KVR(DR)/2025/RU

KENDRIYA VIDYALAYA SANGATHAN DELHI REGION
PREBOARD-2 EXAMINATION (2025-26)

Class-XII **Subject- Physics**

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

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

iv. $\mu 0 = 4\pi \times 10^{-7}$ TmA^{-1}

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

vi. $\varepsilon 0 = 8.854 \times 10^{-12}$ C N^{-1} m^{-1}

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

SECTION A

Q1: A cell with emf E and internal resistance r is connected to an external resistor of value 2r. What will be the potential difference measured across the cell's terminals?

a) E/4 b) E/2 c) (2/3)E d) E/3

Q2: A particle having a charge $q1$ exerts F electrostatic force on the charge $q2$ at rest. If a particle has a charge $q1/4$ is placed midway between the line joining the two charges $q1$ and $q2$. Then electrostatic force on $q2$ due to $q1$ will become/remain

a) 2F b) F/2 c) F d) zero.

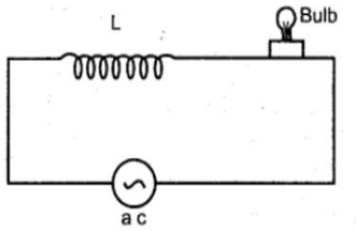
Q3: Consider a solenoid of length l and area of cross-section A with fixed number of turns. The self-inductance of the solenoid will increase if :

a) both l and A are increased

b) l is decreased and A is increased

c) l is increased and A is decreased
d) both l and A are decreased

Q4: An iron cored coil is connected in series with an electric bulb with an AC source as shown in figure. When iron piece is introduced into the coil, the brightness of the bulb will



a) increase
b) decrease
c) remains unaffected
d) fluctuate

Q5: Needles N1, N2 and N3 are made of a ferromagnetic, paramagnetic and diamagnetic substance respectively. A magnet is brought close to them will

a) Attract N1 and N2 strongly but repel N3
b) Attract N1 strongly , but repel N2 and N3 weakly
c) Attract N1 strongly, N2 weakly and repel N3 weakly
d) Attract all these of them.

Q6: A compass needle is placed above a straight conducting wire. If current passes through the conducting wire from South to North. Then the deflection of the compass needle
(a) is towards West
(b) is towards East
(c) keeps oscillating in East-West direction

(d) no deflection

Q7: When an AC voltage of 220 V is applied to the capacitor C
(a) The maximum voltage between plates is 220 V.
(b) The current is in phase with the applied voltage.
(c) The charge on the plates is zero.
(d) Power delivered to the capacitor is zero.

Q8: A plane wave front is incident on a concave mirror of radius of curvature R. The radius of curvature of the reflected wave front will be:
a. 2R b. R c. R/2 d. R/4

Q9: In a single diffraction pattern observed on a screen placed at D ,distance from the slit of width d , the ratio of the width of the central maxima to the width of other secondary maxima is
(a) 2 : 1 (b) 1 : 2 (c) 1 : 1 (d) 3 : 1

Q10: The energy E of a hydrogen atom with principal quantum no. n is given by $E = -13.6/n^2\ eV$. The energy ejected when the electron jumps from $n = 3$ state to $n = 2$ state of hydrogen is approximately.
(a) 0.85 eV (b) 1.5 eV (c) 1.9 eV (d) 3.4 eV

Q11: A proton and an alpha particle are accelerated through the same potential. What is the ratio of de Broglie Wavelength
(A) 2:1 (B) 1:2 (C) $2\sqrt{2}$:1 (D) 1: $2\sqrt{2}$

Q12: In a Young's double slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case
(a) There shall be alternate interference patterns of red and blue
(b) There shall be an interference pattern for red distinct from that for blue
(c) There shall be no interference fringes
(d) there shall be an interference pattern for red mixing with one for blue

For Question 13 to 16, two statements are given – one labelled as Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options given below:

A. Assertion and Reason are true and Reason is the correct explanation of Assertion.

B. Assertion and Reason are true but Reason is Not the correct explanation of Assertion.

C. Assertion is true but Reason is false.

D. Both Assertion and Reason are false.

Q13: Assertion(A): The resistance of a given mass of copper wire is inversely proportional to the square of length.
Reason(R): When a copper wire of a given mass is stressed to increase its length, its cross-sectional area also increases.

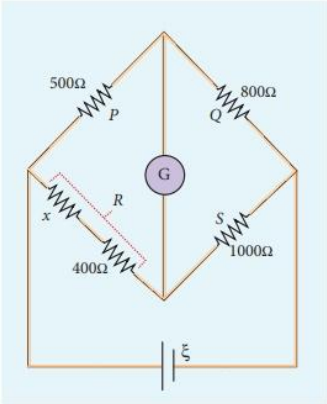
Q14: **Assertion (A):** The focal length of a concave mirror increases with an increase in the wavelength of light used.
Reason (R): The refractive index of the material of the mirror decreases with the increase in wavelength of light.
Q15: **Assertion (A):** The phase difference between any two points on a wave front is zero**.**
Reason (R): All points on a wave front are at the same distance from the source and thus oscillate in the same phase.

Q16: **Assertion**: Among the particles of same kinetic energy, lighter particles have greater de-Broglie wavelength.
Reason: The de-Broglie wavelength of a particle depends only on the charge of the particle.

SECTION B

Q17: What is the value of x when the Wheatstone's network is balanced?

P = 500 Ω, Q = 800 Ω, R = x + 400, S = 1000 Ω



Q18: A straight wire of length L is bent into a semi-circular loop. Use Biot-Savart's law to deduce an expression for the magnetic field at its center due to the current (i) passing through it.

Q19: Obtain the expression for the mutual inductance of two long co axial solenoids S1 and S2 wound one over the other, each of length L and radii r1 and r2 and n1 and n2 number of turns per unit length, when the current I is set up in the outer solenoid.

Q20: The power of a thin lens is +5D. When it is immersed in a liquid, it behaves like a concave lens of focal length 100 cm. Calculate the refractive index of the liquid. Given refractive index of glass = 1.5.

OR

Find the radius of curvature of the convex surface of a plano-convex lens, whose focal length is 0.3 m and the refractive index of the material of the lens is 1.5

Q21: If light of wavelength 412.5nm is incident on each of the metals given below, which ones will show photoelectric emission and why?

Metal	Work Function (eV)
Na	1.92
K	2.15
Ca	3.20
Mo	4.17

Or

A proton and an α- particle are accelerated through the same potential. What will be the ratio of their De Broglie wavelenghth?

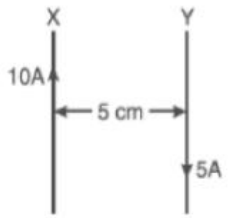
SECTION C

Q22: Define the terms drift velocity and relaxation time. Establish the relation between drift velocity of electrons and electric field applied to the conductor.

Q23: (a)Define Electric flux. Write its unit.

(b) A square plane sheet of side 10cm is inclined at an angle 30^o with direction of uniform electric field of 200N/C. Calculate the electric flux passing through the sheet.

Q24: Two parallel straight wires X and Y separated by a distance 5 cm in air carry current of 10 A and 5 A respectively in opposite direction as shown in diagram. Calculate the magnitude and direction of the force on a 20 cm length of the wire Y.



Q25: Name the parts of the electromagnetic spectrum which is:

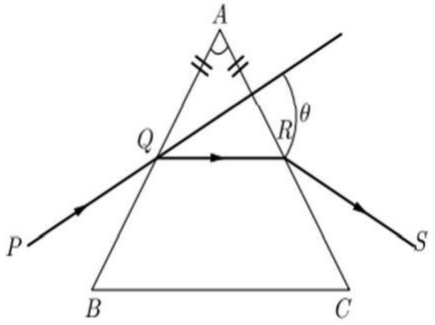
Suitable for radar systems used in aircraft navigation.

Used to treat muscular strain.

Used as a diagnostic tool in medicine.

Write in brief, how these waves can be produced.

Q26: A ray PQ incident on the refracting face BA is refracted in the prism ABC as shown in the figure and emerges from the other refracting face AC as RS such that AQ = AR. If angle of prism A = 60^0 and refractive index of material of prism is $\sqrt{3}$ calculate angle θ



Or

Draw a ray diagram showing the image formation by a compound microscope. Hence obtain expression for total magnification when the image is formed at infinity.

Q27: Calculate the binding energy per nucleon of iron nucleus. Given mass of $^{56}{}_{26}Fe$ = 55.934939u, mass of a neutron = 1.008665u, mass of a proton = 1.007825u.

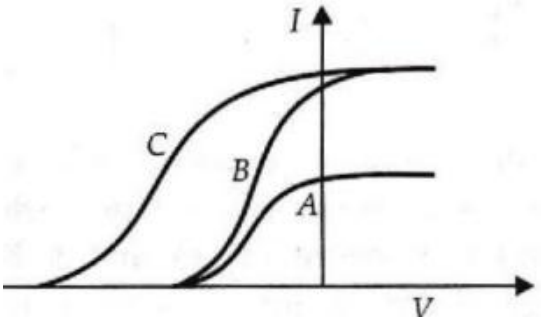
Q28: Draw the necessary energy band diagrams to distinguish between conductors, semiconductors and insulators. How does the change in temperature affect the behaviour of these materials? Explain briefly.

SECTION – D

Case Study: Read the following paragraph and answer the questions 4+4

Q29. It is the phenomenon of emission of electrons from a metallic surface when light of a suitable frequency is incident on it. The emitted electrons are called photoelectrons.
Nearly all metals exhibit this effect with ultraviolet light but alkali metals like lithium, sodium, potassium, caesium etc. show this effect even with visible light. It is an instantaneous process i.e. photoelectrons are emitted as soon as the light is incident on the metal surface. The number of photoelectrons emitted per second is directly proportional to the intensity of the incident radiation. The maximum kinetic energy of the photoelectrons emitted from a given metal surface is independent of the intensity of the incident light and depends only on the frequency of the incident light. For a given metal surface there is a certain minimum value of the frequency of the incident light below which emission of photoelectrons does not occur.

(I)In a photoelectric experiment plate current is plotted against anode potential.



(A) A and B will have same intensities while B and C will have different frequencies
(B) B and C will have different intensities while A and B will have different frequencies
(C) A and B will have different intensities while B and C will have equal frequencies
(D) B and C will have equal intensities while A and B will have same frequencies.

(II) Photoelectrons are emitted when a zinc plate is
(A)heated
(B) hammered
(C) irradiated by ultraviolet light
(D) subjected to a high pressure.

(III) The threshold frequency for photoelectric effect on sodium corresponds to a wavelength of 500 nm. Its work function is about

(A) $4x10^{-19}$ J
(B) 1 J
(C) $2x10^{-19}$ J
(D) $3x10^{-19}$ J

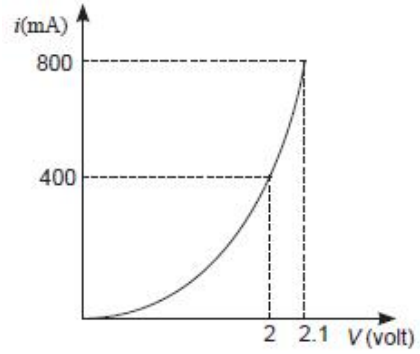
(IV) The maximum kinetic energy of photoelectrons emitted from a surface when photons of energy 6 eV fall on it is 4 eV. The stopping potential is
(A)2 V (B) 4 V (C) 6 V (D) 10 V

OR

(V) The minimum energy required to remove an electron from a substance is called its
(A)work function (B) kinetic energy
(C) stopping potential (D) potential energy.

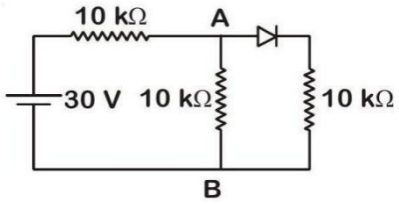
Q30. When an external voltage is applied across a semiconductor diode such that p-side is connected to the positive terminal of the battery and n-side to the negative terminal it is said to be forward biased. The applied voltage mostly drops across the depletion region and the voltage drop across the p-side and n-side of the junction is negligible. When an external voltage is applied across the diode such that n-side is positive and p-side is negative, it is said to be reverse biased. The applied voltage mostly drops across the depletion region.

(I) The I-V characteristic of a p-n junction diode is shown below. The approximate dynamic resistance of the p-n junction when a forward bias of 2 volt is applied



(A) 1 Ω (B) 0.25 Ω (C) 0.5 Ω (D) 5 Ω

(II) In the figure, potential difference between A and B is



(A) Zero (B) 5V (C) 10 V (D) 15 V

(III) Electrical conductivity of a semiconductor
(A) decreases with the rise in its temperature.
(B) increases with the rise in its temperature.
(C) does not change with the rise in its temperature.
(D) first increases and then decreases with the rise in its temperature.

(IV) When a p-n junction is forward biased, then
(A) only diffusion current flows.
(B) both diffusion current and drift current flow but diffusion current is more than drift current.
(C) only drift current flows.
(D) both diffusion and drift current flow but drift current exceeds the diffusion current.

OR
(V) In a p-type semiconductor, there is
(A) excess of one electron.
(B) absence of one electron.
(C) a missing atom.
(D) a donor level.

SECTION: E

Q31: (I) (A) State the working principle of a moving coil galvanometer? What modification is required in the galvanometer to make its scale linear?
(B) If a galvanometer of resistance 49.5Ω has range of 0.05A. What will be the value of resistance needed to convert it in ammeter of range 5A?

Or

31 (II) (A) An input potential V=200 Sin 100 πt V is provided to an ideal transformer having 1000 turns in primary coil and 100 turns in secondary coil. The load circuit has a resistance of 4Ω, a capacitive reactance of 2Ω and an inductive reactance of 6Ω. Find:

(i) the output voltage across the load circuit
(ii) the current flowing through the load circuit
(iii) the power supplied to the load circuit by the transformer

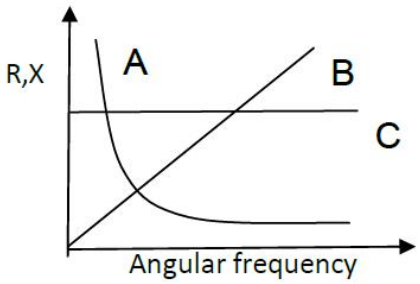
(B) State the working principle of a transformer and explain how it is a key component in the transfer of electrical power over long distances.

Q32 : a). Draw the schematic arrangement for winding of primary and secondary coils in a transformer when the two coils are wound on top of each other.
b. state the underlying principle of a step-up transformer and obtain the expression for the ratio of secondary to primary voltage in terms of number of turns.

c. A transformer of 100% efficiency has 200 turns in the primary and 40,000 turns in the secondary. it is connected to a 220V a.c. mains and the secondary feeds to a 100 k Ohm resistance. Calculate the output potential difference per turn.

OR

a. Figure shows the variation of resistance and reactance versus angular frequency. Identify the curve which corresponds to inductive reactance and capacitive reactance write the mathematical form of their reactance.



b. A series LCR circuit is connected to an ac source (200V, 50Hz). The voltages across the resistor, capacitor and inductor are respectively 200V, 250V and 250V.

i. The algebraic sum of the voltages across the three elements is greater than the voltage of the source. How is this paradox resolved?

ii. Given the value of the resistance of the resistance of R is 40 Ohm, calculate the current in the circuit.

Q33.(I)(A) State Huygen's principle. Draw the reflected wave front for a plane wave front incident on a plane reflecting surface. Hence verify the laws of reflection using Huygen's principle.

(B) A planoconvex lens is made of glass of refractive index 1.5. The radius of curvature of the convex surface is 25 cm. Calculate the focal length of the lens. If an object is placed 50cm in front of the lens, find the nature and position of the image formed. 3+2

Or

Q33(II)(A) Obtain the relation A+δ=i+e for a prism where A is the angle of prism, δ is the angle of deviation, i is the angle of incidence and e is the angle of emergence. Write this relation for the minimum deviation?

(B) If one of the two identical slits producing interference in Young's experiment is covered with glass, so that the light intensity passing through it is reduced to 50%, find the ratio of the maximum and minimum intensity of the fringe in the interference pattern. 3+2