**KENDRIYA VIDYALAYA SANGTHAN DEHRADUN REGION**
**PRE-BOARD EXAMINATION 2025-26**
**SUBJECT- PHYSICS**
**CLASS –XII**

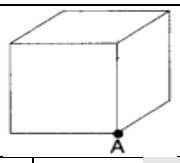
**TIME: 3 HOUR** **MAXIMUM MARKS: 70**

**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 x $10^8$ m/s
ii. me = 9.1 x $10^{-31}$ kg
iii. mp = 1.7 x$10^{-27}$ kg
iv. e = 1.6 x $10^{-19}$ C
v. μ0 = 4π x $10^{-7}$ T m $A^{-1}$
vi. h = 6.63 x$10^{-34}$ J s
vii. ε0 = 8.854 x$10^{-12}$ $C^2N^{-1}m^{-2}$
viii. Avogadro's number = 6.023 X $10^{23}$ per gram mole

**SECTION-A (MCQ)**

Q1 The total flux through the faces of the cube with side of length **a** if charge q is placed at corner A of the cube is — 1 MARK




(a) $\frac{q}{8\varepsilon 0}$ (b) $\frac{q}{4\varepsilon 0}$ (c) $\frac{q}{2\varepsilon 0}$ (d) $\frac{q}{\varepsilon 0}$

Q2 According to Coulomb's law, which is the correct relation for the given figure? — 1 MARK



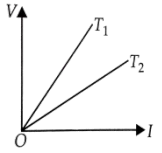
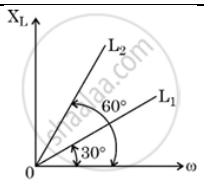

(a) $q_1q_2 > 0$ (b) $q_1q_2 < 0$ (c) $q_1q_2 = 0$ (d)1> $\frac{q_1}{q_2} > 0$

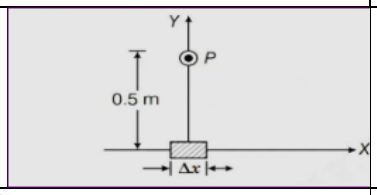
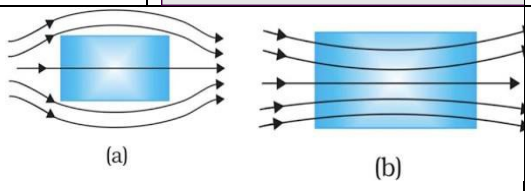
Q3 A straight wire is kept horizontally along east-west direction. If a steady current flows in the wire from east to west, the magnetic field at a point above the wire will point towards — 1 MARK

(a) east (b) west (c) north (d) south

Q4 Two long parallel wires kept 2m apart carry 3A current each, in the same direction. The force per unit length on one wire due to other is — 1 MARK

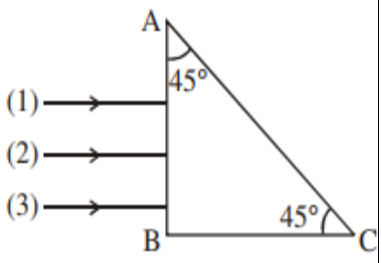
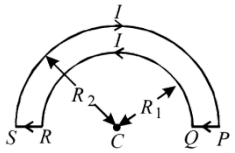
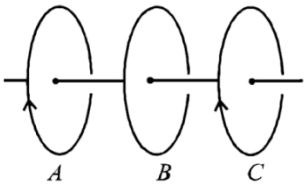
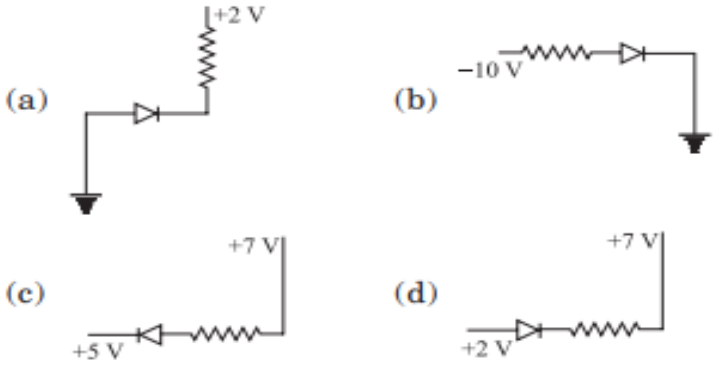
(a)$4.5 \times 10^{-5} Nm^{-1}$attractive (b) $4.5 \times 10^{-7} Nm^{-1}$repulsive
(c) $9 \times 10^{-7} Nm^{-1}$ attractive (d) $9 \times 10^{-5} Nm^{-1}$ attractive

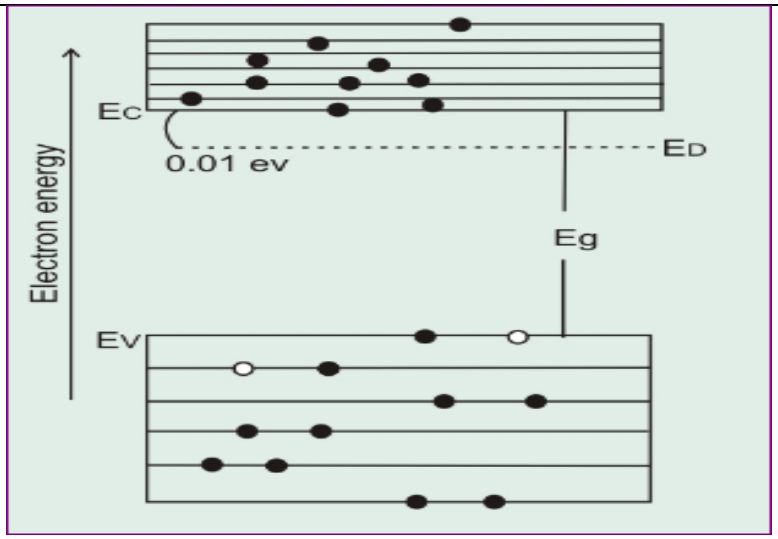
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| Q5 | The voltage V and current I graphs for a conductor at two different temperatures $T_1$and$T_2$ are shown in the figure. The relation between $T_1$and$T_2$ is<br>(a) $T_1 > T_2$ (b) $T_1 < T_2$ (c) $T_1 = T_2$ (d) $T_1 = 2T_2$ |  | 1 MARK |
| Q6 | The magnetic flux linked with the coil(in weber) is given by the equation $\phi = 5t^2 + 3t + 16$. The induced EMF in the coil at time t=4sec will be<br>(a) -27 V (b) -43 V (c) -108 V (d) 210 V | | 1 MARK |
| Q7 | Figure shows the variation of inductive reactance $X_L$ of two ideal inductors of inductance $L_1$ and $L_2$, with angular frequency ω. $L_1$/ $L_2$ is<br>(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) 3 (d) $\frac{1}{3}$ |  | 1 MARK |
| Q8 | In the process of charging of a capacitor the current produced between the plate of the capacitor is<br>(a) $\mu_0 \frac{d\phi_E}{dt}$ (b) $\frac{1}{\mu_0}\frac{d\phi_E}{dt}$ (c) $\varepsilon_0 \frac{d\phi_E}{dt}$ (d) $\frac{1}{\varepsilon_0}\frac{d\phi_E}{dt}$ | | 1 MARK |
| Q9 | For a concave mirror of focal length '$f$' the minimum distance between the object and its real image is<br>(a) Zero (b) f (c)2f (d)4f | | 1 MARK |
| Q10 | The coherence of two light sources means that the light waves emitted have<br>(a)Same frequency (b) same intensity (c) constant phase difference (d) same velocity | | 1 MARK |
| Q11 | The energy of an electron in the ground state of hydrogen atom is -13.6 eV. The kinetic energy and potential energy of the electron in the first excited state will be<br>(a) -13.6eV, 27.2 eV (b) -6.8eV, 13.6eV (c) 3.4eV, -6.8eV (d) 6.8eV, -3.4eV | | 1 MARK |
| Q12 | Two nuclei have their mass numbers in the ratio of 1:27. What is the ratio of their nuclear densities?<br>(a) 1:27 (b) 1:1 (c)1:9 (d)1:3 | | 1 MARK |
| | **(ASSERTION- REASON)** | | |
| | Directions : Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.<br>(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.<br>(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion<br>(c) Assertion is correct, reason is incorrect<br>(d) Assertion is incorrect, reason is incorrect. | | |
| Q13 | **Assertion**- Work done by electric field on moving a positive charge on an equipotential surface is always zero.<br>**Reason**- Electric lines of force are always perpendicular to equipotential surfaces. | | 1 MARK |
| Q14 | **Assertion**- Propagation of light through an optical fibre is due to total internal reflection taking place at the core-cladding interface.<br>**Reason**- Refractive index of the material of the cladding of the optical fibre is greater than that of the core. | | 1 MARK |
| Q15 | **Assertion**- In Young's double slit experiment all fringes are of equal width. | | 1 MARK |

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| | **Reason**- The fringe width depends upon wavelength of light (λ) used, distance of screen from plate of slits(D) and slits separation(d). | |
| Q16 | **Assertion**- An alpha particle is moving towards a gold nucleus. The impact parameter is maximum for the scattering angle of $180^0$<br>**Reason**- The impact parameter in an alpha particle scattering experiment does not depend upon the atomic number of the target nucleus. | 1 MARK |
| | **SECTION-B (2 MARKS)** | |
| Q17 | Four point charges of 1μC, -2μC, 1μC and -2μC are placed at the corners A, B, C, and D respectively, of a square of side 30cm. Find the net force acting on a charge of 4μC placed at the centre of the square. | 2 MARKS |
| Q18 | A battery of emf 12V and internal resistance 4Ω is connected to an external resistance R. If the current in the resistance is 0.5A, calculate the value of (a) R, and (b) the terminal voltage of the battery. | 2 MARKS |
| Q19 | An element $\overrightarrow{\Delta l} = \Delta x \to 0$ is placed at the origin and carries a large current I = 10 A along X-axis . What is the magnetic field on the y-axis at a distance of 0.5 m. Δx=1cm.<br>**OR**   | 2 MARKS |
| Q19 | A uniform magnetic field get modified as shown in figure, when two specimens A and B are placed in it<br>(i) Identify the specimen A and B.<br>(ii) How is the magnetic susceptibility of specimen A is different from that of specimen B.   | 2 MARKS |
| Q20 | The voltage between the plates of a parallel plate capacitor of capacitance 1.0μF is changing at the rate of 5 V $s^{-1}$.What is the displacement current in the capacitor? | 2 MARKS |
| Q21 | If light of wavelength 412.5 nm is incident on each of the metals given below, which one will show photoelectric emission and why? | 2 MARKS |

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

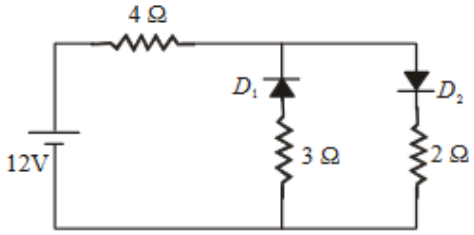
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| Q21 | **OR**<br>Using Rydberg formula calculate the longest wavelength belonging to Lyman and and shortest wavelength in Balmer series. In which region of hydrogen spectrum do these transitions lie? ( $R = 1.0 \times 10^7 m^{-1}$) | 2 MARKS |
| | **SECTION-C (3 MARKS)** | |
| Q22 | State Kirchhoff's laws. Derive condition for balanced Wheatstone bridge. | 3 |
| Q23 | Explain the process of formation of 'depletion layer' and 'potential barrier' in a p-n junction region of a diode, with the help of a suitable diagram. Which feature of junction diode makes it suitable for its use as a rectifier? | 3 MARKS |
| Q24 | Calculate binding energy per nucleon for $^{56}_{26}Fe$. $M(^{56}_{26}Fe) = 55.934939\ u$,<br>$m_n = 1.008665\ u, m_p = 1.007825\ u$ | 3 MARKS |
| Q25 | In Young's double slit experiment, the slits S, and $S_2$ are 3 mm apart and the screen is placed 1.0 m away from the slits. It is observed that the fourth bright fringe is at a distance of 5 mm | 3 MARKS |

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| | from the second dark fringe. Find the wavelength of light used. | | |
| Q26 | Three rays (1,2,3) of different colours fall normally on one of the sides of an isosceles right angled prism as shown. The refractive index of prism for these rays is 1.39,1.47 and 1.52 respectively. Find which of these rays get internally reflected and which get only refracted from *AC*. Trace the paths of rays. Justify your answer with the help of necessary calculations. |  | 3 MARKS |
| Q27 | The wire loop PQRSP formed by joining two semicircular wires of radii R1 and R2 carries a current I as shown. The magnitude of the magnetic induction at the centre C is<br>**OR** |  | 3 MARKS |
| Q27 | A galvanometer is converted into a voltmeter of range (0−*V*) volt using a resistor of 9900Ω. If a resistor of 4900Ω is used, the range becomes half, i.e. (0−*V*/2) volt. Calculate:<br>(a)Resistance of galvanometer<br>(b)Resistance required to convert it into a voltmeter of range(0-2V) volt | | 3 MARKS |
| Q28 | Three identical closed coils A, B and C are placed with their planes parallel to one another. Coils A and C carry equal currents as shown in fig. Coils B and C are fixed in position and coil A is moved towards B with uniform motion. Is there any induced current in B? If no, give reasons. If yes mark the direction of the induced current in this diagram. |  | 3 MARKS |
| | **SECTION-D (CASE STUDY)** | | |
| Q29 | When the diode is forward biased, it is found that beyond forward voltage V = Vk, called knee voltage, the conductivity is very high. At this value of battery biasing for the p-n junction, the potential barrier is overcome, and the current increases rapidly with an increase in forwarding voltage. When the diode is reverse biased, the reverse bias voltage produces a very small current of about a few microamperes which almost remains constant with bias. This small current is a reverse saturation current.<br><br>Q1-In which of the following figures, the p-n diode is forward biased<br><br>Q2-Identify which type of extrinsic semiconductor it is | | 4 MARKS |



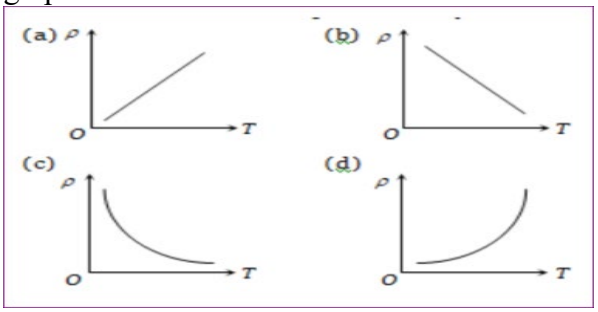

(a) P-type semiconductor (b) n-type semiconductor
(c) intrinsic semiconductor (d) none of these

Q3- The circuit has two oppositely connect ideal diodes in parallel. What is the current following in the circuit

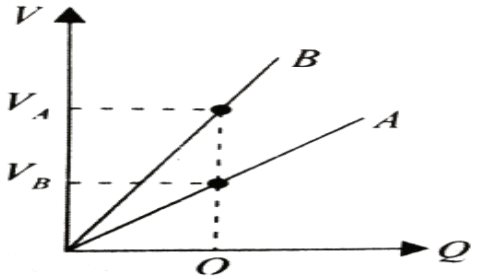



(a) 1.33A (b)1.71A (c) 2.00A (d) 2.31A

Q4-The temperature dependence of resistivity of a semiconductor is represented by which graph




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| Q30 | The concept of 'wave nature of matter' was postulated by de Broglie in 1924. It was confirmed experimentally by Davisson and Germer a few years after its postulation. Therefore, the realization was that 'wave nature' and 'particle nature' can be viewed as the 'two sides of a coin'. Both matter and radiation can exhibit either of these 'natures', depending on the experimental situation. The phenomena of photoelectric effect and the concept of 'matter waves', have been put to very useful and interesting practical applications. We are aware of photocells, automatic doors at shops and malls, automatic light switches that turn on the lights as soon as the intensity drops.<br><br>Q1. The kinetic energy of the electron orbiting in the first excited state of Hydrogen atom is 3.4eV. Determine the de-Broglie wavelength associated with it.<br><br>Q2. In what ways are matter waves different from electromagnetic waves? | 4 MARKS (2+1+1) |

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| | Q3. A proton and an electron have same kinetic energy. Which of them will have greater de-Broglie wavelength associated with it? Justify. | |
| | **SECTION-F (5 MARKS)** | |
| Q31 (i) | (a) A dielectric slab of thickness t, is introduced between the plates of parallel plate capacitor of area A and separation d (t<d). Find an expression for the capacitance with the dielectric slab.<br>(b) The given graph shows the variation of voltage V across the plates of two capacitors A and B versus increase in charge Q stored in them. Which of the capacitors has higher capacitance? Give reason for your answer<br><br><br>(c) Depict equipotential surfaces due to an electric dipole.<br>**OR** | 5 MARKS (3+1+1) |
| Q31 | (a)What is a parallel plate capacitor? Derive an expression for its capacitance. On what factors does the capacitance of a parallel plate capacitor depend?<br>(b)What is electrostatic shielding?<br>(c ) Sketch a graph to show how the capacitance C varies with the charge Q given to it. | 5 MARKS (3+1+1) |
| Q32 (i) | (A) Derive lens maker's formula.<br>(B) The radii of curvature of the two surfaces of a concave lens are 20cm each. Find the refractive index of the material of the lens if its power is -5.0 D<br>**OR** | 5 MARKS (3+2) |
| Q32 (ii) | (A) Define angle of deviation in a prism?<br>(B) 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?<br>(C) Write the condition for minimum deviation. | 5 MARKS (1+3+1) |
| Q33 (i) | (A) How can a galvanometer be converted to an ammeter? Show required circuit diagram.<br>(B) A galvanometer of resistance 50 Ω is converted into a voltmeter of range (0-2V) using a resistor of 1.0 kΩ. If it is to be converted into a voltmeter of range (0-10V). What will be the value of required resistance for this?<br>(C ) What do you mean by figure of merit of a galvanometer?<br>**OR** | 5 MARKS (2+2+1) |
| Q33 (ii) | (a)Explain the principle, and working of an a.c generator. Derive the expression for the induced emf and current.<br>(b)An ac voltage $V_i = 140 \sin(100\pi t)$V is applied to the primary coil having 200 turns , of an ideal transformer and it supplies a power of a 5kW. If the secondary coil has 1000 turns, find<br>( i) the instantaneous voltage across the secondary coil<br>( ii) the current in the secondary coil. ( take $\sqrt{2} = 1.4$ ) | 5 MARKS 3+2 |