KENDRIYA VIDYALAYA SANGATHAN , MUMBAI REGION
PREBOARD- I EXAMINATION (2025-2026)
SUB. – MATHEMATICS (041)
CLASS – XII

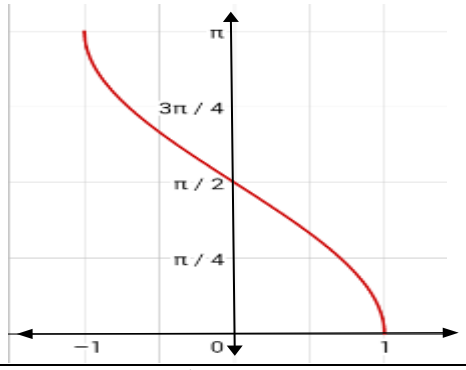
TIME: 3Hrs. **MM – 80**

General Instructions:

Read the following instructions very carefully and strictly follow them:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) with only one correct option and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are Case study-based questions, carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one subpart each in 2 questions of Section E.
9. Use of calculator is not allowed.

SECTION – A		
Q. N.	**QUESTIONS**	**MARKS**
1	If A = [a_{ij}] is a symmetric matrix of order n, then (a) $a_{ij} = 1/a_{ij}$ for all i,j (b) $a_{ij} \neq 0$ for all i,j (c) $a_{ij} = a_{ji}$ for all i,j (d) $a_{ij} = 0$ for all i, j	1
2	If A is a square matrix of order 3, $\lvert A \rvert = 4$, then $\lvert AA' \rvert$ = (a) 9 (b) -9 (c) -12 (d) 16	1
3	The value of $\hat{i}.(\hat{j}\times\hat{k})+\hat{j}\cdot(\hat{i}\times\hat{k})+\hat{k}\cdot(\hat{i}\times\hat{j})$ is (a) 0 (b) -1 (c) 1 (d) 3	1
4	For what value of a, $f(x) = a(x + \sin x)$ is an increasing function (a) $a \leq 0$ (b) $a\epsilon(0,\infty)$ (c) $a\epsilon[0,\infty)$ (d) $a\epsilon R$	1

5	If f ' (x) = sec x, the f(x) is (a) sec x tan x (b) sec x + tan x (c) log (sec x + tan x) (d) log (sec x - tan x)	1
6	If the order and degree of the differential equation $\left(\frac{dy}{dx}\right)^2 + \frac{dy}{dx} - \sin^2 y = 0$ **are** m **and** n **respectively , then the value of** $(m^2 + n)$ **is:** a) 1 (b) -1 (c) 3 (d) 5	1
7	The graph drawn below depicts (a) y=$sin^{-1}x$ (b) y=$cos^{-1}x$ (c) y=$cosec^{-1}x$ (d) y=$cot^{-1}x$  	1
8	The value of $\int_0^1 x\sqrt{1-x}\,dx$ is (a) -4/15 (b) 4/15 (c) -3/15 (d) 2/15	1
9	The function $f(x) = \begin{cases} \frac{\sin^2 3x}{x^2}, x \neq 0 \\ \frac{k}{2}, x = 0 \end{cases}$ is continuous at $x = 0$,then k is equals to (a) 3 (b) 6 (c) 12 (d) 18	1
10	If A , B are non - singular square matrices of the same order, then $(A^{-1}B^{-1})^{-1}$ is (a) BA (b) AB (c) AB^{-1} (d) $A^{-1}B$	1
11	If A = $\begin{vmatrix} 1 & 2 \\ 4 & 2 \end{vmatrix}$, then find the value of k if $\|2A\| = k\|A\|$. (a) 1 (b) 2 (c) -4 (d) 4	1
12	If A is a square matrix of order 3 and $\|adj.A\| = 25$, then $\|A\|$ = (a) 5 (b) -5 (c) 0 (d) a and b both	1
13	The maximum value of $z = 3x + 4y$ subject to constraints $x + y \leq 1$ and $x, y \geq 0$ is a) 7 b) 3 c) 4 d) 10	1
14	The point which lies in the half plane 2x + 3y -6 ≤ 0 is: (a) (1, 2) (b) (2, 1) (c) (2, 3) (d) (-3, 2)	1
15	The general solution of the differential equation $\frac{dy}{dx} = e^x + 1$ is: (a) y = $e^x + c$ (b) y = xe^x + c (c) y = x + $e^x + c$ (d) None of these	1

16	A person observed the first 4 digits of your 6-digit PIN. What is the probability that the person can guess your PIN? (a) $\frac{1}{81}$ (b) $\frac{1}{100}$ (c) $\frac{1}{90}$ (d) 1	1
17	If $y^2 = ax^2 + b$ then $\frac{d^2y}{dx^2}$ is (a) $\frac{ab}{x^3}$ (b) $\frac{x^3}{ab}$ (c) $\frac{ab}{y^2}$ (d) $\frac{ab}{y^3}$	1
18	Differentiate $\log\left\{\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)\right\}$ w.r.t. x. (a) 1/ tan x (b) $sec^2x/tan\ tan\ x$ (c) sec x (d) sec x tan x	1
	ASSERTION-REASON BASED QUESTIONS In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. (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.	
19	**Assertion(A)**: If $X = \{0,1,2\}$ and the function $f: X \to Y$ defined by $f(x) = x^2 - 2$ is surjective then $Y = \{-2,-1,2\}$ **Reason (R)** :*If $f: X \to Y$ is surjective then $f(x) = y$.*	1
20	**Assertion (A):** The direction cosines of the vector $2\,\hat{\imath} + 3\hat{\jmath} - 5\hat{k}$ are $<\frac{2}{\sqrt{38}},\frac{3}{\sqrt{38}},-\frac{5}{\sqrt{38}}>$. **Reason (R)** : If < a, b, c> are direction ratios then direction cosines are $<\frac{a}{D},\frac{b}{D},\frac{c}{D}>$, where D = $\sqrt{a^2+b^2+c^2}$.	1
	SECTION – B	
21	Find the value of $cos^{-1}(-cos\ \frac{\pi}{7})$. **OR** Find the domain of $cos^{-1}(3x-2)$.	2
22	Find the rate of change of the surface area of a sphere with respect to its radius 'r' when r = 6 cm.	2
23	For what value of 'a' the vectors: $-2\,\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $a\hat{\imath} + 6\hat{\jmath} - 8\hat{k}$ are collinear? **OR** Find the vector equation of the line which passes through the point (1, 2, -5) and is parallel to the vector $3\,\hat{\imath} + 3\hat{\jmath} - 5\hat{k}$.	2
24	If y = xsiny, prove that $x\frac{dy}{dx} = \frac{y}{1-x\cos y}$	2
25	Find 'k' when $(2\,\hat{\imath} + 6\hat{\jmath} + 14\hat{k}) \times \left(\hat{\imath} + k\hat{\jmath} + 7\hat{k}\right) = \vec{0}$	2
	SECTION – C	
26	Evaluate: $\int \frac{2x}{(x^2+3)(x^2+2)}\,dx$ (OR) Evaluate $\int \frac{dx}{\sqrt{3-2x-x^2}}$	3

27	Bag I contains 3 red and 4 black ball and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black .	3
28	Let $\vec{a}=\hat{\imath}+4\hat{\jmath}+2\hat{k}$, $\vec{b}=3\hat{\imath}-2\hat{\jmath}+7\hat{k}$and $\vec{c}=2\hat{\imath}-\hat{\jmath}+4\hat{k}$ .Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$,and $\vec{c}.\vec{d}=15$. **OR** If $\vec{a},\vec{b}$ and $\vec{c}$ are three unit vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then find $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.	3
29	Solve the differential equation: $\frac{dy}{dx}-3y\cot x=\sin 2x$, given that $y=2$ when $x=\frac{\pi}{2}$ **OR** Solve the differential equation: $xdy-ydx=\sqrt{x^2+y^2}dx$	3
30	Solve the following Linear Programming Problem graphically: Maximize Z = 5x + 2y subject to the constraints: x - 2y ≤ 2, 3x + 2y ≤ 12, -3x + 2y ≤ 3, x ≥ 0, y ≥ 0.	3
31	Evaluate $\int_0^{2\pi}\frac{1}{1+e^{\sin x}}dx$	3
	SECTION – D	
32	Using integration, find the area of the region in the first quadrant enclosed by the line x + y = 2, the parabola y^2 = x and the x-axis.	5
33	Find ' a ' and ' b ' , if the function given by $f(x)=\begin{cases}ax^2+b, & if\ x<1\\ 2x+1, & if\ x\geq 1\end{cases}$ is differentiable at x=1 **OR** Differentiate w.r.t. x : $(\sin x)^x+(\cos x)^{\sin x}$	5
34	Two bikers are running at the speed more than allowed on the road along the lines $\vec{r}=(\hat{\imath}+\hat{\jmath}-\hat{k})+\lambda(3\hat{\imath}-\hat{\jmath})$ and $\vec{r}=(4\hat{\imath}-\hat{k})+\mu(2\hat{\imath}+3\hat{k})$.Find the Shortest distance between them at any moment. Also check whether they meet to an accident or not. **OR** Find the image of the point (1, 6, 3) in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$	5

35	Solve the following system of equations by matrix method. $3x - 2y + 3z = 8$ $2x + y - z = 1$ $4x - 3y + 2z = 4$	5
	SECTION – E	
36	**Case-Study 1**: Read the following passage and answer the questions given below : A telephone company in Gurgaon has 500 subscribers on its list and collect fixed charge of Rs.300 per subscriber. The company proposes to increase the annual subscription and it is believed that every increase of Rs. 1, One subscriber will discontinue the service. Based on the above information answer the following : (i) If the annual subscription is increased by Rs. x per subscriber then find the total revenue are of the company .(R) (ii) Find dR/dx (iii) Find the maximum annual revenue of the company **(OR)** Find R'' at x = 50	 1 1 2
37	**Case-Study 2**: Read the following passage and answer the questions given below An organization conducted bike race under 2 different categories –boys and girls. In all, there were **250** participants. Among all of them finally three from Category **1** and two from Category **2** were selected for the final race. Ravi forms two sets ***B*** and ***G*** with these participants for his college project. Let $B = \{b_1, b_2, b_3\}$, $G = \{g_1, g_2\}$ where ***B*** represents the set of boys selected and ***G*** the set of girls who were selected for the final race. Ravi decides to explore these sets for various types of relations and functions. On the basis of the above information, answer the following questions: **(i)** Ravi wishes to form all the relations possible from ***B*** to ***G***. How many such relations are possible? **(ii)** Ravi wants to find the numbers of injective functions from B to G. How many number of injective functions are possible. **(iii)** Let R: B$\rightarrow$ G be defined by R={$(b_1,g_1),(b_2,g_2),(b_3,g_1)$}.Check whether R is injective / surjective / bijective ? **OR** If the track of the final race (for the biker b_1) follows the curve $x^2 = 4y$; (where $0 \le x \le 20\sqrt{2}$ & $0 \le y \le 200$), then state whether the track represents a one-one and onto function or not.(Justify).	 1 1 2

38	**Case-Study 3**: Read the following passage and answer the questions given below : An insurance company believes that people can be divided into two classes: those who are accident prone and those who are not. The company's statistics show that an accident-prone person will have an accident at sometime within a fixed one-year period with probability 0.6, whereas this probability is 0.2 for a person who is not accident prone. The company knows that 20 percent of the population is accident prone. Based on the above information answer the following: (i) What is the probability that a new policyholder will have an accident within a year of purchasing a policy? (ii) Suppose that a new policyholder has an accident within a year of purchasing a policy. What is the probability that he or she is accident prone?	2 2

KENDRIYA VIDYALAYA SANGATHAN, MUMBAI REGION

PRE-BOARD I EXAMINATION

SESSION 2025-26

Subject: Chemistry(043) **Class: XII**

Time Allowed: 3:00 Hours **Max. Marks - 70**

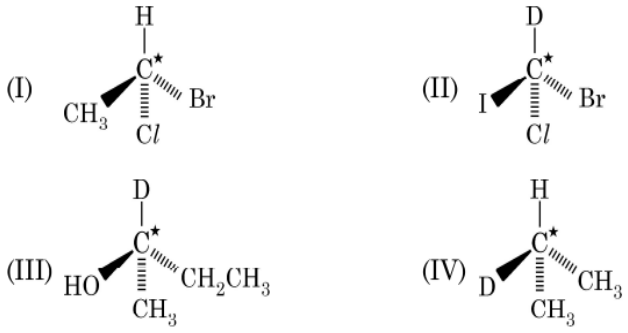
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***General Instructions*:**

Read the following instructions carefully.

1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

	SECTION- A	
1.	If limiting molar conductivity of Ca^{2+} and Cl^- are 119.0 and 76.3 S cm^2 mol^{-1}, then the value of limiting molar conductivity of $CaCl_2$ will be (a) 195.3 S cm^2 mol^{-1} (b) 271.6 S cm^2 mol^{-1} (c) 43.3 S cm^2 mol^{-1} (d) 314.3 S cm^2 mol^{-1}.	1
2.	Which of the following has magnetic moment value of 5.9? (a) Fe^{2+} (b) Fe^{3+} (c) Ni^{2+} (d) Cu^{2+}	1
3.	If concentration of reactant 'A' is increased 10 times and the rate of reaction becomes 100 times. What is the order with respect to 'A'? (A) 1 (B) 2 (C) 4 (D) 10	1
4.	Which one of the following characteristics of the transition metals is associated with higher catalytic activity? (A) High enthalpy of atomisation (B) Paramagnetic behaviour (C) Colour of hydrate ions (D) Variable oxidation states	1

5.	The value of K_H at 298 K for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 40.32, 1.68, $1.84\times10^{-5}$and 0.416 kbar respectively. When these gases are arranged in increasing order of solubility, the correct order is : (A) HCHO < CH_4 < CO_2 <Ar (B) HCHO < CO_2 < CH_4<Ar (C) Ar< CO_2< CH_4< HCHO (D) Ar< CH_4< CO_2< HCHO	1
6.	Based on crystal field theory, the electronic configuration of d^6in terms of $t_{2g}$and e_g in an octahedral field when Δ_o< P will be- (A) $t_{2g}^6 e_g^0$ (B) $t_{2g}^3 e_g^3$ (C) $t_{2g}^4 e_g^2$ (D) $t_{2g}^2 e_g^4$	1
7.	In which of the following molecules, C atom marked with asterisk is chiral?  (A) I, II, and III (B) I, II, IV(C) I, III, IV (D) I, II, III, IV	1
8.	Which one of the following halides contains $'C_{sp^2}$– X'bond ? (A) Alkyl halide (B) Allyl halide (C) Vinyl halide (D) Benzyl halide	1
9.	Out of the following organic compounds, the one which will react with Lucas reagent at room temperature is : (A) $CH_2 = CH - CH_2OH$ (B) $CH_3CH_2CH_2OH$ (C) $C_6H_5CH_2OH$ (D) $(CH_3)_3COH$	1
10.	The correct name of the given reaction is $Ar - N_2^+ X^- \xrightarrow{Cu\ CN/KCN} Ar - CN + N_2$ (A) Sandmeyer's reaction (B) Gabriel Phthalimide synthesis (C) Carbylamine reaction (D) Hoffmann bromamide degradation reaction	1
11.	The organic compounds X, Y and Z are amines having equivalent molecular weight. X and Y on reaction with benzene sulphonyl chloride give white precipitate, however white precipitate obtained from compound Y remains insoluble in NaOH. Compound Z does not react with benzene sulphonyl chloride. Among Compounds X, Y and Z, tertiary amine is/are (A) X and Y (B) only X (C) only Y (D) only Z	1
12.	Maltose on treatment with dilute HCl gives- (A) D-glucose and D-fructose (B) D-glucose and D-galactose (C) D-glucose (D) D-fructose	1
For Questions number 13 to 16, 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 (A), (B), (C) and (D) as given below.		

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true		
13.	**Assertion(A): -** When a cell is placed in hypotonic solution, it shrinks. **Reason (R): -** Reverse osmosis is used for desalination of water.	1
14.	**Assertion (A) :** The units of rate constant of a zero order reaction and rate of reaction are the same. **Reason (R) :** In zero order reaction, the rate of reaction is dependent on the concentration of reactants.	1
15.	**Assertion (A):** Presence of a nitro group at ortho or para position increases the reactivity of Haloarenes towards nucleophilic substitution. **Reason (R):** Nitro group, being an electron withdrawing group decreases the electron density over the benzene ring.	1
16.	**Assertion (A) :** N-Ethylbenzene sulphonamide is soluble in alkali. **Reason (R) :** Hydrogen attached to nitrogen in sulphonamide is acidic.	1
	SECTION- B	
17.	Write the mechanism of acid dehydration of ethanol to yield Ethene. **"OR"** a) Phenol is more acidic than ethanol. Is it correct? Justify your answer. b) What happens when phenol reacts with chloroform in presence of NaOH? Write chemical equation.	2
18.	A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$. [Given: log1=0, log2=0.301, log3=0.4771, log5=0.6990, log7=0.8451, log10=1]	2
19.	(i) Write the shape and magnetic character of $[Ni(CN)_4]^{2-}$ [Atomic number: Ni = 28] (ii) Write the formula of Pentaamminechloridocobalt(III) chloride and the number of ions produced from this complex in solution.	1 1
20.	Give reasons for the following: (a) When 2g of benzoic acid is dissolved in 25 g of benzene, the experimentally determined molar mass is always greater than the true value. (b) Mixture of ethanol and acetone shows positive deviation from Raoult's Law.	2
21.	Give one point of difference between **any two** of the following pairs : (a) Starch and Cellulose (b) Glycosidic linkage and Peptide bond (c) Primary and Secondary structure of protein	1+1

SECTION- C

22. Shanu's automobile radiator is filled with 1.0 kg of water. How many grams of ethylene glycol (Molar mass = 62 g/mol) must Shanu add to get the freezing point of the solution lowered to - 2.8 °C. [3]
[K_f for water is 1.86 $Kkgmol^{-1}$.]

23. Write the reactions taking place at anode and cathode, and calculate the emf of the following cell at 298K $Cr|Cr^{3+}(0.1M)||Fe^{2+}(0.001M)|Fe$ [3]
[Given: $E^o_{Cr^{3+}/Cr} = -0.74\,V$, $E^o_{Fe^{2+}/Fe} = -0.44V$.]

24. The following data were obtained during the kinetic studies of the reaction : [3]

$$A + 2B \rightarrow C + 2D$$

Experiment	Initial [A] (mol/L)	Initial [B] (mol/L)	Initial rate of formation of C ($M\ min^{-1}$)
1	0·10	0·10	$3{\cdot}0 \times 10^{-4}$
2	0·30	0·30	$9{\cdot}0 \times 10^{-4}$
3	0·10	0·30	$3{\cdot}0 \times 10^{-4}$
4	0·20	0·40	$6{\cdot}0 \times 10^{-4}$

Determine the order of reaction with respect to each reactant and the overall order of the reaction. Write the rate law expression for the reaction.

25. A compound is formed by the substitution of two chlorine atoms for two hydrogen atoms in propane. Write the structures of the isomers possible. Give the IUPAC name of the isomer which can exhibit Enantiomerism. [3]

26. Give reasons for the following: [1x3]

(a) t-butyl bromide on reaction with sodium methoxide gives alkene as main product and not ether.

(b) Among o-nitrophenol and p-nitrophenol, which will have higher boiling point and why?

(c) The bond angle  in alcohols is slightly less than the tetrahedral angle.

27. Ethanamine reacts with benzoyl chloride to form a product 'X'. Give the structure and IUPAC name of 'X'. Can 'X' undergo Hoffmann bromamide degradation reaction ? If yes, then give the structure of the product. If no, then give reason. [3]

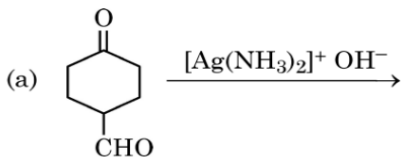
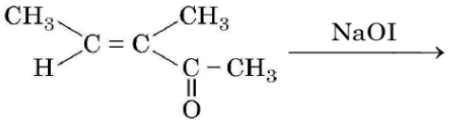
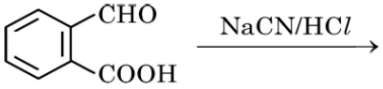
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(a) Name the reaction which can be used to distinguish chemically between Ethanamine and Aniline [1]

(b) For controlled electrophilic substitution reaction of aniline its -NH_2 group is protected by acetylation reaction with acetic anhydride in presence of pyridine. Write the reaction involved and name of the main product. [1]

(c) Write the product formed when benzene Diazonium chloride is treated with KI [1]

28.	(a) Write the IUPAC name of- H_3C-CH(Br)CH(CH_3)COOH. (b) Which acid of CH_3COOH and CH_2FCOOH would you expect to be stronger? Justify your answer. (c) Arrange the following in increasing order of their boiling points- Propanol, Propanal, Propane, Propanoic acid.	1 1 1
	SECTION- D	
29.	The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds are known to play many important functions in area of analytical chemistry, metallurgy, biological system, industry and medicine. Formation of coordination compound is largely used in analytical chemistry for the qualitative detection and qualitative estimation of metal ions. Coordination compounds also find poisoning caused by ingestion of poisonous metal by human beings. In coordination compound metal show two types of linkages- primary and secondary. Primary valencies are ionisable are satisfied by negatively charged ions. Secondary valencies are non- ionisable and are satisfied by neutral or negative ions having lone pair of electrons. Primary valencies are non-directional while secondary valencies decide the shape of the complexes. Answer the following questions : (i) What mass of AgCl will get precipitated when 4 mole of $[Ni(H_2O)_6]Cl_2$ reacts with excess of $AgNO_3$? [Given: At. Mass of N= 14u, O = 16u, Cl = 35.5u, Ni = 59u, Ag = 108u) (ii) Name the red pigment of blood which acts as an oxygen carrier and is a complex of Fe^{2+} and porphyrin. **"OR"** (iii) Low spin octahedral complexes of Nickel are not known. Give reason ? (iv) What is the primary and secondary valency of $[Co(en)_3]^{3+}$?	 2 1 1
30.	Reduce carbohydrates, increase protein to check diabetes, older people may need greater carbohydrates reduction. An average Indian derives 61 – 64% of energy from consumption of food rich in carbohydrates. A study published in the Journal of Diabetes Care has recommended reducing this to 49 – 56% for remission or prevention of Type 2 diabetes, one of the leading causes of death worldwide. Along with reducing carbohydrate intake, the study suggests that one should also increase protein intake up to 14 – 20% of the total energy consumption. Fat should contribute not more than 21 – 27% of the total energy consumption. In simple words, 50% of the plate should consist of fruits and green vegetables, 25% carbohydrates, 25% food rich in protein. Type 1 diabetes is due to deficiency of insulin. Answer the following questions : (a) Write any two functions of carbohydrates. (b) What are monosaccharides? (c) (i) Write the name of the deficiency diseases caused due to the lack of Vitamin D.	 2 1

	"OR" (c)(ii) Name the hormone which maintains the glucose level within narrow limit in the blood.	1
	SECTION- E	
31.	(i) A solution of $Ni(NO_3)_2$ is electrolyzed between platinum electrodes using a current of 5.0 ampere for 20 minutes. What mass of nickel will be deposited at the cathode? (Given : At. mass of Ni = 58.7 g mol^{-1}, 1F = 96500 C mol^{-1}) (ii) How does molar conductivity of strong and weak electrolytes vary with concentration? Explain with diagram **"OR"** (a) The conductivity of 0.001 M acetic acid is 4×10^{-5} S/cm. Calculate the dissociation constant of acetic acid, if molar conductivity at infinite dilution for acetic acid is 390 S cm^2/mol (b) Write the chemistry of lead storage battery when it is being used (discharged).	3 2 3 2
32.	(a) Account for the following: (i) Transition metals exhibit higher enthalpies of atomization. (ii) Cr^{2+} is reducing and Mn^{3+}oxidising when both have d^4 configuration. (iii) Transition metals form alloys (iv) (b) Complete and balance the following chemical equations : (i) $MnO_4^-(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$ (ii) $Cr_2O_7^{2-}(aq) + C_2O_4^{2-}(aq) + H^+(aq) \rightarrow$ **"OR"** (A) Why the second and third members in each group of the transition elements have similar atomic radii? (B) Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only? (C) The $E^0_{M^{2+}/M}$value for copper is positive (0.34 V), what is possibly the reason for this? (D) Write the reactions involved in the preparation of potassium permanganate from MnO_2.	1 x 3 1 x 2 1 1 1 2
33.	(i) Write the structure of expected product of – (A) Cannizarro reaction of 2-chlorobenzaldehyde. (B) Wolf-Kishner reduction of 2 –methylbutanal. (ii)Draw the structures of major product(s) in each of the following reactions : (a)  (b)  (c) 	 1 ×2 1 × 3

	"OR" (i) Carry out the following conversions: (I) Propanone to Propane (II) Acetophenone to Benzoic acid (III) Benzyl chloride to Phenylethanoic acid	1 × 3
	(ii) An alkene 'A' (Mol. formula C_5H_{10}) on ozonolysis gives a mixture of two compounds, 'B' and 'C'. Compound B' gives positive Fehling's test and forms Iodoform on treatment with I_2 and NaOH. Compound C' does not give Fehling's test but forms iodoform. Identify the compounds A, B, and C. Write the reaction for ozonolysis and formation of iodoform from B and C. Write IUPAC name of ABC	1 × 2

KENDRIYA VIDYALAYA SANGATHAN MUMBAI REGION

PREBOARD-1 EXAMINATION (2025-26)

SET – 1

SUBJECT: PHYSICS-042 (THEORY)

Maximum Marks: 70 Marks **Time: 3 hours.**

General Instructions:

(1) There are 33 questions in all. All questions are compulsory.

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

(3) All the sections are compulsory.

(4) **Section A** contains **sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B** contains **five questions of two marks each, Section C** contains seven questions of three marks each, **Section D** contains **two case study based questions of four marks each** and **Section E** contains **three long answer questions of five marks each.**

(5) There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C and all three questions in Section E. You have to attempt only one of the choices in such questions.

(6) Use of calculators is not allowed.

(7) You may use the following values of physical constants where ever necessary

i. $c = 3 \times 10^8$ m s^{-1}

ii. $m_e = 9.1 \times 10^{-31}$ kg

iii. $e = 1.6 \times 10^{-19}$ C

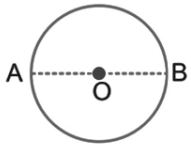
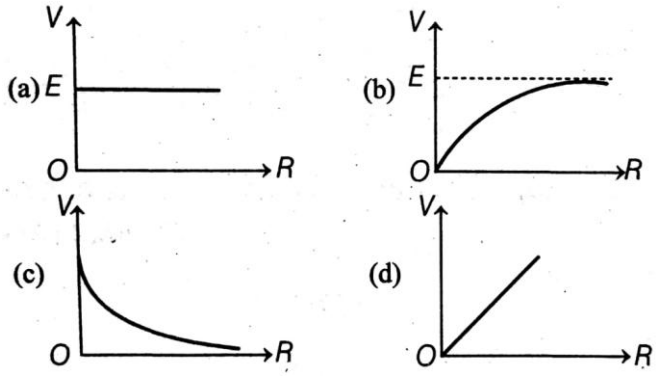
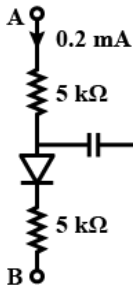
iv. $\mu_0 = 4\pi$ x 10-7 TmA^{-1}

v. $h = 6.63 \times 10^{-34}$ Js

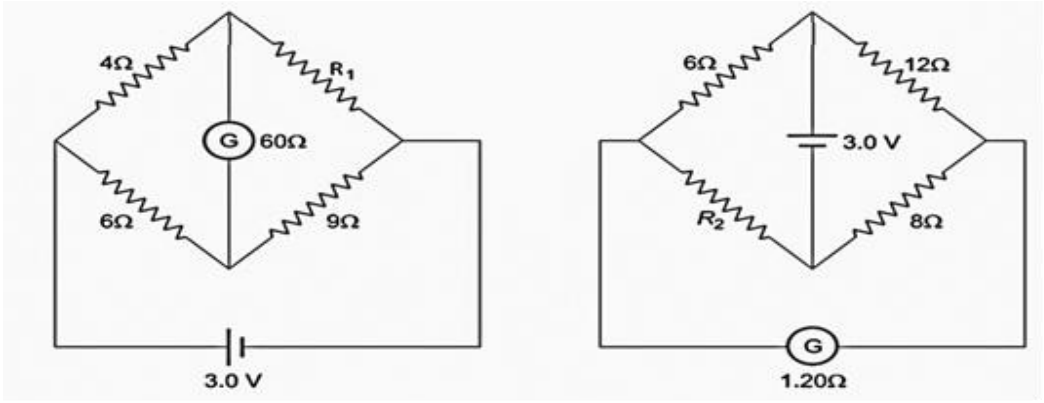
vi. $\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2N^{-1}m^{-2}$

vii. Avogadro's number = 6.023 X 10^{23} per gram mole

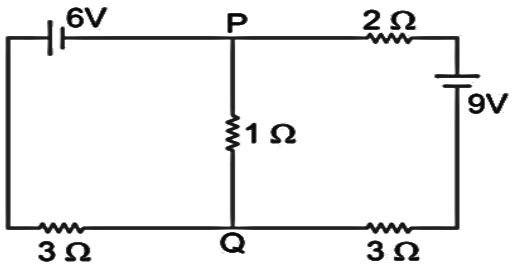
	SECTION A	
1.	The threshold frequency for a photosensitive metal is 3.3×10^{14} Hz. If light of frequency 8.2×10^{14} Hz is incident on this metal, the cut-off voltage for the photoelectron emission is nearly	1

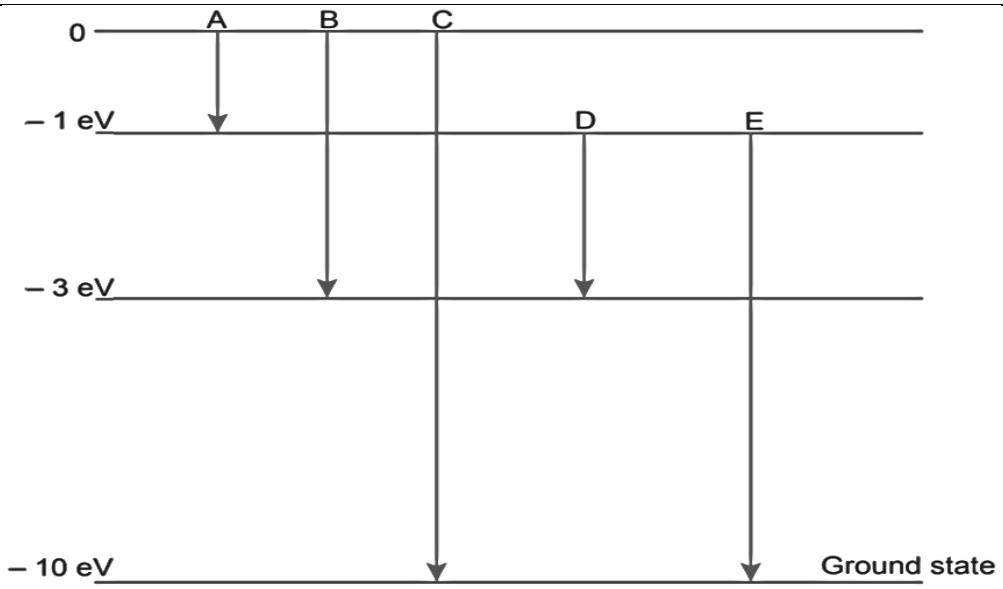
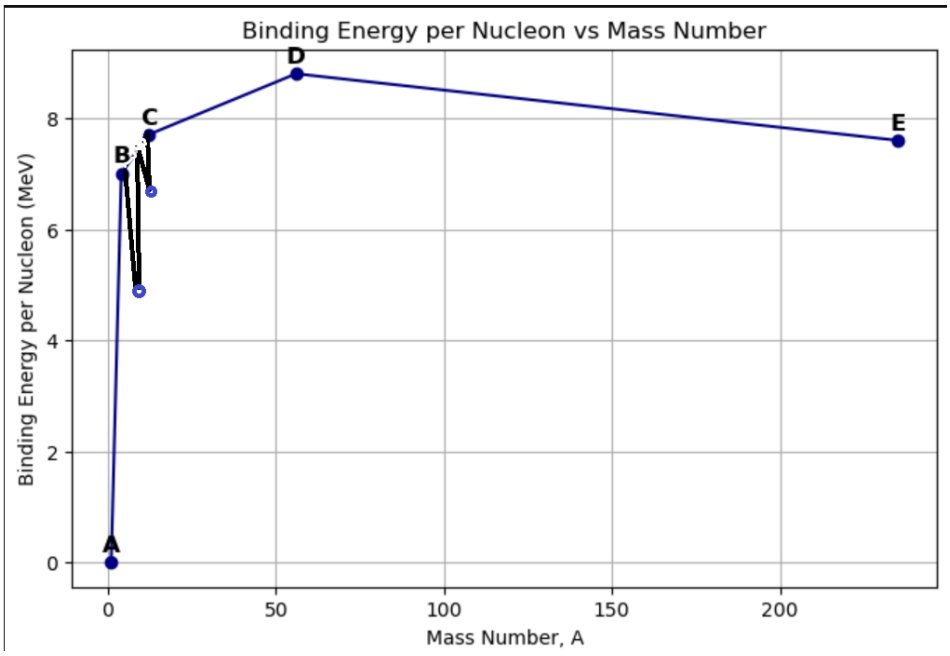
	(a) 1 V (b) 2 V (c) 3 V (d) 5 V	
2.	A wire of resistance 12Ω/m is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points A and B as shown in figure is  (a) 3 Ω (b) 6 π Ω (c) 6 Ω (d) 0.6πΩ	1
3.	A cell of emf E and internal resistance r is connected across a variable external resistance R. The graph of terminal potential difference V as a function of R is 	1
4.	The impurity atoms to be doped in pure silicon to form p-type semiconductor are, of (a) phosphorus (b) germanium (c) antimony (d) aluminium	1
5.	In the circuit shown in figure, if the diode forward voltage is 0.3 V, the voltage difference between A and B is (a) 1.3 V (b) 2.3 V (c) 0 (d) 0.5 V 	1
6.	The ratio of energies of the hydrogen atom in its first to second excited state is (a) 1 : 4 (b) 4 : 1 (c) 4 : 9 (d) 9 : 4	1
7.	If the focal length of objective lens is increased, then magnifying power of (a) microscope will increase but that of telescope decrease (b) microscope and telescope both will increase (c) microscope and telescope both will decrease (d) microscope will decrease but that of telescope will increase	1
8.	The angle between electric field and equipotential surface is (a) 90^o always (b) 0^0 always (c) 0^0 to 90^o (d) 0^o to 180^o	1

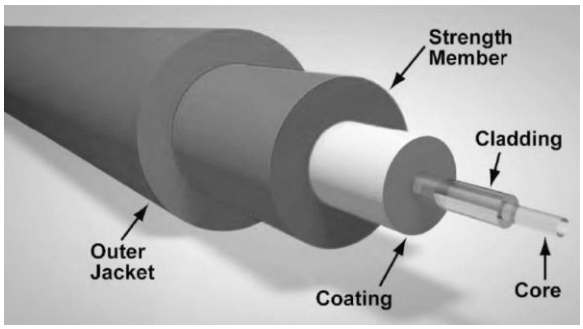
9.	The S I unit of inductance is (a) Farad (b) Henry (c) weber (d) Tesla	1
10.	The permeability of a magnetic material is 0.9983. Name the type of magnetic materials it represents. (a) Paramagnetic (b) Ferromagnetic (c) Diamagnetic (d) all of the above	1
11.	Out of the following options which one can be used to produce a propagating electromagnetic wave? (a) A charge less particles (b) An accelerating charge (c) A charge moving at constant velocity (d) A stationary charge	1
12.	A proton and a deuteron are accelerated through the same accelerating potential, value of de-Broglie wavelength of (a) proton greater than deuteron (b) deuteron greater than proton (c) deuteron and proton have same (d) none of the above	1
For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. **(a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.** **(b) If both Assertion and Reason are true but Reason is not the correct of Assertion.** **(c) If Assertion is true but Reason is false.** **(d) If both Assertion and Reason are false.**		
13.	**Assertion:** Thin films such as soap bubble or a thin layer of oil on water show beautiful colours when illuminated by white light. **Reason:** It is due to interference of sun's light reflected from upper and lower surfaces of the film.	1
14.	**Assertion:** Two parallel conducting wires carrying currents in same direction, come close to each other. **Reason:** Parallel wires carrying currents in same direction repel and Parallel wires carrying currents in opposite direction attract.	1
15.	**Assertion (A):** On increasing the intensity of light the photocurrent increases. **Reason (R):** The photocurrent increases with increase of frequency of light.	1
16	**Assertion (A):** If a convex lens is kept in water, its convergence power decreases.	1

	Reason (R): The refractive index of convex lens relative to water is less than that relative to air.	
	SECTION B	
17.	Figure shows two circuits each having a galvanometer and a battery of 3 V. When the galvanometers in each arrangement do not show any deflection, obtain the ratio R_1/R_2.  **Circuit -1** **Circuit -2**	2
18.	What role does infra-red radiation play in (i) maintaining the earth's warmth and (ii) physical therapy?	2
19.	(i) Draw a graph showing variation of photo-electric current (I) with anode potential (V) for different intensities of incident radiation. Name the characteristic of the incident radiation that is kept constant in this experiment.	2
20.	(A) Distinguish between diamagnetic and ferromagnetic material. OR (B) Show diagrammatically the behaviour of magnetic field lines in the presence of (i) paramagnetic and (ii) diamagnetic substances. How does one explain this distinguishing feature?	2
21.	(A) What is total internal reflection? Write the conditions for total internal reflection OR (B) A small bulb is placed at the bottom of a tank containing water to a depth of 80 cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 4/3.	2
	SECTION C	
22.	(A)Which two of the following lenses L_1, L_2 and L_3 will you select as objective and eyepiece for constructing best possible (i) telescope, (ii) microscope? Give reason to support your answer.	3

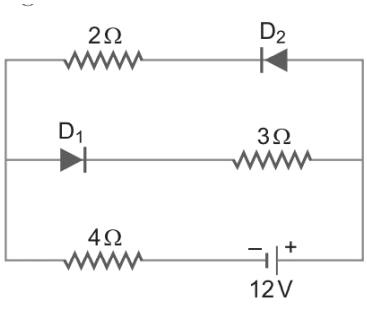
Lens	Power (P)	Aperture (A)
L_1	6 D	1

	<table><tr><td>L_2</td><td>3 D</td><td>8</td></tr><tr><td>L_3</td><td>10 D</td><td>1</td></tr></table> (B) In a Young's double-slit experiment the fringe width is found to be 0.4 mm. If the whole apparatus is dipped in water of refractive index 4/3, without disturbing the arrangement, Find the value of new fringe width.	
23.	An ac source of voltage $V = V_0 \sin \omega t$ is connected to a series combination of L, C and R. Use the phasor diagram to obtain expressions for impedance of the circuit and phase angle between voltage and current.	3
24.	Find the magnitude and direction of current in 1Ω resistor in the given circuit. 	3
25.	Define wave front. What is the shape of the wavefront in each of the following cases (i) light diverging from a point source. (ii) light emerging out of a convex lens when a point source is placed at its focus.	3
26.	(A) Show that energy of electron in Bohr's orbit is inversely proportional to square of principle quantum number. OR (B) The energy levels of an atom of element X are shown in the diagram. Which one of the level transitions will result in the emission of photons of wavelength 620 nm? Support your answer with mathematical calculations.	3

		
27.	State Gauss's law derive an expression for electric field due to an infinite charged plane sheet	3
28.	Why do stable nuclei never have more protons than neutrons? The figure shows the plot of binding energy (BE) per nucleon as a function of mass number A. The letters A, B, C, D and E represent the positions of typical nuclei on the curve. Point out, giving reasons, the two processes (in terms of A, B, C, D and E), one of which can occur due to nuclear fission and the other due to nuclear fusion. 	3
	SECTION D **Case Study Based Questions**	
29.	**Read the following paragraph and answer the questions that follow.**	

	An optical fibre is a thin rod of high-quality glass. Light/infrared getting in at one end undergoes repeated total internal reflection and emerges at the other end. Optical Fibre is wave guided die – electric cable which non-conducting in nature used to data transmission using light pulses travelling in it. It transmits the light without any loss of energy. From one place to another for longer as well as for a shorter distance.  In optical fibre cable light pulses bounce back and transmit from one place to another with any loss in the energy of light. Basically bounce back of light is the phenomena of Reflection of light in the same medium and happens without any loss. We can say Optical Fibre works on the principle of total internal reflections. It is a power full Phenomena which is used in optical fibre cable to transmit data from one place to another place.	
	(i) On which principle, optical fibre works? (a) refraction of light (b) interference of light (c) diffraction of light (d) total internal reflection of light	1
	(ii) The refractive indices of core is (a) equal to cladding (b) more than cladding (c) less than cladding (d) none of the above	1
	(iii) Write two examples similar to optical fibre which are also working on the principle of total internal reflection. (a) Mirage, endoscopy (medical diagnostic tool) (b) Mirage, MRI (medical diagnostic tool) (c) Mirage and X-ray (medical diagnostic tool) (d) brilliance of diamond and ECG (medical diagnostic tool)	1
	(iv) An optical fiber system is designed for efficient data transmission. If a system uses a fiber with a core refractive index of n_1=1.53 and a cladding with an index of n_2. The possible value of n_2 is. (a) 1.63 (b) 1.58 (c) 1.48 (d) 1.65	1

30.	**Read the following paragraph and answer the questions that follow.** Electromagnetic induction finds many applications such as in electrical components which includes transformers, inductors, and other devices such as electric motors and generators. An inductor is a passive component that is used in most power electronic circuits to store energy in the form of magnetic energy when electricity is applied to it. When a current begins to flow through a coil of wire, it undergoes an opposition to its flow in addition to the resistance of the metal wire. On the other hand, when an electric circuit carrying a steady current and containing a coil is suddenly opened, the collapsing, and hence diminishing, magnetic field causes an induced electromotive force that tends to maintain the current and the magnetic field and may cause a spark between the contacts of the switch.	
	(i) Why does a spark appear when a current-carrying circuit with a coil is suddenly opened?	1
	(ii) What is the basic principle behind the working of electric generators and transformers?	1
	(iii) Two spherical bobs, one metallic and the other of glass, of the same size are allowed to fall freely from the same height above the ground. Which of the two would reach earlier and why?	2
	SECTION E	
31.	(a) Show that the potential energy of a dipole making angle θ with the direction of the field is given by U = - $\vec{P}.\vec{E}$. Hence find out the amount of work done in rotating it from the position of unstable equilibrium to the stable equilibrium. (b) Plot a graph comparing the variation of potential V and electric field E due to a point charge Q as a function of distance R from the point charge.	5
	OR (a) An infinitely long positively charged straight wire has a linear charge density λ Cm^{-1}. An electron is revolving around the wire as its centre with a constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy. (b) Plot a graph of the kinetic energy as a function of charge density λ. (c) Five point charges, each of charge +q are placed on five vertices of a regular hexagon of side '*l*'. Find the magnitude of the resultant force on a charge – q placed at the centre of the hexagon.	

32.	(a) Derive an expression for the force per unit length between two long straight parallel current carrying conductors. Hence define SI unit of current (ampere). (b) Draw graphs showing dependence of (i) F on I_1, I_2 when d is kept constant (ii) F on d when the product I_1 I_2 is maintained at a constant positive value.	5
	OR (a) What is working principle moving coil galvanometer. Show that deflection in galvanometer is directly proportional to current flowing through coil. (b) A galvanometer coil has a resistance of 12 Ω and the meter shows full scale deflection for a current of 3 mA. How will you convert the meter into a voltmeter of range 0 to 18 V?	
33.	(a) Explain how the width of depletion layer in a p-n junction diode changes when the junction is (i) forward biased (ii) reverse biased. (b) Draw V – I characteristics of a p–n junction diode. Answer the following questions, giving reasons: (i) Why is the current under reverse bias almost independent of the applied potential upto a critical voltage? (ii) Why does the reverse current show a sudden increase at the critical voltage?	5
	OR (a) Explain the working of P-N junction diode as a full wave rectifier. (b) The circuit shown in the figure has two oppositely connected ideal diodes connected in parallel. Find the current flowing through each diode in the circuit.  (c) A p-n junction diode is damaged by a strong current, why?	

KENDRIYA VIDYALAYA SANGATHAN MUMBAI REGION
PREBOARD I EXAMINATION -2025-26
CLASS: XII
SUBJECT- BIOLOGY (044)

Maximum Marks: 70 **Time: 3 hours**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper has five sections and 33 questions.

(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section–C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v) Wherever necessary, neat and properly labelled diagrams should be drawn.

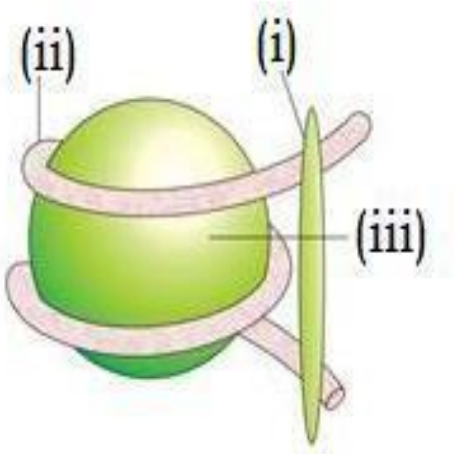
SECTION – A

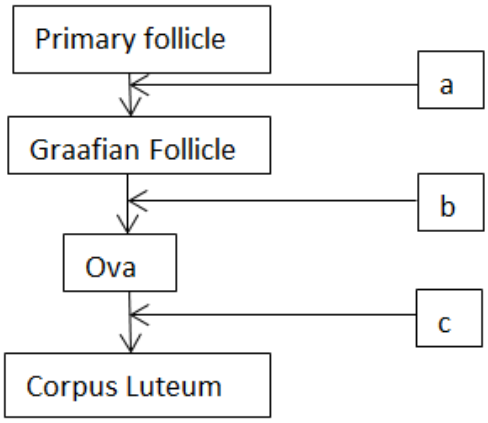
Q. No. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

<table>
<tr><th>Q.No</th><th>Question</th><th>Marks</th></tr>
<tr><td>1.</td><td>In a particular flowering plant, each ovary contains 8 ovules. If 50 flowers are pollinated and 80% ovules get fertilized, how many seeds are expected to be formed?
A. 240
B. 200
C. 320
D. 400</td><td>1</td></tr>
<tr><td>2</td><td>Identify the RNA type that acts as an adapter molecule in protein synthesis by bringing amino acids to the ribosome.
A. rRNA
B. sn RNA
C. t RNA
D. m RNA</td><td>1</td></tr>
<tr><td>3</td><td>Match the phases of Menstrual cycle with key events-
<table><tr><th>Column I (Phase)</th><th>Column II (Event)</th></tr><tr><td>A. Menstrual phase</td><td>1. LH surge</td></tr><tr><td>B. Follicular phase</td><td>2. Endometrial shedding</td></tr><tr><td>C. Ovulation</td><td>3. Endometrial regeneration</td></tr><tr><td>D. Luteal phase</td><td>4. Progesterone production</td></tr></table></td><td>1</td></tr>
</table>

	Select the correct option- A. A-2, B-3, C-1, D-4 B. A-1, B-4, C-2, D-3 C. A-3, B-1, C-4, D-2 D. A-2, B-4, C-3, D-1	
4	Evaluate the following statements regarding DNA packaging in eukaryotes and choose the correct option- Statement A - Histones wrap around DNA to form nucleosome. Statement B - Each nucleosome contains 6 Histone molecules. Statement C - H1 Histone binds DNA at the point where it enters and exits the nucleosome. Statement D - Nucleosomes further coil to form solenoids, which pack into chromosomes. Select the correct option- A. All statements A, B, C and D are correct. B. A, B and C are correct. C. Only B and C are correct. D. Only C and D are correct.	1
5	The number of codons that code for amino-acids is- A. 64 B. 61 C. 63 D. 20	1
6	A 25-year -old woman is advised to use an IUD for contraception. She is concerned about whether it will affect her ability to conceive later. What should be the doctor's advice? A. IUDs cause permanent infertility. B. IUDs are hormonal and irreversible. C. IUDs are reversible and do not affect future fertility. D. IUDs increase the risk of STIs.	1
7	A tall true breeding pea plant is crossed with a dwarf true breeding pea plant. When the F1 plants were self-crossed, the resulting genotype were in the ratio A. 1:2:1 (Homozygous tall: heterozygous tall: dwarf) B. 3:1 (tall: dwarf) C. 3:1 (dwarf: tall) D. 1:2:1 (heterozygous tall: homozygous tall: dwarf)	1
8	A color blind girl is rare because she will be born only when A. Her mother and maternal grandfather were colorblind B. Her father and maternal grandfather were colorblind C. Her mother is colorblind, and father has a normal vision D. Parents have normal vision, but grandparents were colorblind	1

9	Microbes are used during which stage of the purification of sewage water? A. Primary treatment B. Secondary treatment C. None of the above D. Both 1& 2	1
10	Which one of the following factors will not affect the Hardy Weinberg equilibrium? A. genetic drift B. genetic migration C. constant genetic pool D. genetic recombination	1
11	A widely accepted method of contraception in India is- A. IUDs B. diaphragm C. tubectomy D. cervical caps	1
12	The interaction in which both the interacting species are benefitted is exhibited in – A. Mutualism B. Commensalism C. Parasitism D. Predation	1
	Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by 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	
13	Assertion (A): Pollination is the prerequisite for fertilization in flowering plants. Reason (R): Pollination ensures the transfer of female gametes to the male reproductive part of the flower.	1
14	Assertion (A): GM crops are useful in increasing crop yield and decreasing pesticide use. Reason (R): Bt cotton produces a toxin that is harmful to all insects.	1
15	Assertion: Yeast are used in baking industry. Reason: Carbon dioxide produced during fermentation causes bread dough to rise by thermal expansion.	1
16	Assertion: Restriction enzyme recognizes palindromic sequence. Reason: Palindromic sequence reads same in both directions of two strands.	1

	SECTION B	
17	***Attempt either option A or B*** A. State the role of FSH and LH in the female reproductive cycle. **OR** B. What is colostrum? Mention its significance.	2
18	Modern biotechnology has made disease detection quicker and more accurate. Identify the technique used to detect HIV infection at an early stage and briefly explain how it works.	2
19	In a rural area, an outbreak of malaria was reported after stagnant water was found near homes. (i) Name the causative organism and its vector. (ii) Analyse how the environment contributed to the spread of disease?. (iii) Suggest two community-level preventive measures.	2
20	***Attempt either option A or B*** **A.** A geneticist introduces a mutation in the promoter region of a gene in a bacterial cell. As a result, the RNA polymerase is unable to initiate transcription. **(i)** Predict the consequence of this mutation on protein synthesis. **(ii)** Explain the role of the promoter in transcription. **OR** **B.** A mutation occurs in a DNA sequence such that the terminator region is deleted. Predict and explain the outcome of transcription in a prokaryotic cell.	2
21	Write the name of structure given below and identify the labels (i),(ii) and (iii) in it.  	2
	SECTION C	
22	Continued self-pollination leads to inbreeding depression. List three devices, which flowering plants have developed to discourage self-pollination?	3

<table>
<tr><td>23</td><td>Mention the names of the hormones responsible for ovarian changes during the menstrual cycle in the boxes provided.

</td><td>3</td></tr>
<tr><td>24</td><td>What are sexually transmitted diseases (STDs)? Mention any two STDs caused by virus and how they can be prevented?</td><td>3</td></tr>
<tr><td>25</td><td>A cross was carried out between a pea plant heterozygous for round and yellow seeds with a pea plant having wrinkled and green seeds.
(i) Show the cross in a Punnett square.
(ii) Write the phenotype of the progeny of this cross.
(iii) What is this cross known as? State the purpose of conducting such a cross.</td><td>3</td></tr>
<tr><td>26</td><td><table>
<tr><th>S. No.</th><th>Name of the organism</th><th>Commercial product</th><th>Use</th></tr>
<tr><td>1</td><td>Penicillium notatum</td><td>Penicillin</td><td>(a)</td></tr>
<tr><td>2</td><td>(b)</td><td>Lactic acid</td><td>Making curd</td></tr>
<tr><td>3</td><td>Streptococcus</td><td>Clot buster enzyme</td><td>(c)</td></tr>
<tr><td>4</td><td>Trichoderma polysporum</td><td>(d)</td><td>Immuno- suppressive agent</td></tr>
<tr><td>5</td><td>Saccharomyces cerevisiae</td><td>Ethanol</td><td>(e)</td></tr>
<tr><td>6</td><td>(f)</td><td>Swiss cheese</td><td>Food product</td></tr>
</table>
Fill in the blanks a, b, c, d, e and f given in the following table</td><td>3</td></tr>
<tr><td>27</td><td>How would you select a recombinant colony using antibiotic resistant genes? Explain.</td><td>3</td></tr>
<tr><td>28</td><td>Explain the concept of natural selection by evolution with the example of industrial melanism.</td><td>3</td></tr>
</table>

	SECTION D	
29	Read the following case and answer the questions that follow: A geneticist is studying a particular trait in pea plants, specifically flower colour, which can be either purple or white. The purple colour is dominant over the white colour. The geneticist conducts a cross between a homozygous purple-flowered plant and a homozygous, white-flowered plant. The resulting F1 generation consists entirely of purple-flowered plants. Later, the geneticist self-pollinates the F1 plants to produce an F2 generation. The F2 generation exhibits a phenotypic ratio of 3 purple-flowered plants to 1 white-flowered plant. A. What are the genotypes of the parent plants used in the initial cross? (i) PP and pp (ii) Pp and Pp (iii) Pp and pp (iv) PP and Pp B. What is the expected genotypic ratio of the F2 generation? (i) 1 PP: 2 Pp: 1 pp (ii) 1 PP: 1 Pp: 1 pp (iii) 3 PP: 1 pp (iv) 1 Pp: 1 pp C. If a test cross is performed using one of the purple-flowered F2 plants, what would be the purpose of this test cross? (i) To ensure all offspring are purple. (ii) To increase the number of purple flowers. (iii) To determine if the plant is homozygous or heterozygous for the purple flower trait (iv) To observe environmental effects on flower colour. *Attempt either subpart D or E* D. Based on Mendel's laws, explain why the white flower trait reappeared in the F2 generation despite being absent in the F1 generation. **OR** E. This experiment illustrates Mendel's Law of Segregation. Justify.	4
30	Read the following case and answer the questions that follow: India is one of the 12 megadiversity countries, hosting two globally recognized biodiversity hotspots — the Western Ghats and Eastern Himalayas. Despite this, biodiversity is rapidly declining due to factors such as habitat destruction, pollution, and overexploitation.	4

	Conservation strategies like in situ (e.g., national parks) and ex situ (e.g., botanical gardens) have been adopted. However, challenges remain in implementation, funding, and community involvement. A. Evaluate the effectiveness of declaring biodiversity hotspots in actually protecting species from extinction. B. *In situ* conservation is often said to be more effective than *ex situ*. Do you agree? Justify your answer with reasons. C. Assess whether economic development and biodiversity conservation can go hand-in-hand in a country like India. Support your argument with one example. <u>*Attempt either subpart D or E*</u> D. Suggest and evaluate a strategy that could enhance public participation in biodiversity. **OR** E. Evaluate the impact of community-based conservation programs (like the Chipko movement or sacred groves) on long-term biodiversity protection.	
	SECTION E	
31	A nematode adversely affects the production of the Tobacco plant causing great reduction in its yield. A. Identify the nematode. B. Explain the technique developed to protect the crop. C. Name the vector through which the tobacco plant was genetically modified and made nematode resistant. **OR** First Clinical Gene Therapy was given in 1990 to a 4-year-old girl for treatment of her genetic disorder. A. Complete the steps in treatment of her disease i. Lymphocytes from the blood of the patient are grown in culture in vitro condition. ii. _____ iii. The genetically modified lymphocytes are then _____. B. How is the disorder caused? C. Name the enzyme the girl was lacking and mention its importance.	5

<table>
<tr>
<td>32</td>
<td>Symptoms of some important Human Diseases are given below. on the basis of symptoms identify the diseases and name the organisms that cause them.
<table>
<tr><th>S.No.</th><th>Symptoms</th><th>Disease</th><th>Causal Organism</th></tr>
<tr><td>1</td><td>Stomach pain, loss of appetite, sustained high fever, weakness</td><td></td><td></td></tr>
<tr><td>2</td><td>Lips and fingernails may turn gray or bluish in colour in severe case</td><td></td><td></td></tr>
<tr><td>3</td><td>Constipation, abdominal pain, cramps, stools with mucus</td><td></td><td></td></tr>
<tr><td>4</td><td>Internal bleeding, muscular pain, blockage of Intestinal passage</td><td></td><td></td></tr>
<tr><td>5</td><td>Chronic Inflammation of Lymphatic Vessels of Lower limbs</td><td></td><td></td></tr>
</table>
OR
A. What is Innate Immunity? List the four types of barriers that provide Innate Immunity with one example of each.
B. Draw labelled diagram of an Antibody.</td>
<td>5</td>
</tr>
<tr>
<td>33</td>
<td>A. Define Productivity, Gross Primary Productivity and Net Primary Productivity?
B. Which among the above is available for the consumption of herbivores?
C. What is the relation between Gross Primary Productivity and Net Primary Productivity?
OR
Explain the five steps in the process of Decomposition.</td>
<td>5</td>
</tr>
</table>

KENDRIYA VIDYALAYA SANGATHAN, MUMBAI REGION

PRE BOARD 1 EXAMINATION (2025-26)

Applied Mathematics (241)

Class XII

Time Allowed: 3 Hour **Maximum Marks: 80**

General Instructions:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are case study-based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and one sub-part each in 2 questions of Section E.
9. Use of calculators is not allowed.

	SECTION A	
1	The cost of Type 1 rice is Rs.15 per kg and Type 2 rice is Rs.20 per kg.If both Type 1 and Type 2 are mixed in the ratio 2:3, then the price per kg of mixed variety is (a)Rs.15 per kg (b) Rs.12 per kg (c) Rs.18per kg (d) Rs.20 per kg	1M
2	In a 100m race, A can give B a start of 10 m and can give C a start of 28 m. In the same race, B can give C a start of (a)10 m (b) 20 m (c) 18 m (d) 8 m	1M
3	If $x = t^2$ *and* $y = t^3$, then at $t = 1$ the value of $\frac{d^2y}{dx^2}$ (a)3/4 (b)1/2 (c)2 (d)3	1M
4	The inverse of the matrix A=$\begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$ $(a)\frac{1}{17}\begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$ (b)$\frac{1}{17}\begin{bmatrix} 3 & -5 \\ 1 & 2 \end{bmatrix}$ $(c)\frac{1}{17}\begin{bmatrix} 1 & -5 \\ 3 & 2 \end{bmatrix}$ (d)$\frac{1}{17}\begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}$	1M
5	For the annual payment R to remain the same, if the interest rate increases from 5% to 8%, the present value of a perpetuity (a) will decrease (b) will remain the same (c) will increase (d) will become infinite	1M

6	Solution of $-11 \leq 4x - 3 \leq 13$ is (a)[-2,4] (b) [-2,4) (c) (-2,4) (d) {-2,4}	1M
7	A time series consist seasonal variations can occur within a period of (a)Four years (b)one year (c)two years (d)three years	1M
8	$If \int \frac{3x+\frac{7}{6}}{3x^2+2x+1}$ dx = Q $\int \frac{6x+2}{3x^2+2x+1}$ dx $+\frac{1}{6}\int \frac{dx}{3x^2+2x+1}$, then the value of Q is (a)$\frac{1}{6}$ (b)$\frac{1}{3}$ (c)$\frac{1}{2}$ (d)$\frac{1}{4}$	1M
9	The central limit theorem states that if the sample size_____ (a)increases then sampling distribution must approach normal distribution (b)decreases then the sample distribution must approach normal distribution (c)increases then the sampling distribution much approach an exponential distribution (d)decreases then the sampling distribution much approach an exponential distribution	1M
10	If α = P(Type I Error), then 1 – α is (a) probability of not rejecting H_o , when H_o is true (b) probability of rejecting H_o , when H_o is true (c) probability of not rejecting H_o , when H_o is not true (d) probability of rejecting H_o , when H_o is not true	1M
11	For what value of x, the matrix A=$\begin{bmatrix} 1+x & 7 \\ 3-x & 8 \end{bmatrix}$ is singular? (a)-29 (b)13/15 (c)1 (d)2	1M
12	The order of the differential equation $\left(\frac{dy}{dx}\right)^2 + \frac{1}{(\frac{dy}{dx})} = 2$ (a) 2 (b) 1 (c) 5 (d) 3	1M
13.	The present value of a perpetuity of Rs.5,000 payable at the end of each year, if money is worth 5% compounded annually, is (a)Rs.50,000 (b) Rs.1,00,000 (c) Rs.1,50,000 (d)Rs. 2,00,000	1M
14	If A be a square matrix such that | adj A| = | A|^2 , then the order of A is (a)3x3 (b)2x2 (c)2x3 (d)3x2	1M
15	The point at which the maximum value of Z = 3x+ 2y subject to the constraints x+ 2y≤2 , x ≥0, y ≥0 is ..... (a) (0, 0) (b) (1.5, – 1.5) (c) (2, 0) (d) (0, 2)	1M
16	A fair coin is tossed 6 times. Let X be the number of heads obtained. If $P(X = k) = P(X = k + 2)$, then the value of k is (a) 4 (b) 3 (c) 2 (d) 1	1M

17	A and B are square matrices each of order 3 such that |A| = - 1 and |B| = 3, then the value of |3AB| is (a) -9 (b) -18 (c) -27 (d) -81	1M
18	Using flat rate method, the EMI to repay a loan of ₹ 5,00,000 in 5 years at an interest rate of 10% p.a. is (a) ₹ 13,000 (b) ₹ 11,500 (c) ₹ 12,000 (d) ₹ 12,500	1M
	Questions numbers 19 and 20 are Assertion and reason-based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). **Select the correct answer from the options (A), (B), (C) and (D) as given below:** (a)Both Assertion (A) and Reason (R) are true, and (R) is the correct explanation of Assertion (A). (b)Both Assertion (A) and Reason (R) are true, but (R) is not the correct explanation of Assertion (A). (c)Assertion (A) is true but Reason (R) is false. (d)Assertion (A) is false but Reason (R) is true.	
19	**Assertion (A):** Let A be a 2 x 2 matrix, then $adj\ (adj\ A) = A$ **Reason (R):** $\|adj\ A\| = \|A\|$	1M
20	**Assertion (A):** In Poisson Distribution , mean and variance are equal. **Reason (R):** In a Poisson Distribution, Mean = m and SD=$(m)^{1/2}$	1M
	SECTION B	
21.(a) 21.(b)	Find the last digit of ($183! + 3^{183}$). **OR** Anuj can row upstream a boat at 10 km/hr and downstream at 18 km/hr.Find the rate at which he rows the boat in still water.	2M
22	A random variable X has the following probability distribution: $P(X = x) = \begin{cases} a\,x, & \text{if } x = 1, 2, 3 \\ b, & \text{if } x = 4 \end{cases}$ where a and b are constants. If it is given that the mean of the distribution is 2.8, then find the values of a and b.	2M
23	A refrigerator costing Rs.75,000 has an estimated useful life of 8 years and a scrap value of Rs.5,000. Find the depreciation rate percentage.	2M
24	An unbiased die is thrown again and again until 3 sixes are obtained. Find the probability of obtaining a third six in the sixth throw of the die. **OR**	2M

	Suppose 2% of the items made by a factory are defective. Find the probability that there are 3 defective items in a sample of 100 items, selected at random. Given that e^{-2}=0.135.	
25	The value $V(t)$ of a machine at time t, in years, follows a linear depreciation model, where the initial value of the machine is ₹ 25,000 and it depreciates by ₹ 2,500 each year. At what time will the value of the machine be half of its initial value? Find the value of the machine after 6 years.	2M
	SECTION C	
26.	Two pipes A and B can fill a cistern in 12 hours and 8 hours respectively. The pipes are opened simultaneously, and it is found that due to leakage in bottom, 12 min extra are taken to the cistern to be filled. If the cistern is full, in how much time the leak empties the cistern alone?	3M
27.	The total revenue received from the sale of x units of a product is given by $R(x)=36x + 3x^2+5$.Find (i) The average revenue (ii) The marginal revenue The marginal and average revenue when x=5.	3M
28	A bond having a face or maturity value of 56,000, redeemable at par in 6 years carries a coupon rate of 7% p.a., to be paid quarterly. Find the purchase price of the bond if effective yield rate is to be 9% p.a., compounded quarterly. [Use $(1.0225)^{-24} = 0.58$] **OR** A company purchases a machine for 50,000. The machine is expected to be used for 8 years, and its scrap value at the end of this period is estimated to be 6,000. A sinking fund is set up for replacing the machine with a new one after 8 years, which is expected to cost 30% more than the current machine. The sinking fund earns 6% interest per annum, compounded annually. Calculate the yearly payment required to be put in the sinking fund. [Use $(1.06)^8 = 1.6$]	3M
29	A boat takes 1 hr 30 min less to travel 36 km downstream than to travel the same distance upstream. If the speed of boat in still water is 10 km/h, find the speed of stream.	3M
30	The mean weekly sales of a 4-wheeler was 50 units per agency in 20 agencies. After an advertising campaign, the mean weekly sales increased to 55 units per agency with standard deviation of 10 units. Test whether the advertising campaign was successful. [Given $\sqrt{5}$ = 2.24, $t_{19}(0.05)$ = 1.729]	3M
31	A toy company manufactures two types of doll; a basic version doll A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum of 2000 dolls of type A per day. The supply of plastic is sufficient to produce 1500 dolls per day and each type requires an equal amount of each. The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes profit Rs. 3 and Rs. 5 per doll respectively for doll A and doll B.Formulate the LPP.Draw the graph and mark corner points.	3M

SECTION D

32 (5M)

The transport company uses three types of trucks (T1, T2 & T3) to transport 3 types of vehicles (VI. V2 & V3). The capacity of each truck in terms of 3 types of vehicles is given below:

	V1	V2	V3
T1	1	3	2
T2	2	2	3
T3	3	2	2

Using matrix method, find:
The number of trucks of each type required to transport 85, 105 and 110 vehicles of V1, V2 and V3 types of vehicles.

OR

Given the following equations for two related markets A and B, find the equilibrium conditions for each market and the price for each by Cramer's rule:

$x_d(A) = 82 - 3\,p_A + p_B$ $\quad x_S(A) = -5 + 15\,p_A$

$x_d(B) = 92 + 2\,p_A - 4p_B$ $\quad x_S(B) = -6 + 32\,p_B$

where x_d and x_S denotes the quantity demanded and quantity supplied respectively and p_A and p_B represents the price for each in the two markets.

33 (5M)

A radio manufacturer finds that he can sell x radios per week at Rs p each where p=2(100$-\frac{x}{4}$). His average cost of production of x radios per week is Rs (120x+$\frac{x^2}{2}$). Show that this profit is maximum when the production is 40 radios per week.

34 (5M)

Given below are the sales (in lakhsRs.) of a factory during 2008 – 2012.

Year	2008	2009	2010	2011	2012
Sales (in lakhRs.)	35	56	79	80	40

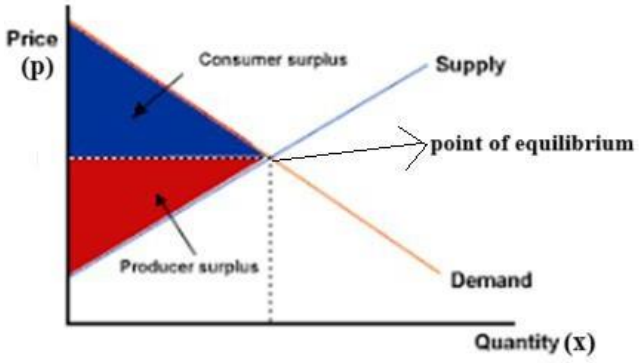
Find the best-fitted trend line by the method of least squares and tabulate the trend values.Also, predict the sales for the year 2012.

OR

The production of soft drink company in thousands of litres during each month of a year is as follows

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.2	0.8	1.4	1.6	1.8	2.4	2.6	3.0	3.6	2.8	1.9	3.4

Calculate the **five** monthly moving averages.

35	Rakesh plans to buy a car worth ₹10,00,000. He makes a down payment of Rs.2,00,000 of the car price and takes a loan for the remaining amount. The loan is to be repaid in 5 years with an annual interest rate of 10%, compounded monthly. Calculate the monthly EMI using the reducing balance method and the total interest paid over the loan period. [Use $(1.0083)^{60} = 1.64$]	5M
	SECTION E	
36	Students of a class were given a mechanical aptitude test. Their marks were found to be normally distributed with mean 60 and standard deviation 5. What percent of a student scored (i) more than 60 marks (ii) less than 56 marks (iii) between 45 and 65 marks	 1M 1M 2M
37	**Analysing the Grain Market for Wheat**  In the grain market for wheat, the relationship between price and quantity demanded can be modelled using a linear demand function. Suppose the following information is available from market data: • At a price of ₹ 20 per kilogram, the quantity demanded is 400 tons. • At a price of ₹ 25 per kilogram, the quantity demanded decreases to 200 tons. Based on the above information, answer the following questions: (i)Formulate the linear demand function based on the given data. (ii)Suppose the supply function is given by $p_S = -15 + \frac{x}{20}$ determine the equilibrium price and quantity.	 1M 1M 2M 2M

	(iii) (a)Using integration, calculate the consumer surplus at the equilibrium price. (OR) iii) (b) Using Integration, Calculate the producer surplus at the equilibrium price.	
38	A factory manufactures tennis rackets and cricket bats. A tennis racket takes 1 and ½ hours of machine time and 3 hours of craftsmanship in its making, while a cricket bat takes 3 hours of machine time and 1 hour of craftsmanship. In a day, the factory has the availability of not more than 42 hours of machine time and 24 hours of craftsmanship. Profit on a racket and on a bat are Rs 20 and Rs 10 respectively. Based on the above information, answer the following questions: (i) If x and y are the numbers of rackets and bats manufactured by the factory, then write the expression of the total profit. (ii) Write the constraint that relates to the number of craftsmanship hours. (iii) Determine the maximum profit (in Rs) earned by the factory.	4M

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