Aarohan Coaching Institute

Pre-Board Mock Test

Date: 05 Feb 2027 | **Class XII · Physics** | Duration: 180 Minutes | Max. Marks: 70

Section A — 1 Mark Questions

Q1. The focal length of a spherical mirror of radius of curvature 30 cm is

(A) 30 cm **(B)** 60 cm
(C) 15 cm **(D)** 7.5 cm

Q2. In Young's double-slit experiment, when the screen distance D is much larger than the slit separation d, the fringes near the centre are

(A) circular **(B)** nearly straight
(C) parabolic **(D)** elliptical

Q3. [CBSE 2020] Above Curie temperature, a

(A) ferromagnetic material becomes diamagnetic. **(B)** ferromagnetic material becomes paramagnetic.
(C) paramagnetic material becomes ferromagnetic. **(D)** paramagnetic material becomes diamagnetic.

Q4. [CBSE 2023] A point P lies at a distance x from the mid point of an electric dipole on its axis. The electric potential at point P is proportional to

(A) $\frac{1}{x^2}$ **(B)** $\frac{1}{x^3}$
(C) $\frac{1}{x^4}$ **(D)** $\frac{1}{x^{1/2}}$

Q5. Which transition in hydrogen emits the photon of greatest frequency?

(A) n = 2 → 1 **(B)** n = 5 → 3
(C) n = 6 → 2 **(D)** n = 4 → 3

Q6. A cell of emf ε and internal resistance r is short-circuited. The maximum current it can give is

(A) ε **(B)** εr
(C) ε/r **(D)** r/ε

Q7. [CBSE 2023] Hydrogen atom initially in the ground state, absorbs a photon which excites it to n = 5 level. The wavelength of the photon is

(A) 975 nm **(B)** 740 nm
(C) 523 nm **(D)** 95 nm

Q8. Electromagnetic waves were first produced and detected in the laboratory by

(A) Maxwell
(B) Hertz
(C) Marconi
(D) Bose

Q9. The SI unit of potential is

(A) J
(B) N/C
(C) volt
(D) C/V

Q10. A point charge q is placed at the centre of a cube. The electric flux through one face of the cube is

(A) q/ε_0
(B) $q/4\varepsilon_0$
(C) $q/6\varepsilon_0$
(D) $q/8\varepsilon_0$

Q11. The magnifying power of a simple microscope with f = 5 cm when the image is at the near point (25 cm) is

(A) 6
(B) 5
(C) 4
(D) 25

Q12. The ratio of the speeds of the electron in the first and third orbits of hydrogen is

(A) 3 : 1
(B) 1 : 3
(C) 9 : 1
(D) 1 : 9

Q13. Assertion (A): Kirchhoff's junction rule is based on conservation of charge.
Reason (R): Charge does not accumulate at a junction in the steady state.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true but Reason (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.

Q14. Assertion (A): A wire carrying a steady current has no net charge on it.
Reason (R): In a conductor carrying current, free electrons drift while the positive ions remain fixed, and the total number of electrons equals the total positive charge.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true but Reason (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.

Q15. Assertion (A): The resistance of a wire is doubled when it is stretched to twice its length.
Reason (R): Resistance is directly proportional to length and inversely proportional to area of cross-section.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true but Reason (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.

Q16. Assertion (A): A dipole in a uniform field has zero net force.
Reason (R): A dipole in a uniform field has zero torque at all angles.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true but Reason (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.

Section B — 2 Marks Questions

Q1. How does the forbidden gap of an intrinsic semiconductor change with temperature?

Q2. An electric field $\vec{E} = 20\hat{i} + 30\hat{j}\ \mathrm{N\ C^{-1}}$ exists in free space. If the potential at the origin is taken zero, determine the potential at point (2 m, 2 m).

Q3. A 20 Ω resistor and 2 μF capacitor are in series. Find the impedance for (i) dc (ii) ac of frequency (10/π) kHz.

Q4. A 70-turn coil of average diameter 0.02 m is perpendicular to a field of 9000 T, which changes to 6000 T in 3 s. Find the induced emf.

Q5. Show that the resistivity of a metal is inversely proportional to the relaxation time. How does τ change with temperature?

Section C — 3 Marks Questions

Q1. A spherical capacitor has an inner sphere of radius 9 cm and an outer sphere of radius 10 cm. The outer sphere is earthed and the inner sphere is charged. What is the capacitance of the capacitor?

Q2. Derive the electric potential due to a short dipole at a point at distance r making an angle θ with its axis.

Q3. Given a uniform electric field $\vec{E} = 5 \times 10^{3}\hat{i}\ \mathrm{N\ C^{-1}}$, find the flux of this field through a square of 10 cm on a side whose plane is parallel to the Y-Z plane. What would be the flux through the same square if the plane makes a 30° angle with the X-axis?

Q4. A 6 V cell (r = 1 Ω) and a 4 V cell (r = 1 Ω) are connected in parallel (positive to positive) across a 2 Ω resistor. Find the current through each cell and the resistor.

Q5. An iron rod 0.2 m long, 10 mm in diameter, of relative permeability 1000, is inside a long solenoid with 300 turns/m carrying 0.5 A. Find the magnetic moment of the rod.

Q6. State Lenz's law and explain how it follows from conservation of energy.

Q7. A parallel plate capacitor has plate area of 25.0 cm^2 and a separation of 2.0 mm between its plates. The capacitor is connected to 12 V battery. (i) Find the charge on the capacitor. (ii) If the plate separation is decreased by 1.0 mm, what extra charge is given by the battery to the positive plate?

Section D — 4 Marks Questions

Q1. A parallel plate capacitor (A = 100 cm^2, d = 2 mm) is charged to 100 V by a battery. A dielectric slab of K = 4 completely filling the gap is then inserted, in two different ways: (I) with the battery still connected, (II) after disconnecting the battery.

(a) Find the initial capacitance and charge.

(b) In case (I), what are the new charge and energy?

(c) In case (II), find the new p.d. and energy, and explain where the energy goes.

Q2. A boy leaves his phone charger plugged in and switched on after unplugging the phone. His sister points out that it still draws a little power.

(a) Estimate the energy wasted by a 2 W device left on for 20 hours.

(b) How many units is this per month (30 days) if repeated daily?

(c) Suggest two ways to reduce wastage of electricity at home.

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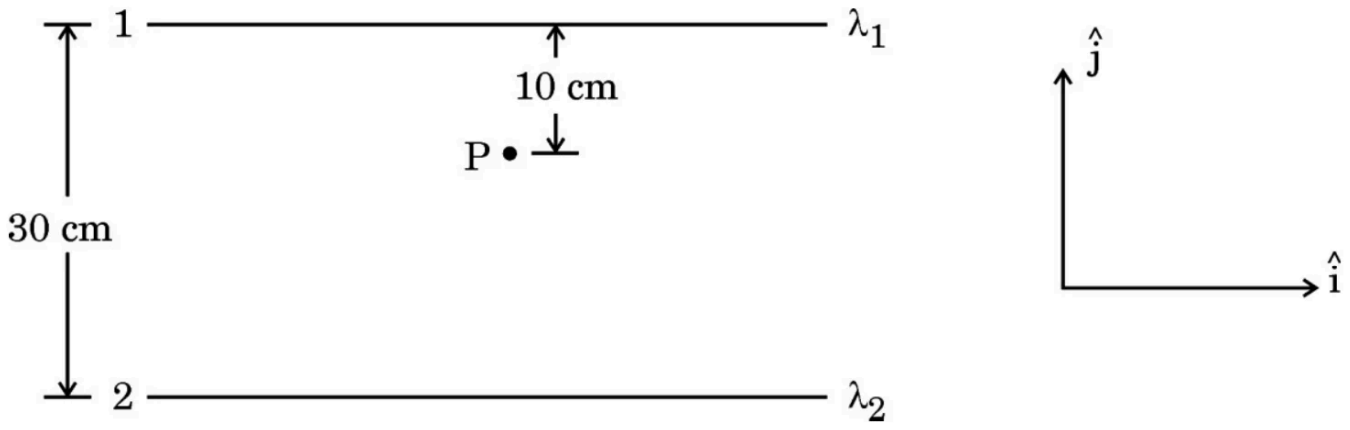
Section E — 5 Marks Questions

Q1. What is nuclear fusion? Explain how the Sun produces energy through the proton–proton cycle and the carbon–nitrogen cycle.

Q2. An ac source $v = v_0 \sin \omega t$ is connected in turn to X (current in phase), Y (current lags by π/2) and Z (current leads by π/2). Identify them. For X, Y, Z in series find the current and net impedance. When is the current amplitude maximum, and what is it?

Q3. [CBSE 2024] (i) State Gauss's Law in electrostatics. Apply this to obtain the electric field $\vec{E}$ at a point near a uniformly charged infinite plane sheet.
(ii) Two long straight wires 1 and 2 are kept as shown in the figure. The linear charge density of the two wires are λ_1 = 10 μC/m and λ_2 = –20 μC/m. Find the net force $\vec{F}$ experienced by an

electron held at point P.



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Question Paper Blueprint

Section	No. of Questions	Total Marks
Section A — 1 Mark	16	16
Section B — 2 Marks	5	10
Section C — 3 Marks	7	21
Section D — 4 Marks	2	8
Section E — 5 Marks	3	15
Total	**33**	**70**

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