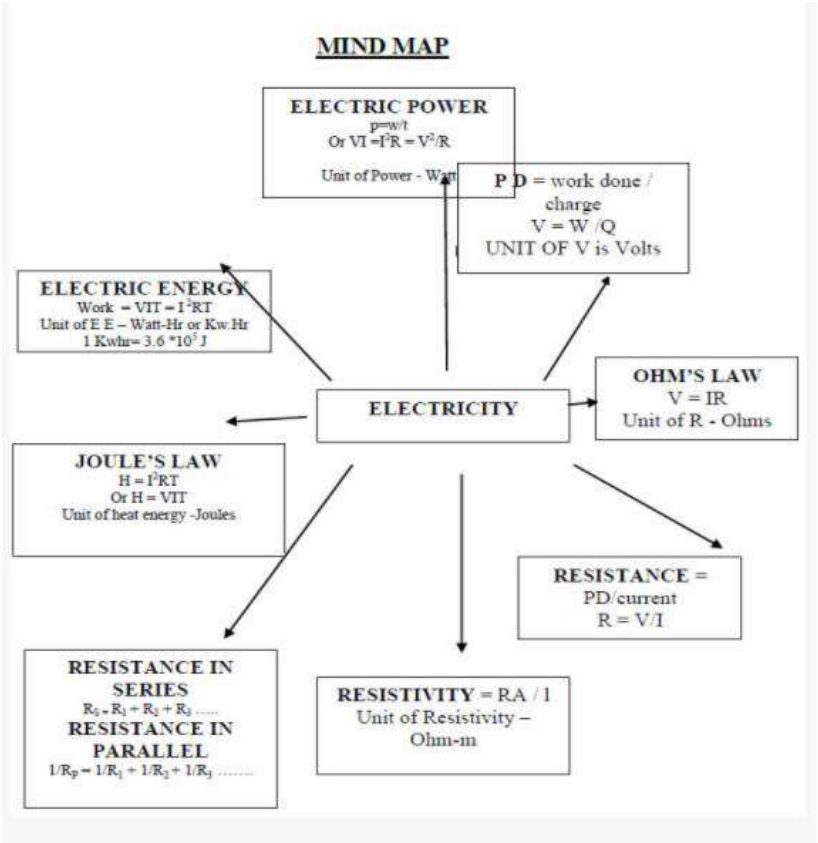
Resistance of each part $= \frac{R}{3} = \frac{9}{3} = 3\ \Omega$

$\therefore \quad R_1 = R_2 = R_3 = 3\ \Omega$

In parallel combination,

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$
$$= \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3} = 1$$

$$\therefore \quad R_P = 1\ \Omega$$


MIND MAP
ELECTRIC POWER
p=w/t
Or VI =I²R = V²/R
Unit of Power - Watt
P D = work done / charge
V = W /Q
UNIT OF V is Volts
ELECTRIC ENERGY
Work = VIT = I²RT
Unit of E E – Watt-Hr or Kw.Hr
1 Kwhr= 3.6 *10⁵ J
ELECTRICITY
OHM'S LAW
V = IR
Unit of R - Ohms
JOULE'S LAW
H = I²RT
Or H = VIT
Unit of heat energy -Joules
RESISTANCE = PD/current
R = V/I
RESISTANCE IN SERIES
Rs = R1 + R2 + R3 .....
RESISTANCE IN PARALLEL
1/Rp = 1/R1 + 1/R2 + 1/R3 .....
RESISTIVITY = RA / l
Unit of Resistivity – Ohm-m

CASE BASED QUESTION

As one of the most sought-after metals in the world, gold has a wide range of valuable chemical and physical properties. Not the least of which is a property called resistivity. While the electrical resistance of a substance's opposition to the flow of charge, resistivity measures how well a substance resists carrying a current, and is dependent on the chemical composition of the substance. Good conductors have low resistivities while bad conductors and insulators have high resistivities; hence resistivity is also known as the reciprocal of conductivity. As the graph shows, the resistivity of a substance is very much dependent on temperature. For most conductors, resistivity increases with rising temperature. At 20 °C, the resistivity of gold is approximately 2.44 × 10−8 ohm-m and steadily rises with increasing temperature.

1. is the device which is often used to change the resistance without changing the voltage source in an electric circuit.
   a) Ammeter b) Rheostat c)volt meter r d)switch
2. Which among the following is not a factor affecting resistance of a conductor?

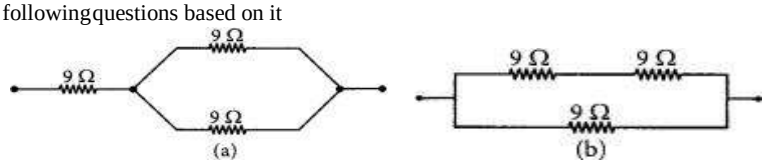
a) The material of the wire b) The thickness of the wire

c) The length of the wire d) The current flowing through the

wire. 3.Identify the element with least resistivity
a) silver b) iron c) gold d) all of these
4. What are the units of resistance and resistivity?
5. Calculate the resistance of a metal wire of length 2m and area of cross section 1.55×10^{-6} m², if the resistivity ofthe metal be 2.8×10^{-8} Ω m.

Answer:
1.b , 2.d , 3.a 4.Ω , Ωm.
5.For the given metal wire, length, l = 2 m
area of cross-section, $A = 1.55 \times 10^{-6}$ m²
resistivity of the metal, $p = 2.8 \times 10^{-8}$ Ω
mSince, resistance, $R = \rho\, l/A$
So $R = 2.8x10^{-8}x2/1.55 \times 10^{-6} = 5.6x10^{-2}/1.55 = 3.6x10^{-2}$ Ω

II. Three resistors of equal resistance are connected in a circuit as represented below. Answer the followingquestions based on it



1. Equivalent resistance of circuit (a) is _____
   a) 27 Ω b) 4.5 Ω c) 13.5 Ω d)18 Ω
2. Equivalent resistance of circuit (b) is _____

a) 6 Ω b) 2Ω c) 27Ω d)18Ω

3. Calculate the current drawn from the battery if the voltage in circuit (b) is 24V 4.Which one will draw more current when connected in a domestic circuit? why?

Answers

1.c 2.a 3.I=V/R 24/6=4A

4.(b)will draw more current

For (a) V/R=220/13.5=16.3A For(b) V/R=220/6=36.67A

MAGNETIC EFFECTS OF ELECTRIC CURRENT

GIST OF THE LESSON

1. **Magnetic field**: The region or space around a magnet where a magnetic force is experienced is called a magnetic field

2. **Magnetic field lines**: Magnetic field is represented by field lines. They are lines drawn in a magnetic field along which a North magnetic pole moves.

3.Properties of Magnetic field lines of a bar magnet:

*Magnetic field lines emerge from North Pole and merge at the south pole .Inside the magnet, the direction of field lines is from its south pole to its north pole. Thus the magnetic field lines are closed curves.

*The relative strength of the magnetic field is shown by the degree of closeness of the fieldlines. The field is stronger, that is, the force acting on the pole of another magnet placed is greater where the field lines are crowded.

*No two field-lines are found to cross each other. If they did, it would mean that at the point of intersection, the compass needle would point towards two different directions, which is not possible.

3. **Magnetic field due to a straight current-carrying conductor**: The magnetic field lines due to a straight current carrying conductor are concentric circles whose centers lie on the wire.

4. Factors on which the magnitude of magnetic field due to straight current carrying conductor depends

The magnitude of magnetic field produced is

* directly proportional to the current passing in the wire.
* inversely proportional to the distance of that point from the wire**.**

5. **Right hand thumb rule**: If a current carrying straight conductor is held in your right hand such that the thumb points towards the direction of current, then the wrapped fingers show the direction of magnetic field lines.

6. Magnetic field lines due to a current through a circular loop .

The strength of the magnetic field at the center of the loop(coil)depends on:***The radius of the coil**.

***The number of turns in the coil**: As the number of turns in the coil increases, the magnetic strength at the center increases, because the current in each circular turn is havingthe same direction, thus the field due to each turn adds up.

***The strength of the current flowing in the coil**: as the strength of the current increases, the strength of the magnetic fields also increases

7. **Solenoid:**A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid. In fact, one end of the solenoid behaves as a magnetic north pole, while the other behaves as the south pole. The field lines inside the solenoid are in the form of parallel straight lines. This indicates that the magnetic field is the same at all points inside the solenoid. That is, the field is uniform inside the solenoid.

The strength of the magnetic field inside a solenoid depends on

*The number of turns in the solenoid
*The strength of current in the solenoid.
*The nature of core material used in making solenoid

Force on a current-carrying conductor in a magnetic field

*A current carrying conductor placed in a magnetic field experiences a force

*If the direction of the field and that of current are mutually perpendicular to each other, thenthe force acting on the conductor will be perpendicular to both and that can be determined using the Fleming's left-hand rule

8. **Fleming's Left hand rule:** Stretch the thumb, forefinger and middle finger of left hand such that they are mutually perpendicular. Forefinger points in the direction of magnetic field and middle finger in the direction of current, then the thumb gives the direction of force acting on the conductor.

9. **Alternating current (AC) and Direct current(DC):T**he difference between the direct and alternating currents is that the direct current always flows in one direction, whereas the alternating current reverses its direction periodically. Most power stations constructed these days produce AC. An important advantage of AC over DC is that electric power can be transmitted over long distances without much loss of energy**.** In India, the AC changes direction after every 1/100 second, that is, the frequency of AC is 50 Hz.

10.* Wires in domestic electric circuit supply with red insulation cover are called live wire (or positive).

*Another wire, with black insulation, is called neutral wire (or negative).
*The earth wire, which has insulation of green colour, is usually connected to a metal plate deep in the earth
*In our country, the potential difference between the two is 220 V.

11.An electric fuse prevents the electric circuit and the appliance from a possible damage by stopping the flow of unduly high electric current.

MCQ

1. Appliances that have a metal body are generally connected to the earth wire. What is the reason to earth these wires?

(a) To prevent the excess current (b) To prevent the leakage of current
(c) To provide extra current to the appliance (d) To provide high resistance to the appliance
Correct Answer: Option (b)

2.The most important safety method used for protecting home appliances from short circuiting or overloading is

(a) earthing (b) use of electric meter (c) use of stabilizer (d) use of fuse
Correct Answer: Option (d)

3.In all the electrical appliances, the switches are put in the

(a) live wire (b)earth wire (c)neutral wire (d)all of above
Correct Answer: Option (a)

4. No force acts on a current carrying conductor when it is placed

(a) Perpendicular to the magnetic field (b) parallel to the magnetic field(c)far away from the magnetic field (d)inside a magnetic field
Correct Answer: Option (b)

5.The force experienced by a current-carrying conductor placed in a magnetic field is the largest when the angle between the conductor and the magnetic field is:

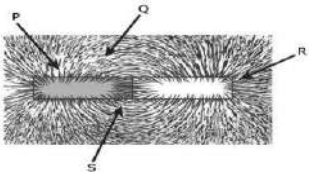
(a) 45
(b) 60
(c) 90
(d) 180 Answer:
(c)

6. Which of the following pattern correctly describes the magnetic field around a long straight wire carrying current?

(a) straight lines perpendicular to the wire. (b) straight lines parallel to the wire.
(c) radial lines originating from the wire. (d) concentric circles centered around the wire.

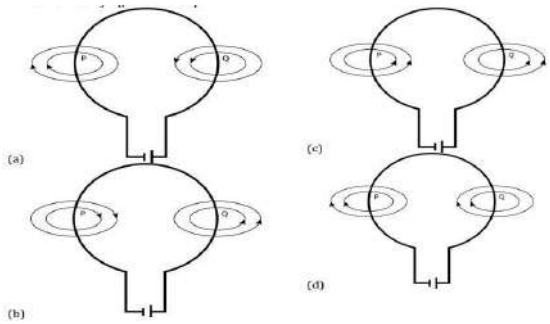
Answer: (d)

7. Rahul sprinkles some iron fillings around a bar magnet kept over a sheet of paper. On tapping gently the iron filings got arranged as shown in the figure below



Rahul labeled four different regions around the magnet. Where would be the magnetic field the strongest?
(a) P (b) Q (c) R (d) S
Correct Answer: Option (c)

8. The given figures show the direction of the magnetic field lines at point P and Q in current carrying circular loop drawn by four different students. Identify the correct figure.



Correct Answer: Option (b)

9. The magnetic field inside the solenoid is

a)variable b)same at all points c)non –uniform d)zero
Correct Answer: Option (b)

10.At the time of short circuit the current in the circuit

a)reduces substantially b)does not change c))increases heavily d)vary continuously
Correct Answer: Option (c)

SHORT ANSWER QUESTIONS (2 MARK)

1.Why is an alternating current considered to be advantageous over direct current for long distance transmission of electric power?

Ans. Alternating current is considered advantageous over direct current because it can be stepped up or stepped down using a transformer which makes it more suitable for transmission of electric power over longdistances without loss of energy.

2. How does an electric fuse prevent electric circuit from overheating?

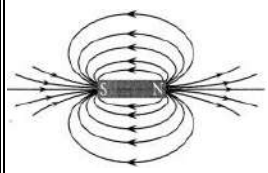
The fuse wire is made up of a lead-tin alloy. It breaks or melts due to overheating or high load it creates a gap so that current cannot flow through it and prevents the appliance from getting damaged.

3.State the rule used to find force acting on a current carrying conductor placed in a magnetic field

Fleming's Left hand rule. Stretch the thumb, forefinger and middle finger of left hand such that they are mutually perpendicular. Forefinger points in the direction of magnetic field and middle finger in thedirection of current, then the thumb gives the direction of force acting on the conductor.

4. Draw magnetic field lines around a bar magnet. Name the device which is used to draw magnetic field lines.

Answer:



Compass needle is used to draw magnetic field lines.5.Give reason for the following

(i) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid.

(ii) The current carrying solenoid when suspended freely rests along a particular direction.

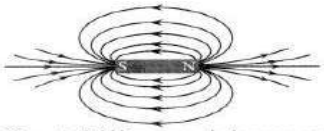
Answer:

(i) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid because it behaves similar to that of a bar magnet and has a magnetic field line pattern similar to that of a bar magnet. Thus the ends of the straight solenoid behave like poles of the magnet, where the converging end is the South Pole and the diverging end is the North Pole. (ii) The current carrying solenoid behaves similar to that of a bar magnet and when freely suspended aligns itself in the north-south direction.

SHORT ANSWER QUESTIONS (3 MARK)

1..Design an activity to demonstrate that a bar magnet has a magnetic field around it.

Answer:One can easily demonstrate the presence of field lines around a bar magnet using compass needles. Place the magnet on a white sheet and mark its boundaries on sheet. Place the compass near the north pole of magnet and mark the position of needle. Now move the compass such that its south pole occupies the position previously occupied by its north pole. Repeat this step several times and you will have pattern as shown in the figure.



Magnetic field lines around a bar magnet

Drawing a magnetic field line with the help of a compass needle

Repeat the above procedure and draw as many lines as you can. These lines represent the magnetic field around the magnet. These are known as magnetic field lines.

2.A compass needle is placed near a current carrying wire. State your observations for the following cases and give reasons for the same in each case-

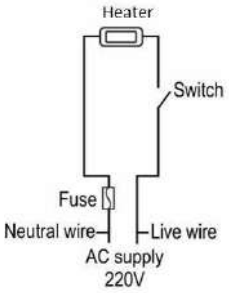
(a) Magnitude of electric current in wire is increased.

(b) The compass needle is displaced away from the wire.

Answer: (a) The deflection in the compass needle increases as Magnetic field of the current carrying conductor is directly proportional to current flowing through it. (b) The deflection in the needle decreases as the magnetic field is inversely proportional to the perpendicular distance from the wire.

8.a)A heater is connected in a circuit as shown below. If there is an overloading in the given circuit ,will the fuse protect the electric heater from damage? Justify your answer.

b)Name two safety devices used in a domestic circuit.



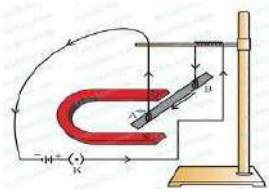
a) No, the fuse will melt only after the current has passed through the heater and damaged it.
b) Earthing and safety fuse.

9.a)Name and state the rule to find the direction of magnetic field associated with a current carryingconductor.

b)What are the factors on which magnetic field due to a current carrying solenoid depends?Ans.a)Right hand thumb rule. If a current carrying straight conductor is held in your right hand such that the thumb points towards the direction of current, then the wrapped fingers show the direction of magnetic field lines.

b) strength of current, number of loops of the solenoid

10**.** In activity given below, how do we think the displacement of rod AB will be affected if
(i) current is rod AB is increased,
(ii) a stronger horse shoe magnet is used, and
(iii) length of the rod AB is increased?



Ans. (i) On increasing the current in rod AB its displacement will increase.
(ii) If stronger horse-shoe magnet is used then the displacement of rod AB will increase.
(iii) If length of the rod is increased, force acting on it will increase and hence, displacementof the rod increases.

<u>Long answer question 5 mark</u>

1.Draw a neat diagram to show the magnetic field around a current carrying circular coil. Explain the effecton the magnetic field produced at a point in a current carrying circular coil due to:
(i) increase in the amount of current flowing through it
(ii) increase in the distance of point from the coil
(iii) increase in the number of turns of the coil.

Answer:Ref NCERT Text book class X –fig of a circular loop carrying current
(i) The magnitude of magnetic field produced by a current carrying circular coil at a point is directly proportional to the current flowing through the circular coil. Thus as the amount of current flowing throughthe circular coil increases, the magnetic field produced at a point in a circular coil increases.

(ii) Magnitude of magnetic field produced at a point in a current carrying circular coil is inversely proportional to the distance of point from the coil. Thus the magnetic field produced at a point decreases asthe distance increases from the coil.

(iii) The magnetic field produced by a current carrying wire at a given point depends directly on the current passing through it. Therefore, if there is a circular coil having n turns, the field produced is n times as large as that produced by a single turn. This is because the current in each circular turn has the same direction, andthe field due to such turns then just adds up.

2.. Based on the domestic circuit given below , answer the following questions.(i) State what happens whenswitch A is connected to a) Position 2 b) Position 3

(ii) Find the potential difference across each lamp when lit.

(iii) Calculate the current

a) in each 12 Ω lamp when lit.

b) In each 4

Ω lamp

when lit.

OR

(iv) Show, with calculations, which type of lamp, 4.0 Ω or 12 Ω, has the higher power.

i) 12 Ω lamps (only) on.

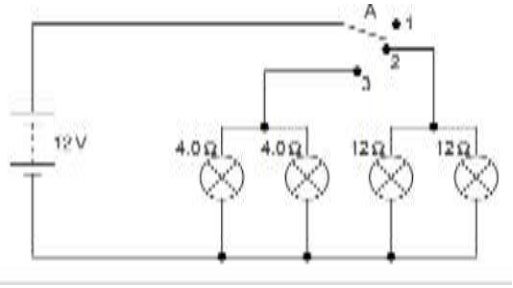
(a) 4 Ω lamps (only) on [0.5+0.5]

(ii) 12 V for both sets of lamps and all of them are in parallel. [1]

(iii) 12 Ω lamps are on when the wire is

connected to position 2.Voltage across both

12 Ω lamps = 12 V.



V=IR (Ohm's law).

$I=\frac{V}{R}=\frac{12}{12}$ = 1A. [1]

4 Ω lamps are on when the wire is

connected to position 3.Voltage across

both 4 Ω lamps = 12 V.

V=IR (Ohm's law).

$I=V/R$

= 12/4

= 3A.

[1]OR
$P = V^2 / R$
All lamps are in parallel and hence same V for all lamps.
For 4 Ω lamps → $P=(12\times12)/4=36\ W$
For 12 Ω lamps → $P=(12\times12)/12=12\ W$
Hence 4 Ω lamps will have higher power. [0.5 x 4]

CASE /SOURCE BASED QUESTIONS

The domestic electric circuit consist of red insulated cover called as live wire, wire with black insulation called as neutral wire and the wire with green insulation is called as Earth wire. We know that fuse is connected in series with the circuit to prevent the damaging of electrical appliances and circuit from overloading. Overloading occurs when live wire and the neutral wire comes in direct contact with each other.Because of which current through the circuit increases suddenly. Also, overloading may occurs because of connecting many appliances to a single socket. The Earth wire which is green in colour is connected to a metal plate deep in the earth near the house. This type of safety measure is used in appliances like electric press, toaster, table fan, refrigerator etc. The Earth wire is gives low resistance conducting path for the electric current. In this way it protects us from severe electric shock. All the appliances are connected in parallel circuit so that the potential difference across each appliance will be same.

1)What are the signs of live wire and neutral wire?
Ans The red insulated wire is the live wire or positive and the black insulated wire is theneutral wire or negative.

2)In our country what is the potential difference between live wire and neutral wire?
Ans: In our country the potential difference between live wire and neutral wire is 220 V.

3)What is short circuiting?
Ans: When live wire and neutral wire comes in direct contact, in that situation the current through thecircuit increases suddenly and it is called as short circuiting.

4) What is the main purpose of using fuse in electric circuit?
Because of Joule's heating effect the heat produced causes the fuse to melt and to break the circuit. Andthereby protect the circuit and electric appliances.

5) In domestic electric circuit,appliances are connected in parallel. Why?

Ans: In domestic electric circuit,appliances are connected in parallel because if one appliance stops workingor get fused,other appliances keep on operating means the other appliances remains unaffected.

6)In domestic electric circuit, with which wire we connect a fuse? Why?
Ans: To prevent the devices from electrical damages, fuse is connected to live wire.

7)What is the main difference in the wiring of an electric bulb and a socket for using an electric iron in a domestic electric circuit? What is the reason for this difference?
Ans: No earth connection is required for the bulb connection as it does not draw heavy current and we hardlytouch it. A socket for using an electric iron has an earth connection because electric iron has a metallic body and draws a large current.

8.In domestic electric circuits the wiring with 15 A current rating is for the electric devices which have
(a) higher power ratings such as geyser.
(b) lower power ratings such as fan.

(c) metallic bodies and low power ratings. (d)non-metallic bodies and low power ratings
Correct Answer: Option (a)

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Class X Science
(Subject Code – 086)

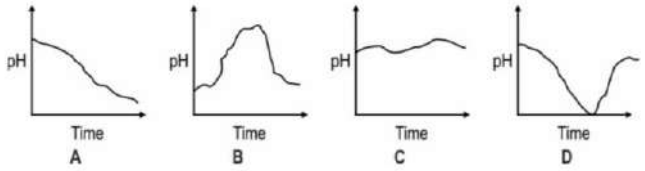
Max. Marks: 80 **Time Allowed: 3 hours**

General Instructions:

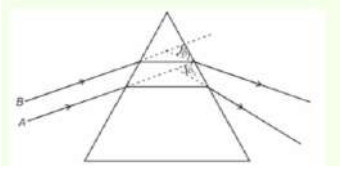
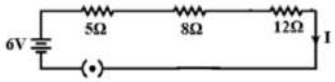
i. *This question paper consists of 39 questions in 5 sections.*
ii. *All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.*
iii. *Section A consists of 20 objective type questions carrying 1 mark each.*
iv. *Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.*
v. *Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.*
vi. *Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.*
vii. *Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts*

SECTION A

Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response

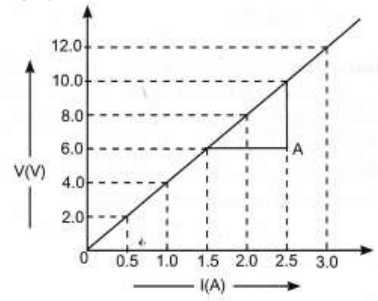
Q.Nos	Questions	Marks	
1	When copper powder is heated it gets coated with (a)Black copper oxide (b)Yellow copper oxide (c)Red copper oxide (d)None of these	1	
2	Which of the following correctly represents a balanced chemical equation? A. $Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$ B. $3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$ C. $3Fe(s) + H_2O(g) \rightarrow Fe_3O_4(s) + H_2(g)$ D. $3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + H_2(g)$	1	
3	The number of molecules of water of crystallisation present in washing soda crystals is: (a) five (b) two (c) ten (d) seven	1	
4	Which of these graphs shows how the pH of milk changes as it forms curd  	1	
5	Copper is used for making cooking utensils. Which of the following physical properties of copper is NOT responsible for the same? a) Malleability c) High melting point b) Thermal conductivity d) High reactivity	1	
6	Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is: (a) 1: 1 (b) 2:1 (c) 4:1 (d) 1:2	1	
7	Ammonium chloride is an acidic salt because it is a salt of a (a) strong acid and strong base (b) weak acid and weak base (c) strong acid and weak base (d) weak acid and strong base	1	

8	The mode of nutrition found in fungi is (a) saprotrophic or parasitic (b) only parasitic (c) only saprotrophic (d) none of the above	1	
9	_____ conducts impulse from peripheral body parts to brain a. sensory nerve b. motor nerve c. inter neuron d. microglia	1	
10	AIDS is a deadly disease which is caused by a) a protozoan b) a fungus c) a bacterium d) a virus	1	
11	A cross between a tall pea-plant (TT) and a short pea-plant (tt) resulted in progenies that were all tall plants because (a) tallness is the recessive trait. (b) shortness is the dominant trait. (c) height of pea-plant is not governed by gene T or t. (d) tallness is the dominant trait.	1	
12	In the experiment to show that carbon dioxide gas is necessary for photosynthesis, at first, the potted plants are kept in dark room for 2 to 3 days. The purpose of this step is A. To avoid drying of plant in hot sun. B. To de starch the plant C. To avoid excess heat and keep it cool D. To supply carbon di oxide	1	
13	Magnification produced by a rear view mirror fitted in vehicles (a) is less than one (b) is more than one (c) is equal to one (d) can be more than or less than one, depending upon the position of the object in front of it	1	
14	The near point and far point are determined with regards to the function of which part of the eye? a. Pupil b. retina c. eye ball d. ciliary muscles	1	
15	Which of the following describes the flow of energy and nutrients, respectively through the ecosystem? a. Bidirectional and cyclic c. Unidirectional and cyclic b. Cyclic and bidirectional d. cyclic and unidirectional	1	
16	In 1987 …….. succeeded in forging an agreement to freeze CFC production at 1986 levels. a. UNESCO b. UNICEF c. UNEP d. OPCW	1	
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: **a) Both A and R are true, and R is the correct explanation of A.** **b) Both A and R are true, and R is not the correct explanation of A.** **c) A is true but R is false.** **d) A is false but R is true**		
17	**Assertion:** The balancing of chemical equations is based on law of conservation of mass. **Reason:** Total mass of reactants is equal to total mass of products**.**	1	
18	**Assertion:** Scrotum is present outside the abdominal cavity **Reason**: It stores sperms which require a lower temperature than the normal body temperature.	1	
19	**Assertion:** A compass needle is placed near a current carrying wire. The deflection of the compass needle decreases when the magnitude of the current in the wire is increased. **Reason :** The strength of a magnetic field at a point near the conductor increases on increasing the current.	1	

20	**Assertion:** Ozone layer is getting depleted at upper atmosphere and it is a serious cause of concern. **Reason**: CFC reacts with ozone and breaks it.	1	
	SECTION B **Question No. 21 to 26 are very short answer questions**		
21	A student burnt a metal 'X' found in the form of ribbon. The ribbon burnt with a dazzling flame and a white powder 'Y' is formed which is basic in nature. Identify 'X' & 'Y'. Write the Balanced chemical equation.	2	
22	Name an organism which reproduces by spore formation. List three conditions favourable for spores to germinate and grow.	2	
23	Bile juice contains no digestive enzymes, yet it is important for digestion. Why? OR What is the role of acid and mucous in the stomach?	2	
24	What is meant by dispersion of white light? Light of two colours A and B pass through a prism. A deviates more than B from its path incidence. Which colour has a highest speed in the prism? 	2	
25	Redraw the given circuit putting in an ammeter to measure the current through the resistors and a voltmeter to measure the potential different across the 12 Ω resistors. What would be the readings in the ammeter and the voltmeter.  OR Draw the pattern of magnetic field lines of a current carrying solenoid. Write the factors on which the strength of magnetic field produced by a current carrying solenoid depends?	2	
26	We do not clean ponds or lakes but an aquarium needs to be cleaned regularly. Why?	2	
	SECTION -C **Question No. 27 to 33 are short answer questions**		
27	Explain the following a) NaCl is not a conductor of electricity in solid-state, whereas it does conduct electricity in aqueous solution as well as in the molten state. b) Aluminium oxide is considered as an amphoteric oxide.	3	
28	A teacher asks her students to identify a metal M. She gives them the following clues • Its oxide reacts with both HCl and NaOH • It doesnot react with hot or cold water but reacts with steam. • It can be extracted by electrolysis of its ore. Identify the metal.	3	

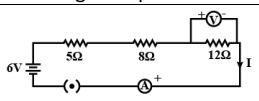
	What would happen if the metal is reacted with iron oxide. Write the chemical equations for the reaction of the metal with HCl and NaOH respectively. OR Carbon cannot reduce the oxides of sodium, magnesium and aluminium to their respective metals. Why? Where are these metals placed in the reactivity series? How are these metals obtained from their ores?		
29	(a) Define reflex arc. (b) Trace the sequence of events which occur in our body when a bright light is focussed on your eyes.		
30	How do Plasmodium and Leishmania reproduce? Write one difference in their mode of reproduction.	3	
31	Define the term power of accommodation. Write the modification in the curvature of the eye lens which enables us to see the nearby objects clearly?	3	
32	A current of 10 A flows through a conductor for two minutes. (i) Calculate the amount of charge passed through any area of cross section of the conductor. (ii) If the charge of an electron is 1.6×10^{-19} C, then calculate the total number of electrons flowing.	3	
33	An electric iron has a rating of 750 W; 200 V. Calculate: (i) the current required. (ii) the resistance of its heating element. (iii) energy consumed by the iron in 2 hours.	3	
	SECTION -D **Question No. 34 to 36 are long answer questions.**		
34	Manasi wrote the names of four compounds as the first members of their respective homologous series. ➢ Methanol ➢ Methanal ➢ Methanone ➢ Methanoic acid a) Which name has she written incorrectly? Justify your answer. b) What name should she have written instead? c) Draw electron dot structures of the following compounds : (i) Ethane (ii) Ethene OR Ethanol C_2H_5OH is heated with alkaline potassium permanganate to give a compound Y. $C_2H_5OH \xrightarrow{\text{alkaline } KMnO_4 + \text{heat}} X$ a) How many carbon atoms will compound X contain? b) Compound X is now reacted with ethanol in the presence of an acid catalyst to give a compound Y. $X + C_2H_5OH \xrightarrow{\text{acid}} Y$ i) Name the type of the compound formed in the above reaction with respect to the functional group it contains. ii) State one characteristic property of compounds of the type of compound Y.	2+1+2 1+2+2	

	iii) State one use of compounds of this type. c) What would be the products formed when ethanol undergoes complete combustion? Support your answer with a balanced chemical equation.		
35	What is the significance of variation? a) How are variations useful for species if there is drastic alteration in the niches? b) Explain how the uterus and placenta provide necessary conditions for proper growth and development of the embryo after implantation? OR (a) Why is it not possible to reconstruct the whole organism from a fragment in complex multicellular organisms? (b) Sexual maturation of reproductive tissues and organs are necessary link for reproduction. Elucidate.	5	
36	The image of an object formed by a lens is of magnification -1. a) If the distance between the object and its image is 60 cm, what is the focal length of the lens? b) If the object is moved 20 cm towards the lens, where would the image be formed? State reason and also draw a ray diagram in support of your answer. OR Rohit wants to have an erect image of an object using a converging mirror of focal length 40 cm. (a) Specify the range of distance where the object can be placed in front of the mirror. Justify. (b) Draw a ray diagram to show image formation in this case. (c) State one use of the mirror based on the above kind of image formation (d) Determine the position of the image formed by this mirror if the object is kept 10cm in front of the mirror.	2+3 1+2+1+1	
SECTION E **Question No. 37 to 39 are case-based/data -based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts**			
37	Most dirt is oily in nature and as you know, oil does not dissolve in water. The molecules of soap are sodium or potassium salts of long-chain carboxylic acids. The ionic-end of soap interacts with water while the carbon chain interacts with oil. The soap molecules, thus form structures called micelles, where one end of the molecules is towards the oil droplet while the ionic-end faces outside. This forms an emulsion in water. The soap micelle thus helps in pulling out the dirt in water and we can wash our clothes clean **i)** What is hydrophobic end? **ii)** Draw the structure of micelle. **iii)** What are scums? **iv)** What is hard water? OR The compounds which have the same molecular formula but differ from	4	

	each other in physical or chemical properties are called isomers and the phenomenon is called isomerism. When the isomerism is due to difference in the arrangement of atoms within the molecule, without any reference to space, the phenomenon is called structural isomerism. In other words. structural isomers are compounds that have the same molecular formula but different structural formulas, i.e., they are different in the order in which different atoms are linked. In these compounds, carbon atoms can be linked together in the form of straight chains, branched chains or even rings. 1) Among CH_4, C_2H_6 and C_4H_{10} which is expected to show isomerism? 2) Why doesn't ethane have any structural isomers? 3) Draw the structure of an unsaturated cyclic compound having six carbon atoms. Also draw its electron dot structure. OR Draw the possible structural isomers of pentane.		
38	Pooja has green eyes while her parents and brother have black eyes. Pooja's husband Ravi has black eyes while his mother has green eyes and father has black eyes. (a) On the basis of the above given information, is the green eye colour a dominant or recessive trait? Justify your answer. (b) What is the possible genetic makeup of Pooja's brother's eye colour? (c) What is the probability that the offspring of Pooja and Ravi will have green eyes? Also, show the inheritance of eye colour in the offspring with the help of a suitable cross. OR (c) 50% of the offspring of Pooja's brother are green eyed. With help of cross show how this is possible.	4	
39	A graph between difference (V) and current (I) is given in figure.  i. What is the relation between V and I? ii. Find the resistance of the conductor using the graph. iii. In a purely resistive electrical appliance, the emf source is 10V. the current flowing through it is 1A. if the wires are resistance free, calculate the resistance of the appliance. OR iv. If a conductor resistance is 50 Ω and the current passing through it is 5 A. Calculate the potential difference?	4	

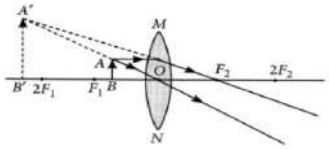
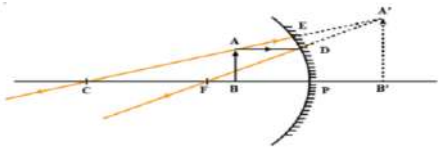
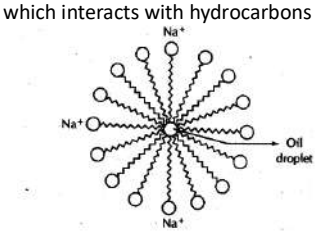
Marking Scheme (2023-24)
Class-X Science SAMPLE PAPER 1
(Subject Code – 086)

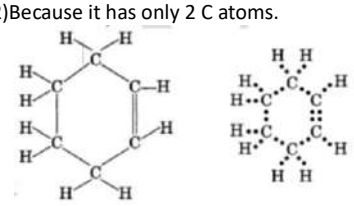
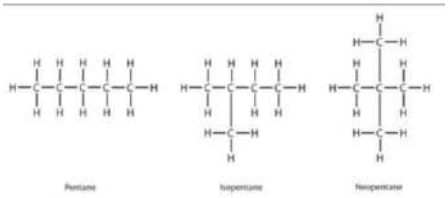
SECTION A

Q.Nos	Answers	Marks	
1	a) Black copper oxide	1	
2	B. $3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4\ (s) + 4H_2(g)$	1	
3	C) 10	1	
4	a)	1	
5	d) High reactivity (Cu has low reactivity. Low reactivity is not a physical property, it is a chemical property)	1	
6	(b) 2:1	1	
7	(c) strong acid and weak base	1	
8	(a) saprotrophic or parasitic	1	
9	a. sensory nerve	1	
10	d) a virus	1	
11	(d) tallness is the dominant trait.	1	
12	B. To de starch the plant	1	
13	(a) is less than one	1	
14	d. ciliary muscles	1	
15	c. Unidirectional and cyclic	1	
16	c. UNEP	1	
17	A	1	
18	A	1	
19	D	1	
20	A	1	
	SECTION B		
21	X- Mg, Y- MgO $Mg + O_2 \rightarrow 2MgO$	2	
22	Rhizopus reproduce by the method of spore formation. The three conditions favourable for spores to germinate and grow are moisture, suitable temperature and food (nutrition)	2	
23	For emulsification of fat. To make the medium alkaline and activates lipase. OR Acid – kills the germ Mucous- protects the wall of stomach from action of acid.	2	
24	Splitting of white light into its constituent colours when it is passed through a prism is called dispersion of white light. B has highest speed.	2	
25	 OR Fig 12.10 NCERT TEXT BOOK No. of turns, strength of current, nature of core material used (any two)	2	

26	An aquarium is an artificial system. There is no recycling and self-cleaning. However, a pond or a lake is a self-sustained, natural and complete ecosystem where there is perfect recycling of nutrients.	2	
	SECTION -C		
27	a) Ionic compounds conduct electricity in molten state due to the presence of free electrons. b) Al is less electropositive metal. So, it forms amphoteric oxide which can react with acid as well as base.	3	
28	Aluminium. It would displace iron to form aluminium oxide. $Al_2O_3 + 2\ NaOH \rightarrow 2\ NaAlO_2 + H_2O$ $Al_2O_3 + HCl \rightarrow 2AlCl_3 + 3H_2O$ OR Sodium, magnesium and aluminium have higher affinity towards oxygen than that of carbon because these are highly reactive metals. Hence, carbon cannot reduce the oxides of sodium, magnesium and aluminium to their respective metals. These metals are placed at the top of the reactivity series. The highly reactive metals like Na, Mg, Al, etc. are extracted by electrolytic reduction of their molten chlorides or oxides.	3	
29	a) The pathway taken by the nerve impulses in a reflex action, from receptor organ to spinal cord and back to effector organ of reflex action is called reflex arc. b) Sequence of events can be summarised as : Photoreceptors in eye → Sensory (Receptor) neuron → Brain → Motor (Effector) neuron → Eye muscle → Constriction of pupils		
30	Plasmodium and Leishmania reproduce by the process of fission. Plasmodium reproduces by multiple fission. Leishmania reproduces by the process of binary fission. In Leishmania, the splitting of parent cell takes place in a definite plane	3	
31	The ability of the eye lens to adjust its focal length is called power of accommodation. The ciliary muscles modifies the curvature to some extent. The change in the curvature of the eye lens can thus change its focal length. When the ciliary muscles contract, the lens becomes thick and its focal length decreases, thus enables us to see nearby objects clearly.	3	
32	Given that: I = 10 A, t = 2 min = 2 × 60 s = 120 s (i) Amount of charge Q passed through any area of cross-section is given by I = Qt or Q = I × t ∴ Q = (10 × 120) A s = 1200 C (ii) Since, Q = ne where n is the total number of electrons flowing and e is the charge on one electron ∴ $1200 = n \times 1.6 \times 10^{-19}$ or n = 12001.6×10−19 = 7.5×10^{21}	3	
33	Here, P = 750 W, V = 200 V (i) As P = V7 I = P/V= (750/200) A = 3.75A (ii) By Ohm's law V = IR or R = V/I ∴ R = 2003.75 Ω = 53.3 Ω (iii) Energy consumed by the iron in 2 hours	3	

	= P × t = 750 W × 2h = 1.5 kWh or E = (750 × 2 × 3600) J = 5.4×10^6 J		
	SECTION -D		
34	a) Methanone -the smallest ketone has three carbon atoms b) Propanone c) i. ethane ii. ethene  OR a) Two b) i) ester ii) sweet smell iii) perfumes, flavouring agent c) Carbon dioxide and water $CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$	5	
35	a) If the niche were drastically altered, the population could be wiped out. However, if some variations were to be present in a few individuals in these populations, there would be some chance for them to survive. Variation is thus useful for the survival of species over time. b) ●The lining of the uterus thickens and is richly supplied with blood to nourish the growing embryo. (½ mark) ● The embryo gets nutrition from the mother's blood with the help of placenta. It is embedded in the uterine wall. (½ mark) ● It contains villi on the embryo's side of the tissue. On the mother's side are blood spaces, which surround the villi. (½ mark) ● This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The developing embryo will also generate waste substances which can be removed by transferring them into the mother's blood through the placenta. (1 mark) ● The child is born as a result of rhythmic contractions of the muscles in the uterus. (½ mark) OR (a) The reason is that many multi-cellular organisms are not simply a random collection of cells. Specialised cells are organised as tissues, and tissues are organised into organs, which then have to be placed at definite positions in the body. Therefore, cell-by-cell division would be impractical. (2 marks) (b) Sexual maturation of reproductive tissues is a necessary link for reproduction because of the need for specialised cell called germ-cells to participate in sexual reproduction. The body of the individual organism has to grow to its adult size, the rate of general body growth begins to slow down, reproductive tissues begin to mature. (1½ marks) A whole new set of changes in the appearance of the body takes place like change in body proportions, new features appear. This period during adolescence is called puberty. There are also changes taking place that are different between boys and girls. In girls, breast size begins to increase, with darkening of the skin of the nipples at the tips of the breasts. Also, girls begin to menstruate at around this time. Boys	2+3	

	begin to have new thick hair growth on the face and their voices begin to crack. (1½ marks)		
36	a) Magnification of -1 indicates that the image is real and inverted and is of the same size as of the object. The object must be at 2f and image also at 2f on the other side. Total distance between image and object, Also 4f = 60 cm ⇒ f = 15 cm b) If object is moved 20 cm towards the lens, then the object will be between focus and optical centre of the lens and image formed will be virtual and erect and on the same side of the lens.  c) OR (a) The object has to be placed at a distance between 0 - 40 cm. This is because image is virtual, erect and magnified when the object is placed between F and P. (1mark) (b) (c)Used as shaving mirror, used by dentists to get enlarged image of teeth (any one use) (1mark)  	5	
	SECTION E		
37	i. Soap molecules have two ends in which one is hydrophobic end which interacts with hydrocarbons and do not dissolve in water.  ii. iii. An insoluble substance(white precipitate) remains after washing with water. It is formed by the reaction of soaps with the calcium and magnesium salts. iv. The water which contains Calcium and magnesium salts in it and form insoluble precipitates when treated with soap are called hard water.		

<table>
<tr><td></td><td>OR
1)C_4H_{10}
2)Because it has only 2 C atoms.
 
(Cyclohexene)
3)
OR
  </td><td></td><td></td></tr>
<tr><td>38</td><td>a. Yes, green eye colour is recessive (½ mark) as it will express only in homozygous condition (½ mark)
b. BB, Bb (1 mark)
c. bb*Bb (0.5mark)
<table><tr><td></td><td>B</td><td>b</td></tr><tr><td>b</td><td>Bb</td><td>bb</td></tr><tr><td>b</td><td>Bb</td><td>bb</td></tr></table>Genetic cross - (1 mark) 50% of the offsprings can have green eye colour (0.5)
OR
c. . Brother is heterozygous(Bb) and wife is green(bb) - (1 mark)
Wife bb*Bb brother
<table><tr><td></td><td>B</td><td>b</td></tr><tr><td>b</td><td>Bb</td><td>bb</td></tr><tr><td>b</td><td>Bb</td><td>bb</td></tr></table>50% of the offsprings can have green eye colour as per the cross shown.(1 mark)</td><td></td><td></td></tr>
<tr><td>39</td><td>i. $V \propto I$
ii. Resistance of conductor= slope of line
= 10-6/2.5-1.5 = 4/1 =4 Ω
iii. V=IR, R=V/I, R= 10/1=10 Ω
OR
Iv. Current I = 5 A, R = 50 Ω,
Potential difference V = IR= 5× 50, V = 250 volts</td><td>1+1+2</td><td></td></tr>
</table>

Sample Question Paper - 2, 2023-24
Class X
Science (Subject Code – 086)

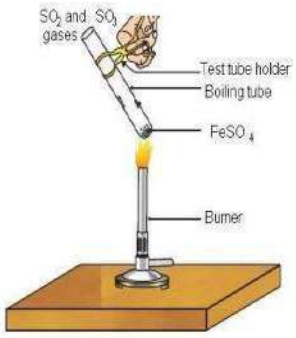
Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

i. *This question paper consists of 39 questions in 5 sections.*
ii. *All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.*
iii. *Section A consists of 20 objective type questions carrying 1 mark each.*
iv. *Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.*
v. *Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.*
vi. *Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.*
vii. *Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.*

Section-A

Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.

Q. Nos.	Questions	Marks
1	 Identify the effect of heating on the given chemical in the experiment; a) Combination reaction with no colour change. b) Decomposition reaction with reddish brown solid. c) Combination reaction with reddish brown solid. d) Decomposition reaction with no colour change.	1

2	Silver articles become black on prolonged exposure to air. This is due to the formation of a) $AgNO_3$ b) Ag_2O c) Ag_2S d) Ag_2S and Ag_3N	1
3	Lime water reacts with chlorine to give a) $CaOCl_2$ b) $NaHCO_3$ c) Na_2CO_3 d) $Na_2CO_3.10H_2O$	1
4	Generally metal react with acids to give salt and hydrogen gas. Which of the following acids do not give hydrogen gas on reacting with metals.(Except Mn and Mg) a) H_2SO_4 b) HCl c) HNO_3 d) H_2CO_3	1
5	Galvanisation is a method of protecting iron from rusting by coating with a thin layer of (a) Galium (b) Aluminium (c) Zinc (d) Silver	1
6	 When a china dish containing 2g of silver bromide is placed in sunlight as shown in the figure, the colour changes. What is its colour?	1

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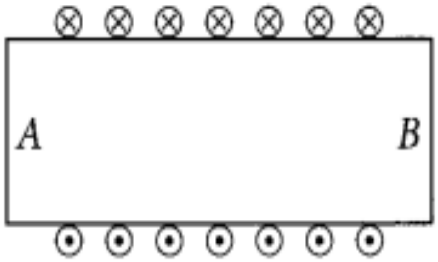
	a) Grey b) White c) Black d) Silver	
7	Na2CO3 is a salt produced by the combination of a) Strong acid and strong base b) Strong acid and weak base c) Weak acid and strong base d) Weak acid and weak base.	1
8	Which part of nephron allows the selective reabsorption of useful substances like glucose, amino acids, salts and water into the blood capillaries? (a) Tubule (b) Glomerulus (c) Bowman's capsule (d) Ureter	1
9	Main function of cerebrum is (a) thinking (b) hearing (c) memory (d) balancing	1
10	IUCD is for a) Vegetative propagation b) Contraception c) Increasing fertility d) Avoiding miscarriage	1
11	What does the progeny of a tall plant with round seeds and a short plant with wrinkled seeds look like? (a) All are tall with round seeds. (b) All are short with round seeds. (c) All are tall with wrinkled seeds. (d) All are short with wrinkled seeds.	1

12	Opening and closing of stomata depends on (a) Oxygen (b)Water in guard cells (c)Concentration of CO_2 in stomata (d)Temperature	1
13	Headlights of vehicles are coated with silver colour and of concave shape because… a) rays of reflected light should spread away b) rays of reflected light should get converges c) rays of light should diverges d) beam of reflected light should be parallel	1
14	The least distance of distinct vision is (a) 25cm (b) 35 cm (c) 30 cm (d) infinity	1
15	A food chain comprising birds, green plants, fish and man. The concentration of harmful chemical entering the food chain will be maximum in (a) green plants (b) man (c) birds (d) fish	1
16	Which of the following actions may not affect the environment in worse? a) Plastic bags buried inside the earth. b) Uses of cloth bags c) Excessive use of non-biodegradable pesticides. d) Burning of plastic bags.	1

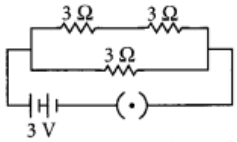
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, and R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
17	Assertion: Different metals have different reactivity's with water and dilute acids. Reason: Reactivity of a metal depends on its position in the reactivity series..	1
18	Assertion: In the testis, spermatogenesis occurs in the seminiferous tubules and testosterone secretion takes place from the interstitial cells. Reason: Testosterone brings growth and maturation of primany sex organs and also development of accessory sex characters.	1
19	Assertion: On changing the direction of flow of current through a straight conductor, the direction of a magnetic field around the conductor is reversed. Reason : The direction of the magnetic field around a conductor can be given in accordance with the left hand thumb rule.	1
20	Assertion: Polythene bags and plastic containers are non-biodegradable substances. Reason: They can be broken down by microorganisms into natural simple harmless substances.	1
	Section-B Question No. 21 to 26 are very short answer questions	
21	Write chemical name and the formula of the brown gas produced during thermal decomposition of lead nitrate. Support your response with proper equations.	2
22	What is tissue culture? Name any four types of ornamental plants which are produced by tissue culture technique.	2
23	How do desert plants perform photosynthesis if their stomata remain closed during the day? OR Explain the significance of photosynthesis. Write the balanced chemical equation involved in the process.	2
24	(a) With the help of labelled ray diagram show the path followed by a narrow beam of monochromatic light when it passes through a glass prism. (b) What would happen if this beam is replaced by a narrow beam of white light?	2

25	State how the magnetic field produced by a straight current carrying conductor at a point depends on (a) current through the conductor (b) distance of point from conductor OR Diagram shows the lengthwise section of a current carrying solenoid. ⊗ indicates current entering into the page, ⊙ indicates current emerging out of the page. Decide which end of the solenoid A or B, will behave as north pole. Give reason for your answer. Also draw field lines inside the solenoid.	2
		
26	a) Why do producers always occupy the first trophic level in every food chain? b) List two reasons to show that the existence of decomposers is essential in an ecosystem.	2
	Section-C Question No. 27 to 33 are short answer questions	
27	(i) By the transfer of electrons, illustrate the formation of bond in sodium chloride and identify the ions present in this compound. (ii) Ionic compounds are solids. Give reasons.	3

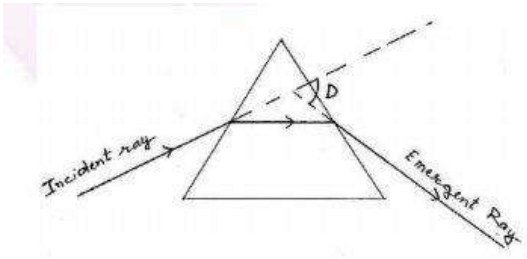
28	a) Reverse of the following chemical reaction is not possible: $Zn_{(s)} + CuSO_{4(aq)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$ Justify this statement with reason. b) What is meant by amphoteric oxides? Choose the amphoteric oxides from the following : Na_2O, ZnO, CO_2, Al_2O_3, H_2O *OR* State what would happen if: a) some zinc pieces are placed in blue copper sulphate solution. b) Some copper pieces are placed in green ferrous sulphate solution. c) An iron nail is dipped in a solution of copper sulphate for some time	3
29	What is synapse ? In a neuron cell how is an electrical impulse created and what is the role of synapse in this context ?	3
30	What happens when a mature Spirogyra filament attains considerable length? Justify your answer.	3
31	Write about power of accommodation of human eye. Explain why the image distance in the eye does not change when we change the distance of an object from the eye?	1+1+1
32	(i) Calculate the resistivity of the material of a wire of length 1 m, radius 0.01 cm and resistance 20 ohms. (ii) How is the resistivity of alloys compared with those of pure metals from which they may have been formed?	2+1
33	(a) Fuse acts like a watchman in an electric circuit. Justify this statement. (b) Mention the usual current rating of the fuse wire in the line to (i) lights and fans (ii) Appliances of 2 kW or more power.	2+1
Section-D Question No. 34 to 36 are long answer questions.		

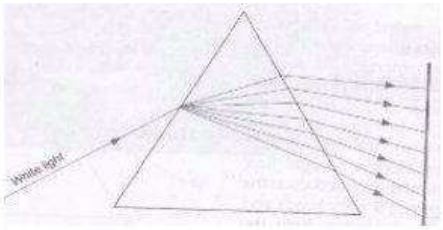
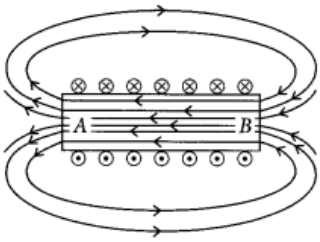
34	An organic compound A is widely used as a preservative in pickles and has a molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound B. (a) Identify the compound A. (b) Write the chemical equation for its reaction with ethanol to form compound B. (c) How can we get compound A back from B. (d) Name the process and write the corresponding chemical equation. (e) Which gas is produced when compound A reacts with washing soda? Write the chemical equation? OR (a) Why does carbon form largest number of compounds? (b) Why are some of these called saturated and other unsaturated compounds? (c) Which of these two is more reactive? (d) Write the names of the following compounds (i) CH_2-CH_2-Br (ii) $CH_3-CH-CH-CH-C\equiv C-H$	5
35	a) On cutting the body of an organism into many pieces, it was observed that many of these pieces developed as new individuals. Name the process and list two organisms in which this process may be observed. Draw a schematic diagram to illustrate the changes that are likely to be observed during the development of new individuals in any one of the organisms named. b) What is vegetative propagation? State two advantages and two disadvantages of this method.	5
	OR a) What is multiple fission? How does it occur in an organism? Explain briefly. Name one organism which exhibits this type of reproduction. b) (i) What is spore formation? (ii) List two advantages for organisms to reproduce themselves through spores.	3+2

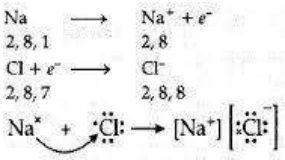
36	A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm? (a) Position of the image (b) Size of the image (c) Nature of the image (d) Draw a labelled ray diagram to justify your inferences. OR (a) Define focal length of a spherical lens. (b) A divergent lens has a focal length of 30 cm. At what distance should an object of height 5 cm from the optical centre of the lens be placed so that its image is formed 15 cm away from the lens? Find the size of the image also. (c) Draw a ray diagram to show the formation of image in the above situation	1+1+1+2 1+2+2
	SECTION - E Question No. 37 to 39 are case-based/data -based questions with 3 to 4 short sub-parts.	
37	Carbon and its compounds get easily oxidized when subjected to combustion. For example alcohol on oxidation is converted to carboxylic acid. The substances which can add oxygen to other compounds are known as oxidising agents. Some examples of oxidising agents include alkaline potassium permanganate and potassium dichromate. Carbon burns in the presence of oxygen and gets oxidized to carbon dioxide and carbon monoxide depending upon the availability of oxygen and the extent of reaction. Most compounds of carbon get oxidized when reacted with strong oxidizing agents. 3 mL of ethanol is taken in a test tube and warmed gently in a water bath. A 5% solution of alkaline potassium permanganate is added first drop by drop to this solution, then in excess. (i) How is the 5% solution of $KMnO_4$ prepared? (ii) State the role of alkaline potassium permanganate in this reaction. What happens when you add it in excess? (iii) Write the chemical equation of this reaction.	4

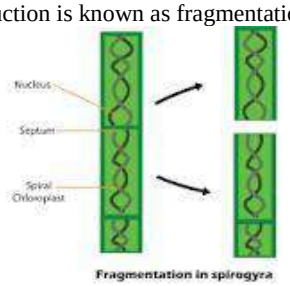
38	The cross that include the inheritance of two pairs of contrasting characters simultaneously is referred as dihybrid cross. Mendel chose pure breeding plants for yellow and green seeds and round and wrinkled shape of seeds. He cross pollinated the plant having yellow round seeds with plant having green wrinkled seeds. All the plants produced in F1 generation were having, yellow round seeds. The plants raised from these seeds were self pollinated, that resulted in production of plants having four phenotypically different types of seeds. (i) When a cross is made between a yellow round seeded plant (YyRr) and a yellow wrinkled seeded plant (Yyrr), what is true regarding the proportions of phenotypes of the offsprings in F1 generation? Proportion of yellow wrinkled seeds — Proportion of green wrinkled seeds (a) 3/8 — 1/8 (b) 2/8 — 1/8 (c) 1/8 — 3/8 (d) 2/8 — 2/8 (ii) How many types of gametes can be produced by YyRr? (a) 1 (b) 2 (c) 3 (d) 4 (iii) How did Mendels experiments show that different traits are inherited independently? Explain.	4
39	(a) Three resistors of 3 Ω each are connected to a battery of 3 V as shown. Calculate the current drawn from the battery.  (b) Draw a schematic diagram of a circuit consisting of a battery of 3 cells of 2 V each, a combination of three resistors of 10 Ω, 20 Ω and 30 Ω connected in parallel, a plug key and an ammeter, all connected in series. Use this circuit to find the value of the following : (a) Current through each resistor (b) Total current in the circuit (c) Total effective resistance of the circuit	1+3

Marking Scheme , SAMPLE PAPER - 2,(2023-24) Class-X Science (Subject Code – 086)		
Q. No.	Answer	Marks
Section–A		
1	b) Decomposition reaction with reddish brown solid.	1
2	c) Ag_2S	1
3	a) $CaOCl_2$	1
4	c) HNO_3	1
5	(c) Zinc	1
6	a) Grey	1
7	c) Weak acid and strong base	1
8	(a) Tubule	1
9	(a) thinking	1
10	b) Contraception	1
11	(a) All are tall with round seeds.	1
12	(b)Water in guard cells	1
13	d) beam of reflected light should be parallel	1
14	(a) 25cm	1
15	(b) man	1
16	b) Uses of cloth bags	1
17	a) Both A and R are true, and R is the correct explanation of A.	1
18	c) A is true but R is false.	1
19	c) A is true but R is false.	1
20	a) Both A and R are true, and R is the correct explanation of A	1

Section–B		
21	• Lead nitrate on heating undergo thermal decomposition reaction to form a yellow residue of lead oxide, brown fumes of nitrogen dioxide and oxygen. The reaction occurs as follows: • $2Pb(NO_3)_2$(s)Lead nitrateHeat$\square\square\rightarrow$2PbO(s)Lead oxide+4$NO_2$(g)Nitrogen dioxide+$O_2$(g)Oxygen.	2
22	(a) Tissue culture is the process of propagating new plants from a small piece of a plant's tissue, obtained from the growing tip of that plant in a suitable growth medium. (b) Orchids, Dahlia, Carnation and Chrysanthemum are propagated by the method of tissue culture.	2
23	In desert plants, the stomata is open during night. During night, desert plants absorb carbon dioxide and form an intermediate. Then during day time when the stomata is closed to prevent loss of water, they use this stored carbon dioxide to perform photosynthesis. OR Photosynthesis serves as a source of energy for all the living organisms and plants are the primary producers in any food chain. Through photosynthesis, plants also purify air by taking in carbon dioxide and giving out oxygen. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$	2
24	a) The path followed by a narrow beam of monochromatic light when it passes through a glass prism is shown in the diagram below,  Path of the ray Labelling	2

	(b)If this beam is replaced by a narrow beam of white light, it will split into spectrum of seven colours shown in the diagram below, ]	
25	**a) Current in the conductor**: The magnitude of the magnetic field produced is directly proportional to the current passing through the wire. **b) Distance from the wire**: The magnitude of the magnetic field produced is inversely proportional to the distance from the wire. **OR**  Using right hand thumb rube we can draw the magnetic field lines around the conductor as shown. From figure, end A of solenoid act as north pole and end B will act as south pole. Inside the solenoid field lines are in the form of parallel straight lines.	2
26	a) Every food chain starts with producers because only plants are capable of changing light energy into chemical energy, which is then used by both plants and other consumers. b) (i)Decomposers naturally replenish the nutrients in the soil, air and water. (ii)Decomposers help in keeping the environment clean. They play an important role in the cycling of materials in the biosphere.	2
Section–C		

27	i) Electrons are transferred from atoms of one element to atoms of another, resulting in positive and negative ions. Metals and non-metals are the only substances that participate in electrovalent bonding. NaCl and MgCl are formed by the transfer of electrons. In NaCl, sodium is the donor atom whereas chlorine is the acceptor atom.  ii) Ionic compounds are made up of oppositely charged ions which are held together by strong electrostatic force of attraction. Due to this reason, they are hard solids	3
28	a) Zn(s) +$CuSO_4$---> ZnSO +Cu. reverse of this reaction is not possible because in double displacement reaction a more reactive metal displace a less reactive metal. here Cu cannot displace Zn because Cu is less reactive than Zn. b) Metal oxides which react both with acids and bases to form salt and water are known as amphoteric oxides. Out of the given list, ZnO and $Al_2O_3Al_2O_3$ are amphoteric oxides. **OR** a) When zinc pieces are added to copper sulfate solution there is a loss of the blue color. b) When some copper pieces are placed in ferrous sulfate solution there is no change in color. Copper is less reactive as compared to iron and Zinc. c) When an iron nail is dipped in copper sulphate solution, a brown coating of copper is formed on the surface of iron and the colour of copper sulphate solution changes from blue to light green.	3
29	- Neuron is the structural and functional unit of nervous system. Information in a neuron travels in the form of electrial impulses. Dendrite in a neuron acquires information. This information travels in the form of electrical impulse through the axon to reach the nerve ending. At the nerve ending, it is converted to a chemical signal. This chemical crosses a gap called synapse and reaches the next neuron generating an electrical impulse there.	3

30	When a mature spirogyra filament reaches a considerable length then mature spirogyra splits into two or more fragments. Then these fragments develop into an entire organism. This process of asexual reproduction is known as fragmentation.  Fragmentation in spirogyra	3
31	The ability of the eye lens to adjust its focal length is called power of accommodation. The ciliary musqles modifies the curvature to some extent. The change in the curvature of the eye lens can thus change its focal length. Thus, the focal length of the human lens increases or decreases depending on the distance of the object value to this distance of the image does not change. For example, when the ciliary muscles are relaxed, the lens becomes thin and its focal length increases, thus enables us to see distant object clearly.	3
32	i) As we know, $R = \rho L/A$ $r = 0.01\ cm = 1\times10^{-4}\ m$ $A = \pi r^2 = 3.14\times(1\times10^{-4})m^2 = 3.14\times10^{-8}\ m^2$ now, $\rho = RA/L$ $=(20\times3.14\times10^{-8})/1$ $=6.28\times10^{-7}$ ohm-m ii) Alloys have higher resistivity than their constituent metals because of the following reasons: Alloys have high melting and boiling points. Alloys do not get oxidized easily. In alloys, higher resistivity is caused by the additional scattering of electrons	3
33	a) A fuse is an electrical safety device that has the capability to protect an electric circuit from excessive electric current. It is designed to allow current through the circuit, but in the event that the current exceeds some maximum value it will open, severing the circuit. An important component of an electrical fuse is a metal wire or strip that melts when excess current flows through it. b) i) 5A is the usual current rating of the fuse wire in the line to feed lights and fans. ii) 15A is the usual current rating of the fuse wire in the line to feed appliances of 2kW or more power.	3

Section–D

34 a) (i) An organic compound A widely used as a preservative in a pickle with the molecular formula, $C_2H_4O_2$ must be an ethanoic acid (CH_3COOH). 5

(ii) When ethanoic acid(A) reacts with ethanol it produces sweet-smelling compound i.e. an ester.
$CH_3COOH+CH_3CH_2OH \rightarrow CH_3COOCH_2CH_3+H_2O$
Hence, the compound B will be ethyl ethanoate.

(iii) We can get ethanoic acid from ethyl ethanoate by hydrolysis in either acidic or basic medium.
$CH_3COOCH_2CH_3+H_2O \rightarrow H+CH_3COOH+CH_3CH_2OHCH_3COOC_2H_5+NaOH \rightarrow CH_3COONa+C_2H_5OH$

(iv) The hydrolysis of ester in the presence of base is generally known as saponification.
$CH_3COOC_2H_5+NaOH \rightarrow CH_3COONa+C_2H_5OH$

(v) When compound A is treated with washing soda brisk effervescence of carbon dioxide is observed.
$2CH_3COOH+Na_2CO_3 \rightarrow 2CH_3COONa+CO_2+H_2O$

OR

(a) Carbon forms the largest number of compounds because of its two properties -

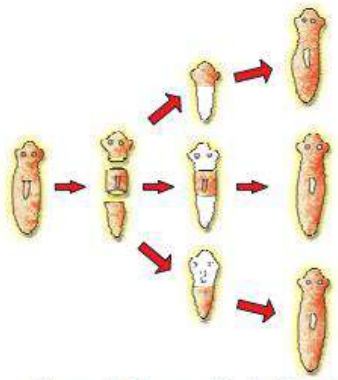
1. Catenation – This is the property of carbon atoms to form bonds with other carbon atoms.
2. Tetravalency – A carbon atom forms four covalent bonds. Moreover, it can form stable single, double and triple bonds with a lot of elements.

(b) Molecules having a single bond are known as a saturated hydrocarbons, for example - alkanes.

Molecules having a double or triple bond are known as an unsaturated hydrocarbon, for example - alkenes and alkynes.

(c) Unsaturated hydrocarbons are more reactive than saturated hydrocarbons. Unsaturated hydrocarbons have double or triple bonds which are weaker compared to the single bonds of saturated hydrocarbons. These double and triple bonds act as reactive sites where addition reactions can occur easily.

(d) (i) Bromoethane

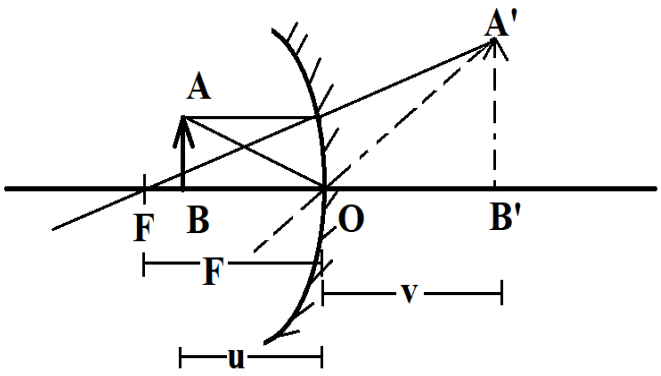
	(ii) Hexyne	
35	a) Regeneration is described as the method of developing a complete organism from its body part. The examples of regeneration are like Hydra and Planaria. When the body structure of Planaria is reduced into a number of pieces, each body part can regenerate and effects in formation of a whole Planaria.  **Figure 8.3** *Regeneration in Planaria* b) Vegetative propagation is a mode of asexual reproduction in which new plants are obtained from vegetative parts of the plants such as shoots or stem for the propagation of new plants. Two advantages of vegetative propagation are : (i) Plants which do not produce seeds are propagated by this method. (ii) Vegetative propagation is a cheaper, easier and rapid method of propagation in plants than growing plants from their seeds. Plants grow very slowly and take 4 to 7 years to develop flowers when grown with their seeds. Two disadvantages of vegetative propagation are :	5

	(i) As there is no genetic variation, there is no chance of development of new and better varieties. (ii) The vegetatively propagated plants are more prone to diseases that are specific to the species.	
	a) Multiple fission is the process of asexual reproduction in which instead of 2 daughter cells, many daughter cells are produced from the parent cell. In this, the nucleus undergoes repeated division to produce a large number of nuclei. Each nucleus along with little bit of cytoplasm forms a membrane around it. All the daughter cells are equal sized and are similar. Plasmodium. b) (i) Spore Formation is an Asexual Reproduction technique. Many Spores are housed in sacs known as Sporangia. The plants produce hundreds of spores and the spore sac bursts. These spores are dispersed into the air, where they germinate and create a new plant under favorable conditions. (ii) As spores are composed of thick walls, hence can easily sustain harsh conditions and prevent dehydration of cells. Reproduction via spore formation is quick, and many organisms germinate at once, hence this leads to a substantial increase and survival of species population.	
36	a) For solving the above given question, we will be using the mirror formula, i.e., $1/f=1/v+1/u$ Before we start solving the question, let us take a look at all the given parameters f = -15 cm Negative sign as the mirror is a concave mirror u = -10 cm Now, for the Part A By using the mirror formula $1/f=1/v+1/u$ By using the given values $\Rightarrow 1/-15=1/v+1/-10$ $\Rightarrow 1/v=1/10 - 1/15$ $\Rightarrow 1/v=1/30$ b) Now, By using the formula for the magnification of the image We have $m=v/u$ $\Rightarrow m=30/10$ $\Rightarrow m=3$	5

So, the image will be highly magnified in size.

c) The image will be Virtual and Erect in nature as v is positive

d) Diagram;



OR

a) Focal length of a spherical lens is the distance between optical centre and focus of the lens. The Focal length of a lens is half of its radius of curvature.

b) Given: Focal length f=− 30cm

Distance of the image from the lens v=− 15cm

Height of the object is h1=5cm

We will write the lens formula to find the distance of the object from the lens.

1/u=1/v− 1/f

Here u is the distance of the image from the optical centre.

Substitute f= − 30cm and v= − 15cm to find the value of u

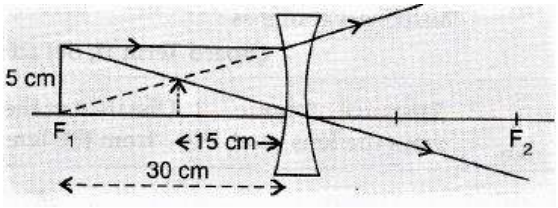
1/u=1/− 15− 1/− 30

u= − 30cm

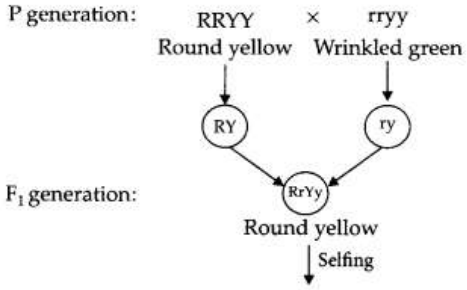
We know that magnification is given by:

m= v/u= h2/h1

v/u=h2/h1

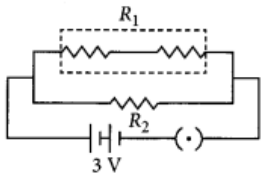
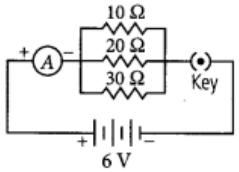
	Substitute, v=− 15cm, u=− 30cm and h1=5cm to find the value of h2 − 15cm/− 30cm = h2/5cm h2=2.5cm Therefore, the object should be placed 30 cm from the optical centre and the size of the image formed is 2.5 cm.  	
	Section–E	
37	i) Preparation of 5% Potassium permanganate : 5% solution of$KMnO_4$ is prepared by dissolving 5 grams of $KMnO_4$in 100ml of water. ii) Role of alkaline potassium permanganate • Alkaline potassium permanganate is adding oxygen to alcohol and converts it to acid. • Hence, it acts as an oxidizing agent. • When $KMnO_4$ is added, initially color disappears because colored permanganate ions of potassium permanganate are consumed to oxidize ethanol. • When an excess of $KMnO_4$ is added, color does not change because there is no more alcohol left for the reaction. iii) Chemical equation of the above reaction : the reaction is given below , $C_2H_5OH(Ethanol) \rightarrow alk KMnO_4 + heat CH_3COOH(Ethanoic\ acid)$	4

38	i) a) cross between YyRr and Yyrr plants the proportion of : Yellow wrinkled seeds (Yy rr or YYrr) is =3/8 And green wrinkled seeds (yyrr) is =1/8 ii) (d) he F1 dihybrid seeds are yellow and round, with a genotype of YyRr. The F1 plants can produce four different types of gametes: YR, Yr, yR, and yr. iii) In a dihybrid cross given by Mendel, it was observed that when two pairs of traits or characters were considered, each trait expressed independent of the other. Thus, Mendel was able to propose the Law of Independent Assortment which says about independent inheritance of traits. This could be explained clearly from the given cross:	4



	RY	Ry	rY	ry
RY	RRYY Round yellow	RRYy Round yellow	RrYY Round yellow	RrYy Round yellow
Ry	RRYy Round yellow	RRyy Round green	RrYy Round yellow	Rryy Round green
rY	RrYY Round yellow	RrYy Round yellow	rrYY Wrinkled yellow	rrYy Wrinkled yellow
ry	RrYy Round yellow	Rryy Round green	rrYy Wrinkled yellow	rryy Wrinkled green

F2 generation ratio : Round-yellow = 9 : Round- green = 3: Wrinkled-yellow = 3: Wrinkled-green = 1

39	(a) As given in circuit diagram, two 3 Ω resistors are connected in series to form R_1; so R_1 = 3 Ω + 3 Ω = 6 Ω And, R_1 and R_2 are in parallel combination, Hence, equivalent resistance of circuit (R_{eq}) given by $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$ $\therefore \quad \frac{1}{R_{eq}} = \frac{1}{6} + \frac{1}{3} = \frac{1+2}{6} = \frac{3}{6} = \frac{1}{2}$  R_{eq} = 2 Ω Using Ohm's law, V = IR We get, 3 V = I × 2 Ω or I = 32 A = 1.5 A Current drawn from the battery is 1.5 A. (b) The circuit diagram is as shown below.  (a) Given, voltage of the battery = 2V + 2V + 2V = 6 V Current through 10 Ω resistance, I_{10} = V/R=6/10 = 0.6 A Current through 20 Ω resistance, I_{20} = V/R=6/20 = 0.3 A Current through 30 Ω resistance, I_{30} = V/R=6/30 = 0.2 A (b) Total current in the circuit, 1= I_{10} + I_{20} + I_{30} = 0.6 + 0.3 + 0.2 = 1.1 A (c) Total resistance of the circuit, 1/RP=1/10+1/20+1/30=11/60	4

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KENDRIYA VIDYALAYA SANGATHAN
ERNAKULAM REGION
CLASS :X SCIENCE
SAMPLE PAPER-3 (2023-24)
(Subject Code – 086)

Max. Marks: 80 **Time Allowed: 3 hours**

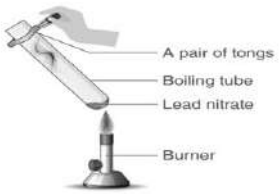
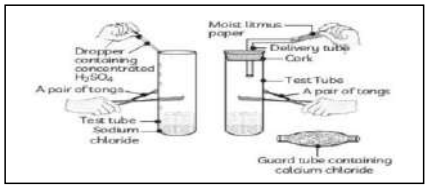
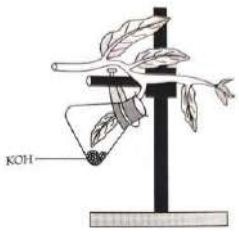
General Instructions:

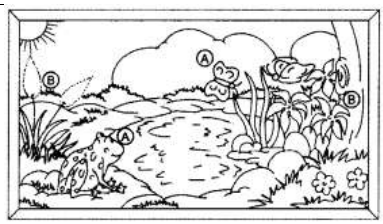
viii. This question paper consists of 39 questions in 5 sections.
ix. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
x. Section A consists of 20 objective type questions carrying 1 mark each.
xi. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
xii. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
xiii. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
xiv. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts

SECTION- A

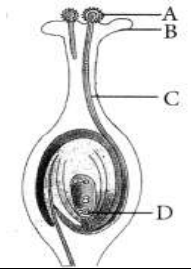
Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for incorrect response.

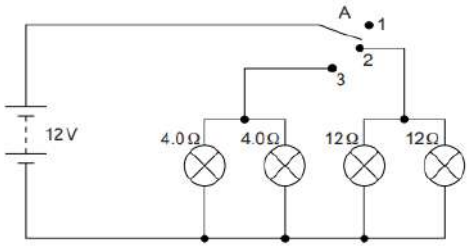
Q No	QUESTIONS	MARKS
1.	$Pb + CuCl_2 \rightarrow PbCl_2 + Cu$ The above reaction is an example of (a) Combination (b) Double displacement (c) Decomposition (d) Displacement	1
2.	The condition produced by aerial oxidation of fats and oils in foods marked by unpleasant smell and taste is called: (a) Anti oxidation (b) Reduction (c) Rancidity (d) Corrosion	1
3.	Plaster of Paris is prepared by heating one of the following to a temperature of 100°C. This is: (a) $CaSO_3.2H_2O$ (b) $CaCl_2.2H_2O$ (c) $CaCO_3.2H_2O1$ (d) $CaSO_4.2H_2O$	1
4.	Name the products formed when iron filings are heated with dilute hydrochloric acid (a) Fe (III) chloride and water (b) Fe (II) chloride and water (c) Fe (II) chloride and hydrogen gas (d) Fe (III) chloride and hydrogen gas	1
5.	Aluminium is extracted from _____ore. a) Limestone b) Carnallite c) Bauxite d) Calamine	1

6.	Carefully observe the activity shown below and identify the type of the reaction. (a) Combination (b) Double displacement (c) Thermal decomposition (d) Displacement  	1
7.	The change in colour of the moist litmus paper in the given setup is due to i. Presence of acid ii. Presence of base iii. Presence of H^+(aq) in the solution iv. Presence of Litmus which acts as an indicator  (a) i and ii (b) Only ii (c) Only iii (d) Only iv	1
8.	This is the chief principle of Dialysis (a) Capillary action (b) Adhesion (c) Reverse – osmosis (d) Cohesion	1
9.	Posture and balance of the body is controlled by (a) Pons (b) Medulla oblongata (c) Cerebellum (d) Cerebrum	1
10.	When the foetus is growing inside the uterus it needs nutrients. Which part provides these nutrients? (a) Placenta (b) Amniotic sac (c) Oviduct (d) Uterus	1
11.	If you cross homozygous recessive short plant with heterozygous purple flower to heterozygous tall plant with heterozygous purple flower, what will be the expected phenotypic ratio? a) 9:3:3:1 b) 4:4:2:2 c) 3:1:3:1 d) 1:2:1:2:4:2:1:2:1	1
12.	A twig of a plant was kept inside a flask as shown in the diagram and it was kept in sunlight for few hours What is the aim of the experiment given below? a) To prove the $CO_2$is necessary for photosynthesis b) Sunlight is necessary for photosynthesis c) Chlorophyll is necessary for photosynthesis. d) To show that O2was used up by the inside leaf part.  	1
13.	Which of the following" LAWS OF REFLECTION" is correct? (a) The angle of incidence (i) is equal to the angle of reflection (r) (b) The incident ray, the normal ray and the reflected ray, all lie in the same plane. (c) Both are correct (d) None of these	1
14.	The power of a concave lens is 10 D and that of a convex lens is 6 D. When these two lenses are placed in contact with each other, the power of their combination will be : (a) +16 D (b) +4 D (c) −16 D (d) −4 D	1

15.	An ecosystem is represented in the figure given below. This ecosystem will be self- sustaining if a) The type of organisms represented by B are eliminated. (b) Materials cycle between the organisms labelled A and the organisms labelled B.  (c) The organisms labelled A outnumber the organisms labelled B. (d) The organisms labelled A are equal in number to the organisms labelled B.	1
16.	Which of the following statement regarding recycling is wrong? a) Saves precious resources b) Require stable market c) Improves efficiency of treatment processes d) Increases the need for mining virgin materials	1
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, and R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
17.	**Assertion**: Silver bromide decomposition is used in black and white photography. **Reason**: Light provides energy for this exothermic reaction	1
18.	**Assertion:** Female produces two types of gametes. **Reason**: Female has two X chromosomes.	1
19.	**Assertion**: On freely suspending a current – carrying solenoid, it comes to rest in Geographical N-S direction. **Reason**: One end of current carrying straight solenoid behaves as a North pole and the other end as a South pole, just like a bar magnet	1
20.	**Assertion:** Polythene bags and plastic containers are non-biodegradable substances. **Reason:** They can be broken down by microorganisms in natural simple harmless substances.	1
	SECTION -B **Question No. 21 to 26 are very short answer questions**	
21.	Ferrous sulphate decomposes with the evolution of a gas having a characteristic dour of burning sulphur. Write the chemical reaction involved and identify the type of reaction	2
22.	Define the term pollination. Differentiate between self-pollination and cross-pollination. What is the significance of pollination?	2
23.	Explain with the help of neat and well labelled diagrams the different steps involved in nutrition in Amoeba. OR Explain with the help of neat and well labelled diagrams the different steps involved in nutrition in paramecium	2
24.	How can we obtain a rainbow using a prism?	2
25.	Draw magnetic field lines around a bar magnet. Name the device which is used to draw magnetic field lines. OR What are magnetic field lines? List three characteristics of these lines.	2

26.	In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes? Plants → Rats → Snakes → Hawks	2
	SECTION -C **Question No. 27 to 33 are short answer questions**	
27.	What is the ionic bond formation of magnesium chloride?	3
28.	Mention the steps involved in extraction of metals from ores.	3
29.	i. Draw a neat diagram of the human brain and label the medulla and cerebellum. ii. Write the functions of the above-mentioned parts. OR Draw a well-labelled diagram of a reflex arc and show the direction of the flow of electrical signals	3
30.	Explain the process of regeneration in Planaria with diagram. How is this process different from reproduction?	3
31.	A student is unable to see clearly the words written on the black board placed at a distance of approximately 3 m from him. a) Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.	3
32.	The resistance of an electric wire of an alloy is 10 Ω. If the thickness of wire is 0.001 meter, and length is 1 m, find its resistivity.	3
33.	i) Three resistors of 10 Ω, 15 Ω and 5 Ω are connected in parallel. Find their equivalent resistance. ii) In case the above said resistors are connected in series, find their equivalent resistance.	3
	SECTION -D **Question No. 34 to 36 are long answer questions.**	
34.	a) Compound 'P' on heating with excess con. H_2SO_4 forms another carbon compound 'Q' which in addition to hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of 'R' oncombustionformstwomoleculesofcarbondioxideandthreemolecu lesofwater. Identify P, Q and R and write chemical equations for the reactions involved. b) Writethemolecularformulaofthe2ndmemberofthehomologousserie swhosefirst member is ethene. OR a) Draw electron dot structure of carbon compound having molecular formula $C_2H_4O_2$ and reacts with sodium metal and produces hydrogen gas. b) Soapsareeffectiveinsoftwaterbutdetergentsworkinbothhardandsoft water.Givereason. c) What happens when hydrogen gas passes through ethane gas in the presence of nickel? The write equation involves and industrial application of this chemical reaction?	5

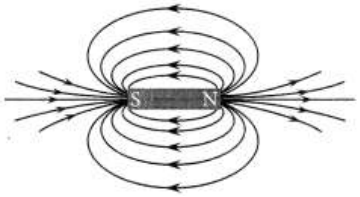
<table>
<tr><td>35.</td><td>a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.
b) (i) Name the part marked A in the diagram.
(ii) How does A reaches part B?
(iii) State the importance of the part C.
(iv) What happens to the part marked D after fertilization is over?
 
</td><td>5</td></tr>
<tr><td>36.</td><td>Draw ray diagrams to show the formation of three times magnified (a) real, and (b) virtual image of an object by a converging lens. Mark the positions of O, F and 2F in each diagram.</td><td>5</td></tr>
<tr><td colspan="3">SECTION -E
Question No. 37 to 39 are case-based/data -based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts</td></tr>
<tr><td>37</td><td>Ethanoic acid is commonly called acetic acid and belongs to a group of acids called carboxylic acids. 5-8% solution of acetic acid in water is called vinegar and is used widely as a preservative in pickles. The melting point of ethanoic acid is16.6°C, so its often freezes during winter. Hence, gave rise to new name called as glacial acetic acid.
Observe the table of boiling points of alcohols and carboxylic acids. Study this table and answer the questions related to studied concepts
<table><tr><td>COMPOUNDS</td><td>BOILING POINTS</td></tr><tr><td>1. Methanol</td><td>64°C</td></tr><tr><td>2.Ethanol</td><td>78.37 °C</td></tr><tr><td>3.Propanol</td><td>97°C</td></tr><tr><td>4.Butanol</td><td>117°C</td></tr><tr><td>5.Methanoic acid</td><td>101°C</td></tr><tr><td>6.Ethanoic acid</td><td>16.6°C</td></tr><tr><td>7.Propanoic acid</td><td>141°C</td></tr><tr><td>8.Acetic acid</td><td>16.6°C</td></tr></table>i. Why do ethanol have higher boiling points than methanol?
ii. What is vinegar?
iii. Why ethanoic acid is called glacial acetic acid?
OR
What is the difference between vinegar and glacial acetic acid?</td><td>1
1
2</td></tr>
<tr><td>38.</td><td>In a dihybrid cross two traits of an organism are considered. In F1 generation only the Dominant traits are expressed. A plant has round and green seeds (RRyy) and another parent has Wrinkled and yellow seeds (rrYY). The F1 generation all plants have round and yellow seeds.F2</td><td></td></tr>
</table>

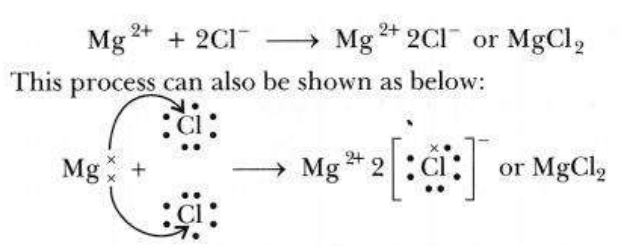
	Generation is produced by self-pollination of F1plants.ButinF2generation9/16haveRoundandyellowseeds,3/16haveroundandgreenseeds,3/16havewrinkledandyellowSeed.1/16haswrinkledandgreenseed. a) Why the round and yellow seeds (9/16) are more in F2generation? b) Write the genotypic ratio of gametes formed by the F1 Plants. c) In parent generation the round shape is linked with green colour. Is it necessary that round shape remain linked with green only in offspring? If No, Why? OR If a total of 1200 plants are obtained, F2generationin dihybrid cross. How many of them are the new combinations (recombinants)?	1 1 2
39.	Vinita and Ahmed demonstrated a circuit that operates the two headlights and the two the two sidelights of a car, in their school exhibition. Based on their demonstrated circuit, answer the following questions. (i)State what happens when switch A is connected to a) Position 2 b) Position 3 (ii) Find the potential difference across each lamp when lit. (iii) Calculate the current *a)* In each 12 Ω lamp when lit. *b)* In each 4 Ω lamp when lit. OR Show, with calculations, which type of lamp, 4.0 Ω or 12 Ω, has the higher power. 	1 1 2

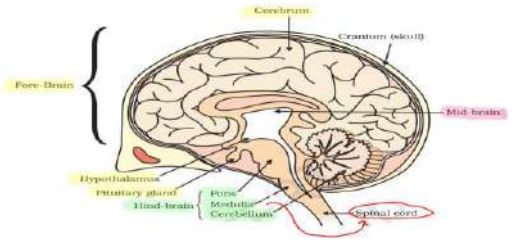
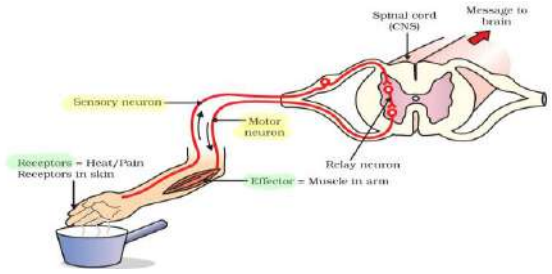
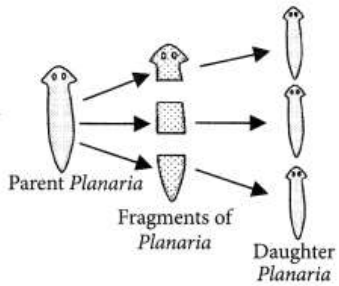
KENDRIYA VIDYALAYA SANGATHAN
ERNAKULAM REGION
CLASS :X SCIENCE
SAMPLE PAPER-3 (2023-24)
MARKING SCHEME
(Subject Code – 086)

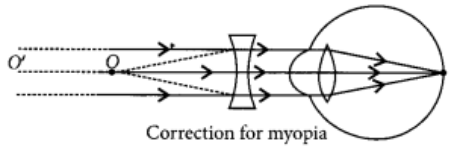
SECTION- A

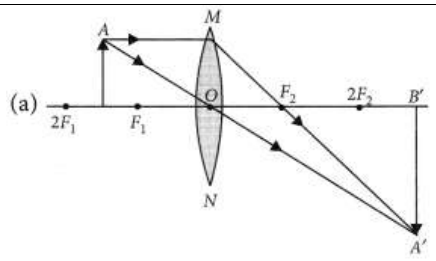
Q.Nos	Answers	Marks	
1	(d) displacement	1	
2	(c) Rancidity	1	
3	(d) CaSO4.2H2O	1	
4	(d) Fe (III) chloride and hydrogen gas	1	
5	c) Bauxite	1	
6	(c) Thermal decomposition	1	
7	(c) Only iii	1	
8	(c) Reverse – osmosis	1	
9	c) Cerebellum	1	
10	(a) Placenta	1	
11	c) 3:1:3:1	1	
12	To prove the $CO_2$is necessary for photosynthesis	1	
13	(c) Both are correct	1	
14	(a) -4 D	1	
15	(b) Materials cycle between the organisms labelled A and the organisms labelled B.	1	
16	d) Increases the need for mining virgin materials	1	
17	(c) A is true but R is false		
18	(d) A is false but R is true	1	
19	(a) Both A and R are true and R is the correct explanation of A	1	
20	c) A is true but R is false	1	
	SECTION -B		
21	$FeSO_4$ (s) + Heat → Fe_2O_3 (s) + SO_2 (g) + SO_3 (g) It is a thermal decomposition reaction.	1 1	2
22	The process of transfer of pollen grains from anther of a flower to the stigma of the same flower or another flower of the same species is known as pollination. The two inodes of pollination are self pollination and cross pollination. Differences between self pollination and cross pollination are as follows: Self-pollination occurs when the pollen of the anther, or another flower of the same species, is deposited on the stigma of the same	1 1	2

	flower. Cross-pollination is the movement of pollen from one flower's anther to another flower's stigma to another of the same species' separate individuals.		
23	The mode of nutrition in Amoeba is holozoic. The process obtaining food by Amoeba is called phagocytosis. Picture with labelling 1. Amoeba ingests food by using its finger-like projections called pseudopodia. 2. The food is engulfed with a little surrounding water to form a food vacuole inside the Amoeba. The food is digested inside food vacuole by digestive enzymes. 3. Food is absorbed directly into the cytoplasm of Amoeba by diffusion. 4. Food is used to obtain energy and growth of Amoeba. 5. When considerable amount of undigested food collects inside Amoeba then its cell membrane ruptures at any place to throw out this undigested food. OR The mode of nutrition in Paramecium is holozoic, which is a category of the heterotrophic mode of nutrition. It mostly engulfs other microorganisms from its surrounding environment.	1 1	2
24	Yes we can obtain a rainbow using a prism. When the white light moves through the two faces of the prism, it produces different colours of light that bend at different angles like a rainbow		2
25	 Compass needle is used to draw magnetic field lines OR Magnetic field lines: These are the imaginary close curves which are used to represent the magnetic field around the magnet. The properties of the magnetic field lines are listed below: • Magnetic field lines start at the North Pole and end at the South Pole. • Magnetic field lines do not intersect each other, because there cannot be two directions of the magnetic field at any one point. • The degree of closeness of the field lines depends upon the strength of the magnetic field. Stronger	1 1	2

26	In an ecosystem, only 10% of energy is transferred from one trophic level to next, i.e. 10 percent law and rest is dissipated into the environment. Therefore, if plants (being producers-1st trophic level)-transfer 500 J of energy to rats (2nd trophic level) then rats would transfer 50 J of energy to snakes (3rd trophic level) which in turn will transfer only 5 J of energy to hawks (4th or last trophic level) in a food chain. Plants → Rats → Snakes → Hawks 5000 J 500 J 50 J 5 J	1 1	2
	SECTION -C		
27	• Magnesium chloride is formed when oppositely charged magnesium and chloride ions attract each other, so the product so formed is MgCl2. • The formation of Magnesium chloride MgCl2 is shown below:  	1 2	3
28	Metallurgy is the process in which the extraction of the metals is done to obtain the crude metal from their ores is defined as metallurgy. The three steps involved in the process of metallurgy are: 1. Crushing or grinding of the ore into smaller pieces. 2. Concentration of the or ORE DRESSING or ENRICHMENT OF THE ORE(gangue- to remove the earthly impurities) 3. Converting into oxides by roasting(sulphide ores in presence of o2and calcinations of the carbonate ores in limited amount of o2) 4. Reduction of metal oxides into metals 5. Refining with the help of ELECTROLYTIC REFINING	½ x6	3

	6. Then your PURE METAL is obtained.		
29.	 OR  Sense Organ -----(Sensory neuron)→ Spinal Cord (CNS) ---- (Motor neuron)→ Effector (Muscle in arm)		3
30.	Planaria possesses great power of regeneration. If the body of Planaria somehow gets cut into a number of pieces, then each body piece can regenerate into a complete Planaria by growing all the missing parts. This is shown in following figure: 	1 1 1	3

31.	Student is suffering from myopia. The two possible reasons due to which the defect of vision arises are: excessive curvature of the eye lens and elongation of the eye ball. A student with myopia has the far point nearer than infinity, thus, the image of a distant object is formed in front of the retina. Image  Correction for myopia of a distant ob ject is formed in front of the retina.	1 1 1	3
32.	Given, Resistance (R) = 10 Ω, Length (l) = 1 m Diameter = 0.001 m Therefore, radius = 0.0005 m Resistivity (ρ) =? Now, area of cross section of wire =πr2 Or, A=3.14×(0.005)2m2=3.14×(0.005)22 Or, A = 0.00007850 m^2 We know that ρ=RAl Or, ρ=10Ω×0.0000785m21mρ=10Ω×0.000078521 =10Ω×0.0000785 m=10Ω×0.0000785 =0.000785 Ωm=0.000785 Ω =7.85×10−4Ωm	1 1 1	3
33.	$\frac{1}{R_{eq}}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$ So, $\frac{1}{R_{eq}}=\frac{1}{10}+\frac{1}{15}+\frac{1}{5}$ $\frac{1}{R_{eq}}=\frac{3+2+6}{30}=\frac{11}{30}$ $\therefore \quad R_{eq}=\frac{30}{11}\Omega=2.73\,\Omega$	1 1 1	3
	SECTION -D		
34.	a)P-Ethanol Q- Ethene R- Ethane Correct chemical reactions	2 1 1 1	5

	b)C_3H_6 OR a) Dot structure of ethanoic acid b) Soaps forms scum with hard water but detergents form soluble complexes with hard water c)It forms ethane and equation to form vegetable ghee .		
35.	a) Variations arise in sexually reproducing organisms on account of the following: (i) Genetic variations occur of because DNA copying mechanism is not absolutely accurate. (ii) Creation of new combinations of genetic variations because variations from two individuals combine during fusion of gametes. (b) (i) A is pollen grain. (ii) Part B is stigma. It is the part of pistil (female reproductive organ) that receives pollen grains. Pollen grains reach stigma through various agencies like wind, water, insect, etc. (iii) Pollen tube (C) carries male gametes to the ovule present in ovary. Male gametes fuse with egg and secondary nucleus to give rise to zygote and endosperm. (iv) Female gamete (D) fuses with male gamete and converts to embryo after fertilisation.	1 1 1 1 1	5
36.	 (b) Ray diagrams of an object placed between F_1 and optical centre O of lens can be drawn as follows: (i) The image formed is virtual and erect. (ii) Image is formed in front of the lens. (iii) Image formed is enlarged.	2 3	5
	SECTION- E		
37.	i.As the number of carbons increases, boiling point of alcohol increases.This force increases as the length of the hydrocarbon chain increases. Hence ethanol possesses a higher boiling point than methanol.	1 1 2 2	4

	ii. 5-8% solution of acetic acid in water is called vinegar iii. The melting point of pure ethanoic acid is 16.6°C and hence it often freezes in cold climates and forms a colourless, ice-like liquid. This property has given it the name glacial acetic acid. OR Vinegar: It is a liquid essentially consisting of acetic acid and water. It contains 4 to 6% acetic acid. Glacial acidic acid is pure acetic acid.		
38.	a) Dominant trait more efficiency for expression b) Genotypic ratio -1:2:1 c) No. Due to Independent assortment new recombinants are formed OR 450 as the ratio 9:3:3:1	1 1 2	4
39.	i) 12 Ω lamps (only) on. (a) 4 Ω lamps (only) on [0.5+0.5] (ii) 12 V for both sets of lamps and all of them are in parallel. [1] (iii) 12 Ω lamps are on when the wire is connected to position 2. Voltage across both 12 Ω lamps = 12 V. V=IR (Ohm's law). $I = \frac{V}{R} = \frac{12}{12}$ = 1A. [1] 4 Ω lamps are on when the wire is connected to position 3. Voltage across both 4 Ω lamps = 12 V. V=IR (Ohm's law). $I = \frac{V}{R} = \frac{12}{4}$ = 3A. [1] **OR** $P = V_2/R$ All lamps are in parallel and hence same V for all lamps. For 4 Ω lamps → $P = \frac{12 \times 12}{4} = 36\ W$ For 12 Ω lamps → $P = \frac{12 \times 12}{12} = 12\ W$ Hence 4 Ω lamps will have higher power.	1 1 2	4

Sample Question Paper-4 2023-24

Class X Science (Subject Code – 086)

Max. Marks: 80 **Time Allowed: 3 hours**

General Instructions:

This question paper consists of 39 questions in 5 sections.

i. *All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.*

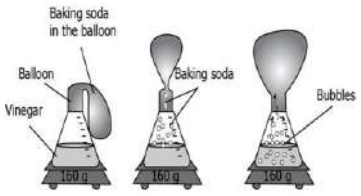
ii. *Section A consists of 20 objective type questions carrying 1 mark each.*

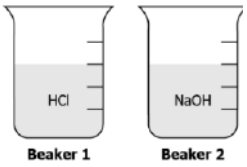
iii. *Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.*

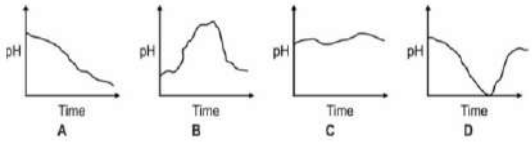
iv. *Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.*

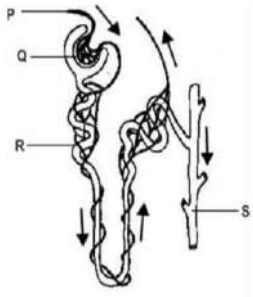
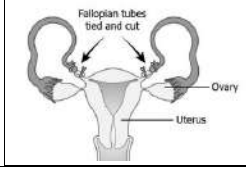
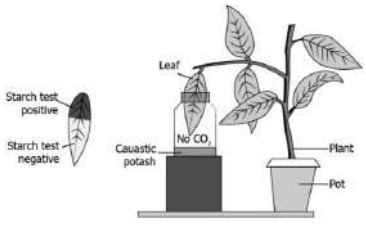
v. *Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.*

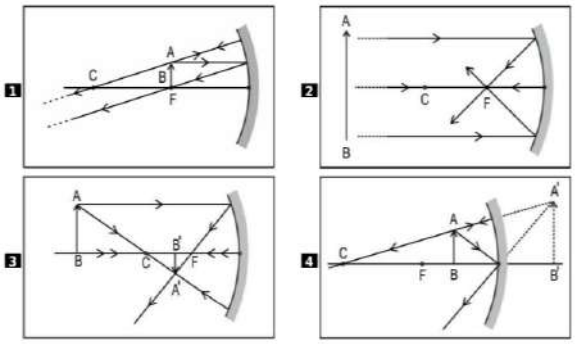
vi. *Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts*

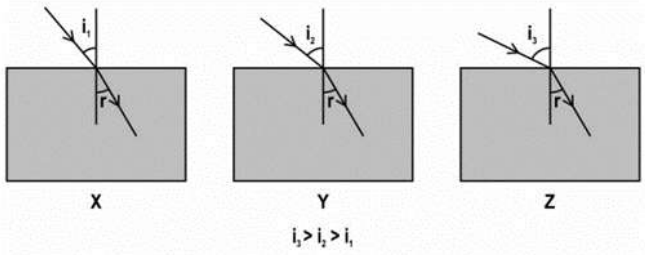
Q.Nos	Questions	Marks
1	A student adds lead and silver to two different test tubes containing an equal amount of copper sulphate solution. The student observes that the color of the solution in the test tube with lead changes. What explains the change in the colour of the solution? (a) A displacement reaction takes place as lead replaces copper from the solution. (b) A combination reaction takes place as lead combines with sulphate in the solution. (c) decomposition reaction takes place as copper dissociates from sulphate in the solution. (d) A double displacement reaction takes place as copper dissociates from sulphate and lead combines with sulphate in the solution.	1
2	A student poured 100 mL of water in a bottle and added 40 mL vinegar to it. A balloon was filled with 20 g baking soda and was fixed at the mouth of the bottle. Slowly the shape of the balloon changed, as shown. The student claims that a chemical change happened when the two substances were mixed. Is the claim made by the student correct? (a) Yes, as a new substance was formed in the form of a gas. (b) Yes, as the mass remains the same throughout the experiment. (c) No, as the formation of bubbles in the mixture shows a physical change. (d) No, as the change in the shape and size of the balloon shows a physical change 	1
3	Litmus , Methyl orange and phenolphthalein are acid – base indicators giving characteristic colours. Which one of the following can be used as an acid–base indicator by a visually impaired student? (a) Hibiscus (b) Turmeric (c) Vanilla essence (d) Petunia leaves	1

<table>
<tr><td>4</td><td>Red litmus solution changed to blue when an aqueous solution is added . Excess addition of which of the following solution would reverse the change?
(a) Baking soda (b) Soda ash (c) Caustic soda (d) Sulphuric acid acid</td><td>1</td></tr>
<tr><td>5</td><td>A student placed 10 ml HCl and NaOH in two separate beakers as shown.
In beaker 1, 4 ml of NaOH is added whereas in beaker 2, 4 ml of HCl is added.
The student notes the possible change in pH in both solutions.
 

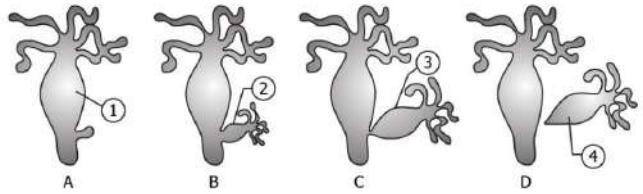
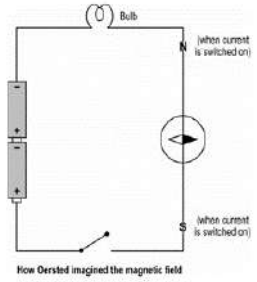
<table>
<tr><td></td><td>Change in pH
Beaker 1</td><td>Change in pH
Beaker 2</td></tr>
<tr><td>A</td><td>increase</td><td>increase</td></tr>
<tr><td>B</td><td>Reduce</td><td>increase</td></tr>
<tr><td>C</td><td>increase</td><td>reduce</td></tr>
<tr><td>D</td><td>reduce</td><td>Reduce</td></tr>
</table>
Which change in pH is correct?
a) A b) B c) C d) D</td><td>1</td></tr>
<tr><td>6</td><td>The ability of metals to be drawn into thin wire is known as ductility. Mercury is a liquid metal used in thermometers. Which of the following properties is not exhibited by mercury
(a) ductility (b) malleability (c) sonorosity (d) none of these</td><td>1</td></tr>
<tr><td>7</td><td>A doctor advised the regular intake of milk of magnesia as part treating gastric problems to a patient . Unfortunately the patient discontinued the intake of antacid after some days, which aggravated the condition. Which graph correctly represents the change in gastric pH of this patient.?
 
</td><td>1</td></tr>
<tr><td>8</td><td>Given below is a diagram of nephron
Which row of the following table correctly shows where filtration and selective reabsorption takes place</td><td>1</td></tr>
</table>

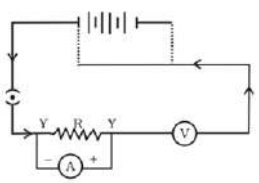
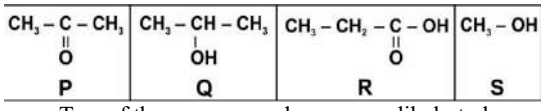
	 a.P (Filtration) Q (Selective reabsorption) b.Q (Filtration) S (Selective reabsorption) c.Q (Filtration) R (Selective reabsorption) d. P(Filtration R) (Selective reabsorption)	
9	Sreejith suffers from a condition due to which his average blood sugar level is 174 mg/dL. The average blood sugar level in a healthy adult is <140 mg/dL. Which of the following could be the cause of Sreejith's condition a. insufficient production of thyroxine in his body b. insufficient production of insulin in his body c. excess production of thyroxine in his body d. excess production of insulin in his body	1
10	 The image shows a surgical method in female to prevent pregnancy. Which event will be likely prevented from this method a) maturation of eggs b) production of eggs c) entry of eggs into the uterus d) entry of sperm into the uterus	1
11	Which statement explains the Mendel's law of segregation? (a) A trait in an offspring is due to the combination of an allele each from both the parent. (b) A trait in an offspring is due to the combination of two alleles each from both the parent. (c) A trait in an offspring is due to the combination of two alleles each from either of the parent. (d) A trait in an offspring is due to the combination of one allele each from either of the parent.	1
12		1

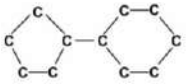
	A student sets up an experiment to study the photosynthesis in plants. The student destarched a potted plant by keeping it in a dark room for 3 days. Half of the portion of destarched leaf was placed in a bottle containing caustic potash (absorbs CO2) as shown. The student then places the plant in light and tests the leaf after 5 hours for the presence of starch. The portions inside the bottle shows negative starch test by reflecting no change in colour when react with iodine, however, other upper portions of the leaf gave positive starch test showing blue-black colour with iodine. What can be evaluated from this experiment? (a) carbon dioxide is directly linked with the colour of leaf (b) carbon dioxide is necessary for preparing carbohydrate (c) lack of carbon dioxide increases amount of starch in plant (d) lack of carbon dioxide slows the process of photosynthesis	
13	 A student is focussing solar rays on a paper to study converging nature of a spherical mirror, If he wants to depict the experiment as a ray diagram which of the following ray diagram should he draw? a. 1 b. 2 c 3 d 4	1
14	Which part of human eye is responsible for adjusting the power of accommodation of the eye lens a. Cornea b. Aqueous humour c. Ciliary muscles d. Iris	1
15	Which statement shows interaction of an abiotic component with a biotic component in an ecosystem? (a) A grasshopper feeding on a leaf. (b) Rainwater running down into the lake. (c) An earthworm making a burrow in the soil. (d) A mouse fighting with another mouse for food.	1
16	If a grass hopper is eaten by a frog, then the energy transfer will be from (a) producer to decomposer (b) producer to primary consumer (c) primary consumer to secondary consumer (d) secondary consumer to primary consumer	1
	Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, and R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true	

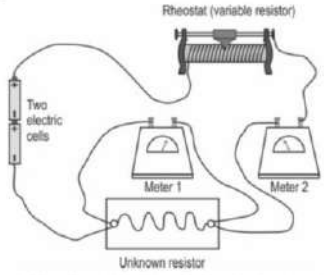
17	**Assertion:** Silver jewellery ornaments turn dull and get a gray-black film over it after wearing for a few months **Reason: .** The jewellery comes in contact with sulphur based air pollutants and corrodes	1
18	**Assertion:** Oral contraceptive pills and copper -T do not prevent sexually transmitted diseases. **Reason**: Sexually transmitted diseases are transmitted by contact with mucous membranes of infected organs	1
19	**Assertion:** The magnetic field lines around a current carrying straight wire do not intersect each other **Reason**: The magnitude of magnetic field produced at a given point increases as the current through the wire increases.	1
20	**Assertion: .** Decomposers play a very important role in the nutrient re-cycling in the environment **Reason**: Decomposers break down biodegradable and nonbiodegradable wastes and return the nutrients to the soil	1
21	What happens when zinc granules are treated with dilute solution of H_2SO_4 , HCl, HNO_3 , NaCl and NaOH, also write the chemical equations if reaction occurs.	2
22	In a bisexual flower in spite of the young stamens being removed artificially, the flower produces fruit. Provide a suitable explanation for the above situation. 30. What is a clone? Why do offspring formed by asexual reproduction exhibit remarkable similarity?	2
23	What is common for cuscuta, ticks and leeches? Name the correct substrates for the following enzymes (a) Trypsin (b) Amylase (c) Pepsin OR Explain the three pathways of breakdown in living organisms.	2
24	 The image shows the refraction of light in three transparent glass slabs X, Y and Z, made of different materials when they are placed in air. The angle of incidence is different in each case but the angle of refraction is the same in all three blocks. Compare the speed of light in the three blocks. Justify your answer.	2
25	a. Draw the pattern of magnetic field lines of i. A current carrying solenoid ii) a bar magnet b. List two distinguishing features of features between the two fields OR A magnetic compass shows a deflection when placed near a current carrying wire. How will the deflection of the compass get affected if the current in the wire is increased? Support your answer with a reason	2

	Meena draws magnetic field lines of field close to the axis of a current carrying circular loop. As she moves away from the centre of the circular loop she observes that the lines keep on diverging. How will you explain her observation	
26	The stratosphere is very dry and rarely allows clouds to form .In the extreme cold of polar winter , however stratospheric clouds of different types may form. These clouds are called Polar Stratospheric Clouds (PSCs) Scientists recently discovered that polar stratospheric clouds , long known to play an important role in arctic ozone destruction , are occurring with increasing frequency in the Arctic. The high altitude clouds form only at very low temperature help destroy ozone in two ways (1) They provide a surface which converts benign forms of chlorine into reactive, ozone- destroying forms , and (2) they remove nitrogen compounds that moderate the destructive impact of chlorine .In recent years , the atmosphere above the arctic has been colder than usual , and polar stratospheric clouds lave lasted into the spring . As a result , ozone levels have decreasing (Source : NASA) a.How is ozone formed in the outer atmosphere? b.Ozone is being continuously destroyed due to extreme low temperatures .How ever ozone formation is also a continuous process .Why there is a depletion in the ozone layer still? c.What can be a positive effect of global warming on the depletion of the ozone layer? d.How does ozone layer depletion impact human health	2
27	i) Given below are the steps for extraction of copper from its ore. Write the reaction involved. (a) Roasting of copper (1) sulphide (b) Reduction of copper (1) oxide with copper (1) sulphide. (c) Electrolytic refining (ii) Draw a neat and well labelled diagram for electrolytic refining of copper OR A teacher asks the students to identify a metal ,M. She gives them the following clues to help them . (P) its oxide reacts with both HCl and NaOH (Q) It does not react with hot water or cold water but reacts with steam (R) It can be extracted by electrolysis of its ore (a) Identify the metal (b) Write the chemical equations for the reaction of the metal with HCl and NaOH respectively (c) What would happen if the metal is reacted with iron oxide?	3
28	An element A burns with golden flame in air. It reacts with another element B, atomic number 17 to give a product C. An aqueous solution of product C on electrolysis gives a compound D and liberates hydrogen. Identify A, B, C and D. Also write down the equations for the reactions involved. OR	3

	A non-metal A which is the largest constituent of air, when heated with H2 in 1:3 ratio in the presence of catalyst (Fe) gives a gas B. On heating with O2 it gives an oxide C. If this oxide is passed into water in the presence of air it gives an acid D which acts as a strong oxidising agent. (a) Identify A, B, C and D (b) Why this non-metal is flushed in packets by chips manufacturers?	
29	Design an experiment to demonstrate hydrotropism	3
30	 The model shows the process of budding in Hydra. a)What is the likely purpose of this division? b)Discuss the type if cell division involved and justify your answer. c)Diagrammatically represent the process of budding in case of a unicellular organism	3
31	a)If the near point of an eye is shifted to 90 cm , the person must be suffering from some defect of vision. Name the defect and two cause of the defect b)A person is suffering from long sightedness If he is advised to use a spectacle of power +1D, find the near point of the person.	3
32	In 1820, Hans Christian Oersted discovered that a magnetic field is deflected by a current carrying wire. For many years , he had expected to find a connection between electricity and magnetism.Before his discovery , Oersted has imagined the magnetic field to be a straight line along the direction of the wire- with the north pole at one end and the south pole at the other. This was a major reason why he took so long to discover electromagnetism. The figure below shows how Oersted would have arranged his wire and magnetic needle in his early experiments  How Oersted imagined the magnetic field a)Draw a diagram to show the observation that Oersted would have expected when switching on the current . If his hypothesis had been correct . b)Based on our current knowledge of the magnetic field around a wire , explain why his experiment failed .	3

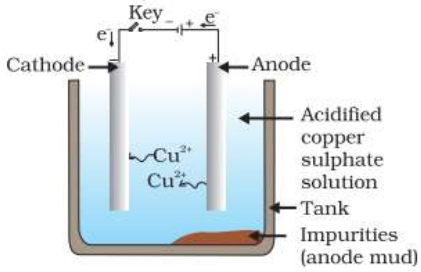
33	 a)A child has drawn the electric circuit to study Ohm's law as shown in Figure . His teacher told that the circuit diagram needs correction. Study the circuit diagram and redraw it after making all corrections b)How does use of a fuse wire protect electrical appliances? c)Why is parallel arrangement used in domestic wiring?	
34	Compounds with identical molecular formula but different structures are called structural isomers. a. In case of saturated hydrocarbons , what is the minimum number of carbon atoms needed in a molecule for it to have a structural isomer b. Draw the structural isomers of the saturated hydrocarbon having the minimum number of carbon atoms mentioned in (a) c. Draw the electron dot structure of ethyne and also draw its structural formula OR Shown below are the structural formulae of four carbon compounds  a. Two of these compounds are more likely to have similar chemical properties .Identify these two compounds .Give a reason for your answer . b. Identify which of these compounds are likely to have the same boiling point . Justify your answer. c. A gas is evolved when ethanol reacts with sodium. Name the gas evolved and also write the balanced chemical equation of the reaction involved.	5
35	Describe the flow of blood through the heart of human beings What will happen if platelets were absent in the blood? OR Plants have low energy needs as compared to animals. Explain. Why and how does water enter continuously into the root xylem? Why is transpiration important for plants? How do leaves of plants help in excretion?	5
36	A student has three concave mirrors A,B and C of focal lengths 20 cm, 15 cm and 10 cm respectively. For each concave mirror , he performs the experiment of image formation for three values of object distance of 30 cm , 10 cm, and 20 cm. Give reason for the following i) For the three object distances , identify the mirror which will form an image equal in size to that that of the object .Find at least one value of object distance . ii)Out of the three mirrors , identify the mirror which would be preferred to be used for shaving purpose. iii)For the mirror B , draw ray diagram for image formation for any two given values of object distance. OR	5

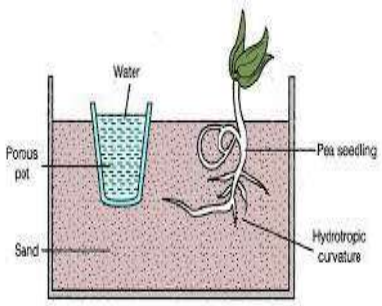
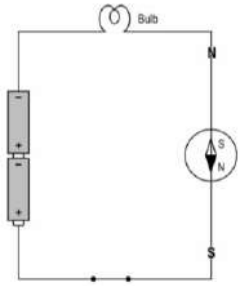
<table>
<tr><td></td><td>A thin converging lens form a real magnified image and virtual magnified image of an object in fron t of it.
a. Write the positions of the objects in each case
b. Draw ray diagrams to show the image formation in each case
c. How will the focal length and intensity of image formed be affected on cutting the lens into two halves along principal axis ?</td><td></td></tr>
<tr><td>37</td><td>Carbon atom has 6 electrons , six protons and six neutrons with atomic number 6 and mass number 12. Study the atomic structure of carbon and answer the following
a.State the reason why carbon can neither form C^{4+} cations nor C4- anions but forms covalent compounds ? (2)
b.Catenation is the ability of an atom to form bonds with other atoms of the same element. It is exhibited by both carbon and silicon. Compare the ability of catenation of the two elements. Give reasons (1)
c. An alkane has 11 carbon atoms arranged within ring structure as shown in the
 
diagram .What is the molecular formula of the alkane ?
OR
Polythene is a plastic made from ethene (CH_2=CH_2).When ethene is subjected to high pressure and moderately high temperature , ethene molecules react with each other to form large molecules hundreds of times bigger , forming plastic.
Which property of carbon atom is instrumental in the formation of polythene?(1)</td><td>4</td></tr>
<tr><td>38</td><td>a. Consider a pea plant that is recessive for seed texture and seed colour, its genotype is rr yy, and phenotype is wrinkled green.
Assuming that the genes for seed texture and seed colour obeys the Mendels laws of inheritance , indicate the genotypes and phenotypes of in the following crosses .
<table>
<tr><td></td><td>CROSS</td><td>PROGENY</td></tr>
<tr><td>a</td><td>RR YY (Round Yellow) x RR YY (Round Yellow)</td><td>…….</td></tr>
<tr><td>b</td><td>Rr Yy (Round Yellow) x Rr Yy(Round Yellow)</td><td>…….</td></tr>
<tr><td>c</td><td>rr yy (wrinkled green)x rr yy (wrinkled green</td><td>……..</td></tr>
<tr><td>d</td><td>RR YY (Round Yellow) x rr yy(wrinkled green</td><td>……..</td></tr>
</table>
b. Sex determination in humans happens through sex chromosomes . Along with other parameters , such processes often help in forensic studies in crime investigation and/or identification of accidents and natural calamities. In order to determine whether an accident victim is male or female , which cells can be used and why?
c. Using a flow chart ,, show how sex determination takes place in humans
OR
A monohybrid cross is conducted between one variety of pea plants having pods that are full (FF) and another having pods that are constricted (ff). Find the percentage of heterozygous offspring in F1 generation</td><td>4</td></tr>
</table>

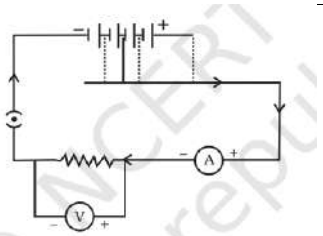
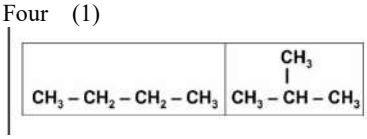
39	Study the diagram given below how Amrita had done connections to verify Ohm's law.  i.Identify which of the devices in the circuit is representing meter1 and meter 2.Justify your answer (1) ii.Draw a circuit diagram with appropriate symbols for the circuit shown in the diagram(1) iii.Amrita forgot to put switch in the circuit . During experiment , the wire labelled as "unknown resistor became hot . The resistivity of the material of the wire increases with temperature . Draw two (VT graphs) potential difference Vs current graphs (in the same diagram : a. as expected by Amrita b. as based on the actual observation she would make .(2) OR Amrita has a copper wire and an aluminium wire of the same length. CCan the resistance of the two wires be tha same ? Justify your answer	4

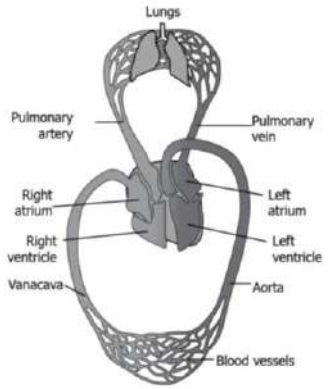
	Sample Question Paper-4 2023-24 **Class X Science SCORING KEY** **(Subject Code – 086)**	
	SECTION A	
Q.No	ANSWERS	Marks
1	a	1
2	a	1
3	c	1
4	d	1
5	c	1
6	d	1
7	b	1
8	c	1
9	c	1
10	c	1
11	a	1

12	b	1
13	b	1
14	c	1
15	c	1
16	c	1
17	a	1
18	a	1
19	b	1
20	c	1
21	The reaction of Zn granules with (a) Dilute H_2SO_4 $Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$ (b) Dilute HCl $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$ (c) Dilute HNO3 Reaction with dilute HNO3 is different as compared to other acids because nitric acid is an oxidising agent and it oxidises H2 gas evolved to H2O. $4\,Zn(s) + 10HNO_3(aq) \rightarrow 4\,Zn(NO_3)_2(aq) + 5\,H_2O(l) + N_2O(g)$ (d) NaCl solution $Zn(s) + NaCl(aq) \rightarrow$ No reaction (e) NaOH solution $Zn(s) + 2\,NaOH(aq) \rightarrow Na_2ZnO_2(aq) + H_2(g)$ Sodium zincate	2
22	The pistil is intact(½). Cross pollination has occurred leading to fertilisation and formation of fruit. (½) Clone refers to offspring of an organism formed by asexual method of reproduction (½). Since they possess exact copies of the DNA of their parent, clones exhibit remarkable similarity. (½)	2
23	All are parasites, they derive nutrition from plants or animals without killing them. (½) a)— Protein (½) (b)— Starch(½) (c)— Protein (½) OR Glucose to Pyruvate (½) Pyruvate to ethanol, CO_2 and energy (½) Pyruvate to lactic acid and energy(½) Pyruvate to CO_2 , H_2O and energy(½)	2
24	Speed in X is > speed in Y > speed in Z 1 As per Snell's law, sine <i / sin <r = n Since the angle of incidence is minimum in block X, the refractive indx of the material of block X is minimum.(1/2) The refractive index of a material is given by n = c/v V = c/n , Since refractive index of block X is minimm, speed of light is maximum in block X Or Since material of block X is the least dense , the impact of light is maximum in block X.	2
25	RTB p.No Figure field lines around current carrying solenoid . (½) RTB p.No Figure Field lines around bar magnet . (½) Features 1. Magnetic field outside the solenoid is weak/negligible as compared to the bar magnet . (½) 2. Strength of magnetic field around solenoid can be changed by changing the current passing, whereas in a bar magnet it is fixed . (½) OR	2

	The deflection increases (½) . The strength of magnetic field is directly proportional to the magnitude of current passing through the straight conductor. (½) Strength of the magnetic field falls as distance increases(½) . This is indicated by the decrease in degree of closeness of the lines of field (½)	
26	a.The high energy UV radiations in the higher levels of atmosphere split apart some molecular oxygen (O2) into free oxygen (O) atoms. These atoms then combine with molecular oxygen to form ozone . (1/2) b. because the rate of destruction is higher is than the rate of destruction (1/2) c. Rise in polar temperature might restrict the formation of PSCs and reduce the depletion of the ozone layer. (1/2) d. Removal of ozone layer allows harmful UV radiations to enter and cause diseases like skin cancer (1/2)	2
27	(i) (a) Roasting of sulphide ore (i) $2Cu_2S(s) + 3O_2(s) \rightarrow$ Heat $2Cu_2O(s) + 2SO_2(g)$ (b) $2Cu_2O + Cu_2S \rightarrow$ Heat $6Cu(s) + SO_2(g)$ This reaction is known as auto-reduction Reaction for electrolytic refining At cathode: $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ At anode: $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$ (ii) Diagram for electroytic refining of copper  OR a.Aluminium b.$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$ $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$	3
28	$Na \rightarrow Na^+ + 1e^-$ (1/2) $Cl + 1e^- \rightarrow Cl^-$ (1/2) $Na^+ + Cl^- \rightarrow NaCl$ (1) $2NaCl + 2H_2O \rightarrow 2NaOH + H_2 + CL_2$ (1) Chlor alkali process OR (a) A — N_2 (½) ; B — NH_3 (½) ; C — NO (½) ; D — HNO_3 (½) (b) Non-metal is nitrogen , being less reactive , it prevents rancidity.(1)	

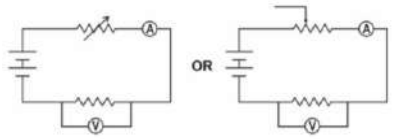
29	Movement of plants in response to water/ towards ot away from water is called hydrotropism. (½) Activity/ rectangular jar filled with sand or saw dust. (½) Porous pot filled with water, placed in the jar. (½) Keep actively growing seedling near the porous pot (½) Roots grow towards the wet region around the pot with water . (½) Diagram (½)  	
30	a. To develop independent new individual . (1) b. Since budding is a method of asexual reproduction , no gamete formation is involved and no meiosis happens (½). Only mitosis takes place (½) c. Budding in yeast diagram (1)	3
31	a. The defect is hypermetropia, because the near point is shifted from 25 cm to 90 cm.Image in this case will be formed behind the retina Two causes of Hypermetropia i) Increased focal length of eye lens/ decreased converging nature of eyelens ii) shortening of eye ball b. f =1/P, f = 100/1 , A s per lens formula , 1/v - 1/u = 1/f , ie 1/v – 1/u = 1/100, ie 1/v – 1/-25 = 1/100 (u = -25 cm) 1/v = 1/100- 1/25 , 1/v = 1- 4/100 , 1/v = -3 / 100, v= 100/-3 , v = -33.3 cm. If the person is using +1D spectacle, his near point will be -33.33cm	3
32	 a. diagram showing the magnetic needle aligned with the wire. (1) b. The magnetic field due to the current is perpendicular to the wire (1) Since the needle is already pointing in a direction perpendicular to the wire, it will not get deflected . (1)	3

33	 a. ½ x 2 = 1 b.If a current larger than a specified value flows in a circuit, temperature of fuse wire increases to its melting point . The fuse wire melts and the circuit breaks (1) c. Provide the same potential difference across each electrical appliance (1)	3
34	a. Four (1) b.  1 +1 . c. electron dot formula of ethyne (1) Structural formula of ethyne (1) OR a. Q and S (1/2) They have same functional group (1) b. None of them (1/2) All are different chemical substances (1) c. Gas evolved is hydrogen. (1) $2CH_3\,CH_2OH + 2Na \rightarrow 2CH_3\,CH_2\,O^- Na^+ + H_2$ (1)	5
35	Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium. The left atrium relaxes when it is collecting this blood. It then contracts, while the next chamber, the left ventricle, relaxes, so that the blood is transferred to it. When the muscular left ventricle contracts in its turn, the blood is pumped out to the body. De-oxygenated blood comes from the body to the upper chamber on the right, the right atrium, as it relaxes. As the right atrium contracts, the corresponding lower chamber, the right ventricle, dilates. This transfers blood to the right ventricle, which in turn pumps it to the lungs for oxygenation. Since ventricles have to pump blood into various organs, they have thicker muscular walls than the atria do	5

	 In the absence of platelets, the process of clotting will be affected. OR Plants do not move. In a large plant body there are many dead cells like sclerenchyma as a result it requires less energy as compared to animals. Cells of root are in close contact with soil and so actively take up ions. The ion-concentration, increases inside the root and hence osmotic pressure increases the movement of water from the soil into the root which occurs continuously. Transpiration is important because (a) it helps in absorption and upward movement of water and minerals from roots to leaves (b) it prevents the plant parts from heating up. Many plants store waste materials in the vacuoles of mesophyll cells and epidermal cells. When old leaves fall, the waste materials are excreted along with the leaves.	
36	i) When the object is placed at C, of the concave mirror , the image formed will be of the same size of the object. Given object distances are 30 cm, 10 cm and 20 cm. (1) Focal length of mirror A = 20 cm (2f = 40 cm) Focal length of mirror B = 15 cm (2f = 30 cm) , Focal length of mirror C = 10 cm (2f = 20 cm) Therefore , if the object distance is 20 cm, the mirror C having focal length 10 cm (2f=20 cm, object at C) will form image equal in size to that of object. (u = R, R= 2f, u = 2 x 10 cm = 20 cm) (1) ii) For shaving purpose mirror B (having focal length 15 cm) would be preferred to form an enlarged erect image of the face at 10 cm (1) iii) Ray diagram for mirror B (f= 15 cm) u = 30 cm , object at C, image at C, real inverted, same size image (diagram) (1) u = 15 cm , object at f, image at infinity, real inverted , highly enlarged image (diagram) (1) u = 10 cm, object between f and P, image behind mirror, erect ,virtual, enlarged image (diagram) (1) (any two) OR a. Object is placed between F and 2F (real inverted enlarged/magnified image) Object placed between optical centre and F (erect virtual magnified image) b. Ray diagram object between F and 2F (RTB . p.154 ,fig.9.16.d)	5

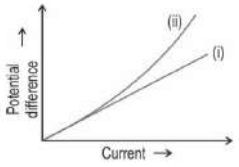
<table>
<tr><td></td><td>Ray diagram object between F and O) (RTB . p.155 ,fig.1.6.e)
c. If the lens is cut into two halves along principal axis
Focal length will not be affected
Intensity will be reduced because refracting surface is reduced to half</td><td></td></tr>
<tr><td>37</td><td>The reactivity of elements is explained as their tendency to attain a completely filled outer shell, that is, attain noble gas configuration.
Elements forming ionic compounds achieve this by either gaining or losing electrons from the outermost shell.
a.In the case of carbon, it has four electrons in its outermost shell and needs to gain or lose four electrons to attain noble gas configuration.
If it were to gain or lose electrons –
(i) It could gain four electrons forming C^{4-} anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons, that is, four extra electrons. (1)
(ii) It could lose four electrons forming C^{4+} cation. But it would require a large amount of energy to remove four electrons leaving behind a carbon cation with six protons in its nucleus holding on to just two electrons. (1)
Carbon overcomes this problem by sharing its valence electrons with other atoms of carbon or with atoms of other elements

b.Carbon exhibits catenation much more than silicon or any other element due to its smaller size which makes the C–C bonds strong while the Si–Si bonds are comparatively weaker due to its large size. (1)
c.$C_{11}H_{20}$
OR
Catenation</td><td>4</td></tr>
<tr><td>38</td><td>a.<table><tr><td></td><td>CROSS</td><td>PROGENY</td></tr><tr><td>a</td><td>RR YY (Round Yellow) x RR YY (Round Yellow)</td><td>all Round yellow / RR YY (½)</td></tr><tr><td>b</td><td>Rr Yy (Round Yellow) x Rr Yy(Round Yellow)</td><td>9 Round yellow: 3 Round wrinkled: 3 Y yellow : 1 wrinkled green (½)</td></tr><tr><td>c</td><td>rr yy (wrinkled green)x rr yy (wrinkled green</td><td>All wrinkled geen (½)</td></tr><tr><td>d</td><td>RR YY (Round Yellow) x rr yy(wrinkled green</td><td>All wrinkled yellow (½)</td></tr></table>b. any cell of the body (½), all cells have 23 pair of chromosomes (½)
c. Flow chart (1 mark)
OR
Monohybrid cross and progeny (1)</td><td>4</td></tr>
<tr><td>39</td><td>i.Meter 2 is ammeter (½) because it is connected in series with the unknown resistorthrough which the current needs to be measured (½)</td><td>4</td></tr>
</table>

ii 

Correct circuit diagram using symbols (1)

iii graph 1. Straight line passing through origin



Graph 2 – curved with an increasing slope (2)

OR

Yes , the resistance of the two wires can be the same

If the area of cross section of the two wires is different / if the thickness of the two wires is different .

Sample Question Paper-5 2023-24

Class X Science

(Subject Code – 086)

Max. Marks: 80 **Time Allowed: 3 hours**

General Instructions:

This question paper consists of 39 questions in 5 sections.

vii. *All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.*

viii. *Section A consists of 20 objective type questions carrying 1 mark each.*

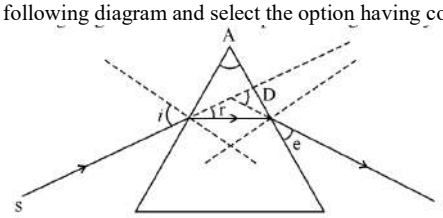
ix. *Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.*

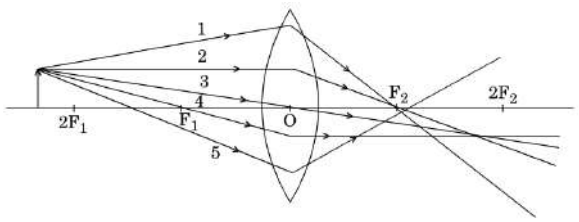
x. *Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.*

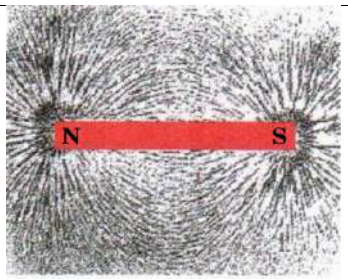
xi. *Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.*

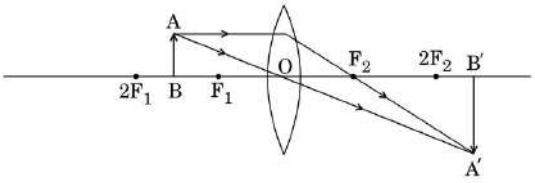
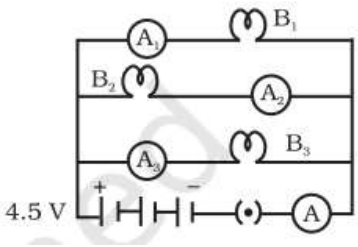
xii. *Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-questions*

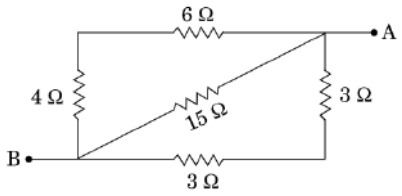
1	In the following reaction : $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$, the oxidant and reductant are A. $MnCl_2$ and Cl_2 respectively C.MnO_2 and HCl respectively B. Cl_2 and H_2O respectively D. MnO_2 and $MnCl_2$ respectively	1
2	White silver chloride (AgCl) turns grey in sunlight. It is an example of A. Combination reaction C. Displacement reaction B.Precipitation reaction D. Decomposition reaction	1
3	Copper utensils slowly lose their shiny brown surface and gain a green coat on prolonged exposure to atmospheric air. This is due to the formation of a coating of (A) Copper sulphate (B) Copper carbonate (C) Cupric oxide (D) Cuprous oxide	1
4	Which one of the following statements is true about the position of metals in the activity series of metals ? 1 (A) Copper is below hydrogen but above lead. (B) Iron is below lead and zinc. (C) Zinc is below magnesium but above aluminium. (D) Magnesium is below calcium but above aluminium.	1
5	Which one of the following natural sources contains Oxalic acid ? (A) Tomato (B) Tamarind (C) Ant sting (D) Nettle sting	1
6	Which of the following property is generally not shown by metals? (A) Electrical conduction (B) Sonorous in nature (C) Dullness (D) Ductility	1

7	Which one of the following compounds changes blue litmus to red ? (A) C_2H_5OH (B) CH_3COCH_3 (C) $C2H_5CHO$ (D) C_2H_5COOH	1
8	The inner lining of stomach is protected by one of the following from hydrochloric acid. Choose the correct one (A) Pepsin (B) Mucus (C) Salivary amylase (D) Bile	1
9	Choose the incorrect statement about insulin (A) It is produced from pancreas (B) It regulates growth and development of the body (C) It regulates blood sugar level (D) Insufficient secretion of insulin will cause diabetes	1
10	Which among the following diseases is not sexually transmitted? (A) Syphillis (B) Hepatitis (C) HIV - AIDS (D) Gonorrhoea	1
11	Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F1 progeny that have round, yellow (RrYy) seeds. When F1 plants are selfed, the F2 progeny will have new combination of characters. Choose the new combination from the following i) Round, yellow (ii) Round, green (iii) Wrinkled, yellow (iv) Wrinkled, green (A) (i) and (ii) (B) (i) and (iv) (C) (ii) and (iii) (D) (i) and (iii)	1
12	Which is the correct sequence of air passage during inhalation? (A) Nostrils → larynx → pharynx → trachea → lungs (B) Nasal passage → trachea → pharynx → larynx → alveoli (C) larynx → nostrils → pharynx → lungs (D) Nostrils → pharynx → larynx → trachea → alveoli	1
13	Study the following diagram and select the option having correctly marked angles s  (A) ∠i, ∠A, ∠D (B) ∠i, ∠r, ∠D (C) ∠i, ∠e, ∠A (D) ∠r, ∠e, ∠D	1
14	Consider the following ecosystems : I.Ponds II. Forests III. Aquariums IV. Crop fields Out of these, the natural ecosystems are (A) I, II and III (B) II, III and IV (C) I and II only (D) I, II and IV	1
15	Disposable plastic plates should not be used because 1 (A) they are made of non-biodegradable materials. (B) they are made of biodegradable materials. (C) they are made of toxic materials. (D) they are made of materials with light weight.	1
16	In the given food chain, suppose the amount of energy at fourth trophic level is 5 kJ, what will be the energy available at the producer level? Grass → Grasshopper → Frog → Snake → Hawk (A) 5 k J (B) 50 k J (C) 500 k J (D) 5000 k J	
	For question numbers 16 and 14, two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below : a. Both (A) and (R) are true and (R) is the correct explanation of the assertion (A). b. Both (A) and (R) are true, but (R) is not the correct explanation of the assertion (A).	

	c. (A) is true, but (R) is false. d. (A) is false, but (R) is true.	
17	Assertion: Photosynthesis is considered as an exothermic reaction Reason: Energy is absorbed in the form of light during photosynthesis	
18	Assertion (A) : Amoeba always produces two daughter amoebae while Plasmodium divides into many daughter cells. Reason (R) : Amoeba undergoes binary fission while Plasmodium undergoes multiple fission.	
19	Assertion: Direction of magnetic field lines around a bar magnet can only be plotted by using a magnetic compass . Reason: Iron filings can also be sprinkled to locate the direction of field lines around a bar magnet	
20	Assertion: Non-biodegradable , toxic substances if entered in food chain leads to Biomagnification. Reason: Level of toxic substances at each trophic level keep on increasing similar to energy transfer	
21	a.Why is it necessary to balance a chemical equation? b. it changes to gypsum once again giving a hard solid mass. CaSO4.1/2 H20 +11/2 H2O → CaSO4.H2O In the above reaction, only half a water molecule is shown to be attached as water of crystallisation. How can you get half a water molecule? Justify your answer	2
22	In tobacco plant, the male gametes have twenty four chromosomes. a. What is the number of chromosomes in the female gamete? b. What is the number of chromosomes in the zygote?	2
23	(a) Name two metals which are obtained from their ores by simple heating. (b) Differentiate between calcination and roasting, taking examples of zinc ores.	2
24	Out of the five incident rays shown in the following diagram, find any two incident rays that are obeying the laws of refraction of light and may be used for locating the position of the image formed by a convex lens. Use these two rays in finding the position, size and nature of the image formed when an object is placed between F1 and 2F1 of a convex lens.  OR Write four steps in proper sequence which should be followed in the determination of focal length of a given convex lens by obtaining a sharp image of a distant object	2
25	Study the diagram given below and answer the questions that follow :	2

	 (a) Why do the iron filings arrange in such a pattern ? (b) What does this pattern demonstrate ? (c) Why do the iron filings near the bar magnet seem to align in the shape of closed curves ?	
26	A candle flame is placed at a distance of 18 cm from the optical centre of a convex lens. If its image is formed on a screen placed at a distance of 36 cm from the lens, answer the following questions : (a) What is the magnification of the image formed ? (b) What is the focal length of the lens ? Use the Lens Formula to determine it.	2
27	Draw a labelled diagram of the set-up of a circuit to show that metals are good conductors of electricity. OR Draw a labelled diagram of the experimental set-up to study the action of steam on a metal. Name the gas produced in the reaction.	2
28	(a) Write the molecular formula of methane and ethane, stating the general formula of the homologous series to which these compounds belong. What is the difference in the molecular mass in between the two successive members of a homologous series ? (b) Write the name and molecular formula of an alcohol having two carbon atoms in its molecule. Write balanced chemical equation to indicate what happens when this compound is heated at 443 K with excess conc. H_2SO_4. Name the main product formed in the reaction stating the function of conc. H_2SO_4 in the reaction. OR (a) How do the following conversions take place ? Write chemical equation for each : (i) Ethanol to Ethanoic acid (ii) Ethene to Ethane b) Give one example each with chemical equation for the following reactions : (i) Combustion reaction (ii) Substitution reaction (iii) Saponification reaction	3
29	Name the hormones secreted by the following endocrine glands and specify one function of each : (a) Thyroid (b) Pituitary (c) Pancreas	3
30	(a) Write the function of following parts in human female reproductive system : (i) Ovary (ii) Oviduct (iii) Uterus (b) Describe in brief the structure and function of placenta.	3
31	Name the type of mirror which facilitates (a) Shaving, (b) Observing large images of the teeth of a patient, and (c) Observing the rear view in vehicles. Give reason to justify your answer in each case.	3

	OR  Study the ray diagram given below and answer the questions that follow : (a) Is the type of lens used converging or diverging ? (b) List three characteristics of the image formed. (c) In which position of the object will the magnification be – 1 ?	
32	a. In a given ammeter, a student saw that needle indicates 12th division in ammeter while performing an experiment to verify Ohm's law. If ammeter has 10 divisions between 0 to 0·5 A, then what is the ammeter reading corresponding to 12th division ? (b) How do you connect an ammeter and a voltmeter in an electric circuit ?	3
33	B1 , B2 and B3 are three identical bulbs connected as shown in Figure 12.8. When all the three bulbs glow, a current of 3A is recorded by the ammeter A. (i) What happens to the glow of the other two bulbs when the bulb B1 gets fused? (ii) What happens to the reading of A1 , A2 , A3 and A when the bulb B2 gets fused? (iii) How much power is dissipated in the circuit when all the three bulbs glow together?  	3
34	An organic compound, A , which is widely used as a food preservative especially for making pickles, reacts with sodium metal releasing a gas which burns with pop sound and another compound B . C is an organic compound which is an ingredient of beverage drinks which when heated in presence of Conc.H_2SO_4 with A produce another compound D with characteristic fruity smell. Identify the compounds A,B,C and D , also write chemical equations involved in their formation. What happens when the compound D is reacted with an alkali. OR (a) A compound 'X' undergoes addition reaction with H_2 to form a compound 'Y' having molecular mass 30 g mol^{-1} . 'X' decolorises bromine water and burns with a smoky flame. Identify 'X' and 'Y' and write chemical equations of the reactions involved. (b) Write the structural formulae of (i) Butanone, and (ii) Pentanoic acid. (c) Would you be able to check if water is hard by using a detergent ? Give reason to justify your answer.	5

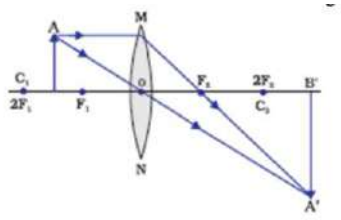
35	(a) With the help of Mendel's experiments show that (i) traits may be dominant or recessive, and (ii) traits are inherited independently.	5
36	(a) Name two defects of vision. Mention two main causes of each defect. (b) A person uses spectacles having lenses of focal length – 2.0 m. Determine the nature and power of the lenses used in his spectacles.	5
37	(a) What is meant by pollination ? (b) Name and differentiate between the two types of pollination. (c) i) What happens to the pollen which falls on a suitable stigma ? OR ii) Mention the post-fertilisation changes that occur in (i) Ovary and (ii) Ovule in the flower.	4
38	The melting points and the boiling points of ionic compounds are comparatively much higher than that of the covalent compounds. The ionic compounds are so called because they are formed by the transfer of electrons from a metal to a non-metal. In the ionic compounds, the transfer of electrons from one element to the other is controlled by their electronic configurations. It is because every element tends to attain a completely filled valence shell of its nearest noble gas or a stable octet. (a) The atomic number of sodium is 11. Write its electronic configuration and state the number of electrons it can lose to have a stable octet. (b) The atomic number of chlorine is 17. Write its electronic configuration. Name the nearest noble gas whose octet chlorine will attain after gaining one electron. 1 c.(i) Show the formation of MgO by the transfer of electrons. The atomic numbers of magnesium and oxygen are 12 and 8 respectively. 2 OR (ii) Write the symbols and names of the anion and the cation present in the aqueous solution of the following compounds : (I) Sodium chloride (II) Potassium nitrate	4
39	a.List two disadvantages of using a series circuit in homes. (b) Calculate the effective resistance between A and B in the circuit given below :  OR (a) Derive the relation for the equivalent resistance when three resistors of resistances R1 , R2 and R3 are connected in parallel. (b) Find the minimum resistance that can be made using four resistors, each of 20 Ω	4

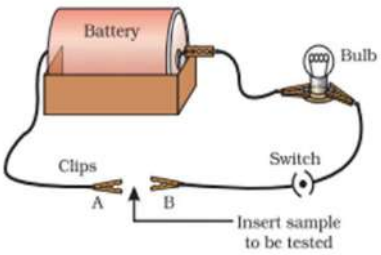
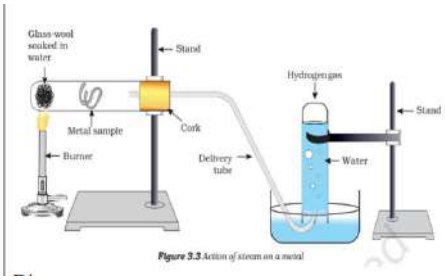
Sample Question Paper-5 2023-24

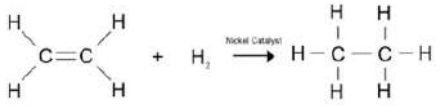
Class X Science SCORING KEY-

(Subject Code – 086)

1	C	

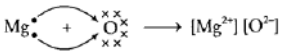
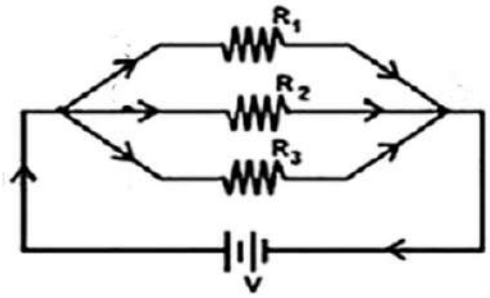
2	D	
3	B	
4	D	
5	A	
6	C	
7	D	
8	B	
9	B	
10	B	
11	B	
12	D	
13	A	
14	C	
15	A	
16	D	
17	D	
18	A	
19	C	
20	C	
21	a.A chemical equation is balanced in order to satisfy law of conservation of mass which states that matter can neither be created nor be destroyed during a chemical reaction b.It is written in this form because two formula units of CaSO4 share one molecule of water.	2
22	a.Number of chromosomes in tobacco plant female gamete will be 24, since gametes are formed by meiosis, and will be equal in both male and female gametes (1) b.In tobacco plant zygote , number of chromosomes will be 48 since the male and female gametes having 24 chromosomes each fuse together during fertilisatiion to form zygote (1)	2
23	a.Copper (Cu) and Mercury (Hg) ½ + ½ b) CALCINATION Zinc carbonate is heated in limited supply of air $ZnCO_3 \rightarrow ZnO + CO_2$ (1/2) /ROASTING /Zinc sulphide is heated in excess of air. $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$ (1/2)	2
24	• Rays no. 2, 3 and 4 follow the laws of refraction of light.  • This ray diagram is drawn using ray no. 2 and 3. (A candidate can select any two correct rays out of the three. Student should use two chosen rays while drawing the ray diagram.)	2
25	a) Iron filings align themselves along the magnetic field lines. ½ b) shape of magnetic field ½	2

	c) because magnetic field lines are closed curves 1	
26	a.u=-18cm, v= +36cm, m= v/u = =36/-18=-2 (½) b.1/v-1/u=1/f 1/36- 1/-18 = 1/f (½) 1/36+1/18=1/f 1+2/36 =1/f (½) 3/36=1/f f= 36/3 =12 cm (1/2)	2
27	chemical equations)  Diagram 1 , labelling (½) x 4 OR  Figure 3.3 Action of steam on a metal Diagram 1, labelling (½)+ (½), Hydrogen 1	3
28	a.Methane and ethane belong to the homologous series Alkane Methane:CH4 , molecular mass : 16 u Ethane : C2H6, molecular mass : 3ou General formula : CnH2n+2 Difference between two successive members of a homologous series = 14u .b.C_2H_5OH C_2H_5OH----→$C_2H_4 + H_20$ (Heated in presence of Conc.H_2SO_4, at 443K) Main product: Ethene/C_2H_4 Function of Conc.H_2SO_4 :as dehydrating agent OR i)Reactions in which alcohols are converted to carboxylic acids – OXIDATION	3

	Substances which are capable of adding oxygen to others are called oxidising agents. Alkaline potassium permanganate or acidified potassium dichromate are oxidising agents used to convert alcohols to acids, $C_2H_5OH \rightarrow CH_3COOH$ (Alk.$KMnO_4$/Acidified $K_2Cr_2O_7$) ½ Ethanol is changing to Ethanoic acid ii) Ethene to Ethane: By HYDROGENATION/ ADDITION Unsaturated hydrocarbons add hydrogen in the presence of catalysts such as palladium or nickel to give saturated hydrocarbons.  ½ i)COMBUSTION REACTION:Most carbon compounds release a large amount of heat and light on burning. These are the oxidation reactions . $C + O_2 \rightarrow CO_2$ + heat and light $CH_4 + O_2 \rightarrow CO_2 + H2O$ + heat and light ½ ii) SUBSTITUTION: Saturated hydrocarbons are fairly unreactive and are inert in the presence of most reagents In the presence of sunlight, chlorine is added to hydrocarbons in a very fast reaction. Chlorine can replace the hydrogen atoms one by one. It is called a substitution reaction because one type of atom or a group of atoms takes the place of another. $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$ (in the presence of sunlight) ½ iii)SAPONIFICATION: On treating with sodium hydroxide, which is an alkali, the ester is converted back to alcohol and sodium salt of carboxylic acid. This reaction is known as saponification(because it is used in the preparation of soap). $CH_3COOC_2H_5$ + NaOH $\rightarrow C_2H_5OH + CH_3COONa$ ½ (Ethanol and sodium ethanoate are formed)	
29	(a) Thyroid gland: Hormone secreted is Thyroxin. ½ . Thyroxin regulates carbohydrate, protein and fat metabolism in the body so as to provide the best balance for growth. ½ Iodine is necessary for the thyroid gland to make thyroxin hormone. In case iodine is deficient in our diet, there is a possibility that we might suffer from goitre. (One of the symptoms in this disease is a swollen neck) (b) Pituitary Gland: Growth hormone is one of the hormones secreted by the pituitary. ½ Growth hormone regulates growth and development of the body. ½ If there is a deficiency of this hormone in childhood, it leads to dwarfism. (c) Pancreas: Insulin is the hormone produced by the pancreas. ½ Insulin helps in regulating blood sugar levels. ½	3

	(If it is not secreted in proper amounts, the sugar level in the blood rises causing diabetes)	
30	functions of parts in human female reproductive system : (i) Ovary : The female germ-cells or eggs are made in the ovaries. ½ Ovary produce hormone- estrogen (female sex hormone) (ii) Oviduct.: Carries egg from ovaries Oviduct / fallopian tube is the site of fertilisation ½ (iii) Uterus : The development of the foetus/child inside the mother's body takes place in uterus. ½ The child is born as a result of rhythmic contractions of the muscles in the uterus/ Parturition (b) the structure and function of placenta: The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. ½ This is a disc which is embedded in the uterine wall. It contains villi on the embryo's side of the tissue. On the mother's side are blood spaces, which surround the villi. This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. ½ The developing embryo will also generate waste substances which can be removed by transferring them into the mother's blood through the placenta. ½	3
31	a) Concave mirror –forms erect and enlarged image b) Concave mirror –forms erect and enlarged image c) Convex mirror – wider field of view and forms erect image ½ x 6= 3 (OR) a) Convex lens / converging lens b) i) real ii) inverted iii) magnified / enlarged iv) forms beyond 2F2 (any three characteristics) c) at 2F1 ½ x 6= 3	3
32	Range of ammeter= 0 to 0.5A ½ Number of divisions = 10 ½ Least count of ammeter= Range /Number of divisions = .00.5/10= 0.05 ½+½ Reading at 12^{th} division = 0.05x12=0.6A (1)	3
33	(i) The glow of the bulbs B2 and B3 will remain the same. (ii) A1 shows 1 ampere, A2 shows zero, A3 shows 1 ampere and A shows 2 ampere (iii) $P = V \times I = 4.5 \times 3 = 13.5$ W	3
34	A – CH_3COOH / Ethanoic acid B – CH_3COONa a Sodium salt /Sodium ethanoate C – C_2H_5OH / CH_3CH_2OH / an alcohol/ Ethanol D – $CH_3COOCH_2CH_3$ /an Ester/ Ethyl ethanoate Equations : $2CH_3COOH + Na \rightarrow 2CH_3COONa + H_2$ $CH_3COOH+C_2H_5OH \rightarrow CH_3COOCH_2CH_3 + H_2O$ (Conc. H_2SO_4 as catalyst)	5

	$CH_3COOCH_2CH_3$ + NaOH→ CH_3CH_2COONa +C_2H_5OH' (Any 3 equations) (OR) a) X – Ethene /Ethyne / C_2H_4 / C_2H_2 /unsaturated hydrocarbon Y – Ethane / saturated hydrocarbon $CH_2=CH_2 + H_2$ (Ni as calayst)→ CH_3-CH_3 b) i) $CH_3-CO-CH_2–CH_3$ (Butanone) ii) $CH_3CH_2CH_2CH_2COOH$ (Pentanoic acid) c) No , Because detergents give foam/lather with hard water	
35	Mendels experiment with any characters (i) monohybrid experiment/ punnet square method/ Law of dominance 1+1) (ii) Dihybrid experiment / Punnet square method/Law of Independent assortment (2+1)	5
36	a.Myopia – i) excessive curvature of the eye lens ii) elongation of eyeball Hypermetropia – i)focal length of the eye lens increases ii) eyeball is shortened b.Diverging lens or concave lens P = 1 f (metres) P = 1/ -2 m P = -0.5 D 1 1½ 1½ ½ ½	5
37	Transfer of pollen grains from anther to stigma is called Pollination . (1) If this transfer of pollen occurs in the same flower, it is referred to as self-pollination. (1) , if the pollen is transferred from one flower to another, it is known as crosspollination. (1) . After the pollen lands on a suitable stigma, it has to reach the female germ-cells which are in the ovary. For this, a tube grows out of the pollen grain and travels through the style to reach the ovary. (1) OR After fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is gradually converted into a seed. (1) The ovary grows rapidly and ripens to form a fruit(1)	4
38	a.Na(Z = 11, ec: 2,8,1) can loose 1 e-, to get stable octet b. Cl (Z=17, ec:2,8,7) c.i) formation of MgO When magnesium reacts with oxygen, the magnesium atom transfers its two outermost electrons to an oxygen atom. By losing two electrons, the magnesium atoms form a magnesium ion ( ) and by gaining two electrons, the oxygen atom forms an oxide ion ( ) and an ionic bond is formed between .	4

	$Mg_{[2,8,2]} \longrightarrow Mg^{2+}_{[2,8]} + 2e^-$ $O_{[2,6]} + 2e^- \longrightarrow O^{2-}_{[2,8]}$  $Mg^{2+} + O^{2-} \longrightarrow MgO$ OR ii) Sodium chloride : cation Na + , Anion: Cl- Potassium nitrate: Cation K , Anion ,NO3 -	
39	a.Current is constant throughout the electric circuit. So it is impractical to connect an electric bulb and a heater in series. When one component fails, the circuit is broken and none of the component works. b)Resistors in series, R1 = 6 + 4 = 10 Ω Resistors in series, R2 = 3 + 3 = 6 Ω R3 = 15 Ω R1, R2 and R 3 are connected in parallel So effective resistance of the circuit is given by 1/R = 1/10 + 1 /6+ 1/15Ω = 3 + 5 + 2/30 = 10 /30 Ω 30 Ω R = 30 /10 = 3Ω OR  Potential difference applied across each resistors is V, then current drawn from battery I = V/ Rp Current through R1 is I1 = V/ R1 Similarly, I2 = V V/R2 I3 = V /R3 I = I1 + I2 + I3 V/Rp = V/R1 + V/R2 + V/R3 1/Rp=1/ R1+1/ R2 +1/R3 b) For minimum resistance all resistors must be connected in parallel. 1/ R= 1/R1+1/ R2 +1/R3+ 1/R4 1/ R= 1/20+1/ 20 +1/20 +20 1/R = 4/20 R = 20/4Ω R = 5 Ω 4	4


Best Wishes!