Kalyani School

PERIODIC TEST- II (2025-26)
QUESTION PAPER

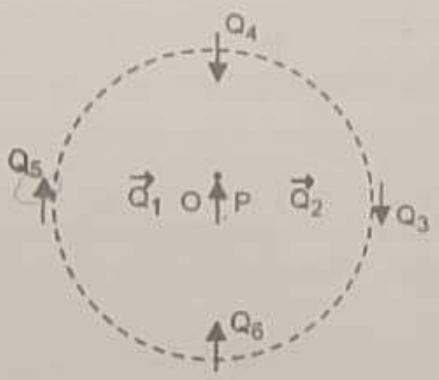
Subject: Physics (042) | **Grade: XII**
Marks: 25 | **Time: 1 Hour**
Name: ---------- | **Date: 04-08-2025**

General Instructions:

i. The question paper consists of five sections: A, B, C, D, and E. It contains 12 questions in total. All questions are compulsory.
ii. Section A - Question Nos. 1 to 4 are Multiple Choice Questions, carrying 1 mark each, and Question Nos. 5 and 6 are Assertion-Reason Type Questions, carrying 1 mark each.
iii. Section B - Question Nos. 7 and 8 are Short Answer Type Questions, carrying 2 marks each.
iv. Section C - Question Nos. 9 and 10 are Short Answer Type Questions, carrying 3 marks each.
v. Section D - Question No. 11 is a Case-Based Question, carrying 4 marks.
vi. Section E - Question No. 12 is a Long Answer Type Question, carrying 5 marks.
vii. There is no overall choice. However, internal choices have been provided in some questions. Attempt only one of the alternatives in such questions.

SECTION - A

1 The figure given below shows the various positions of small magnetized needles P and Q. The arrows indicate the direction of their magnetic moments. Which configuration corresponds to the lowest potential energy among all the configurations shown? [1]



(a) PQ_3 (b) PQ_4 (c) PQ_5 (d) PQ_6

2 A bar magnet with a length of 3 cm has points A and B along its axis. Point A is located 24 cm from the midpoint of the magnet, and point B is located 48 cm from the midpoint, both on opposite sides. The ratio of the magnetic field at point A to that at point B is: [1]

(a) 8 (b) 1/2√2 (c) 3 (d) 4

3 Power 'P_1' is dissipated through a series combination, and power 'P_2' is dissipated through the parallel combination of 3 equal resistors. The ratio of P_1 to P_2 is: [1]

(a) 9 (b) 1/9 (c) 1 (d) 6

4 A charged particle, after being accelerated through a potential difference 'V', enters a uniform magnetic field and moves in a circle of radius 'r'. If V is doubled, the radius of the circle will become: [1]

(a) 2r (b) √2 r (c) 4r (d) r/√2

For Question Nos. 5 and 6, two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Choose the correct option from the following:

(a) Both Assertion and Reason are true, and Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true, but Reason is not the correct explanation of the Assertion.

(c) Assertion is true, but Reason is false.

(d) Both Assertion and Reason are false.

5 **Assertion (A):** When an electron is projected with velocity 'v' along the axis of a current-carrying long solenoid, the path of the electron will be a straight line. [1]

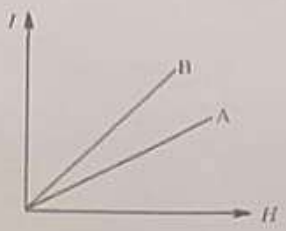
Reason (R): The magnetic field lines inside a long solenoid are parallel and equidistant.

6 **Assertion (A):** The drift velocity of electrons in a metallic wire will decrease if the temperature of the wire is increased. [1]

Reason (R): On increasing temperature, the conductivity of a metallic wire increases.

SECTION - B

7 The figure given below shows the variation of intensity of magnetization 'I' versus the applied magnetic field intensity 'H' for two magnetic materials A and B: [1+1]



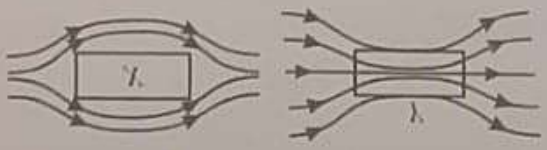
(a) Identify the materials A and B.

(b) Which material A or B have a larger susceptibility, for a given field at constant temperature and why?

8 Two long straight parallel wires A and B, separated by a distance 'd', carry equal current 'I' flowing in the same direction. Find the magnetic field at a point situated between them at a distance 'd/2' from one wire. Show graphically the variation of the magnetic field with distance x for $0 < x < d$. [2]

SECTION - C

9 (a) A uniform magnetic field gets modified as shown in the figure given below when two specimens, X and Y, are placed in it. Identify whether specimens X and Y are diamagnetic, paramagnetic, or ferromagnetic. [1+2]



(b) A circular coil of 16 turns and radius 10 cm carrying a current of 0.75 A rests with its plane normal to an external field of magnitude 5×10^{-2} T. The coil is free to turn about an axis in its plane, perpendicular to the field direction. When the coil is turned slightly and released, it oscillates about its stable equilibrium with a frequency of 2 s^{-1}. What is the moment of inertia of the coil about its axis of rotation?

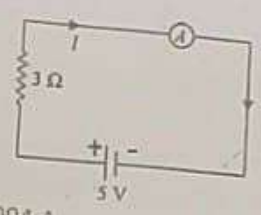
10 (a) Using a circuit diagram, obtain the balance condition in terms of the resistances of the four arms of the Wheatstone bridge. [2+1]

(b) A cell of emf 'E' and internal resistance 'r' is connected across a variable resistor 'R'. Plot a graph showing the variation of terminal voltage 'V' of the cell versus the current I.

SECTION - D

11 In 1942, a German physicist, Kirchhoff, extended Ohm's law to complicated circuits and gave two laws, which enable us to determine current in any part of such a circuit. According to Kirchhoff's first rule, the algebraic sum of the currents meeting at a junction in a closed electric circuit is zero. According to Kirchhoff's second rule, in a closed loop, the algebraic sum of the emf's and the algebraic sum of the products of current and resistance in the various arms of the loop is zero. [4X1]

(i) The value of current in the circuit given below, if the ammeter is a galvanometer with a resistance of 50 Ω, is:

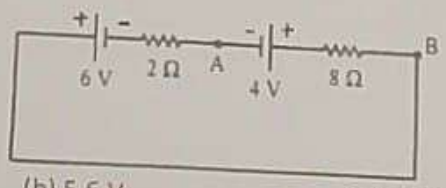


(a) 0.061 A (b) 0.094 A (c) 0.023 A (d) 0.048 A

(ii) Kirchhoff's loop law is based on:
(a) Law of conservation of momentum of an electron
(b) Law of conservation of charge and energy
(c) Law of conservation of energy
(d) None of these

(iii) A wire of 10 Ω resistance is stretched to thrice its original length. Its new resistance will be:
(a) 90 Ω (b) 80 Ω (c) 70 Ω (d) 60 Ω

(iv) The potential difference between points A and B in the circuit given below is:



(a) 4V (b) 5.6 V (c) 2.8 V (d) 6 V

OR

(iv) A metal rod of length 10 cm and a rectangular cross-section of 1 cm × 1/2 cm is connected to a battery across opposite faces. The resistance will be:
(a) maximum when the battery is connected across 1 cm × 1/2 cm faces.
(b) maximum when the battery is connected across 10 cm × 1 cm faces.
(c) maximum when the battery is connected across 10 cm × 1/2 cm faces.
(d) the same irrespective of the three faces.

SECTION - E

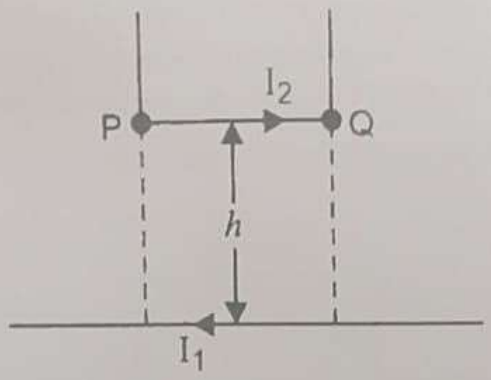
12 (a) Answer the following: [2]
(i) Why is it necessary to introduce a cylindrical soft iron core inside the coil of a galvanometer?
(ii) Why increasing the current sensitivity of a galvanometer may not necessarily increase its voltage sensitivity.

(b) The deflection in a galvanometer falls from 55 divisions to 45 divisions when an 8 Ω shunt is applied. Determine the resistance of the galvanometer. [2]

(c) A uniform conducting wire of length '12a' units and resistance 'R' is wound up as a current-carrying coil in the shape of a square of side 'a' unit. Find the magnetic moment of the coil. [1]

OR

(a) A long straight wire carrying a current of 25 A rests on a table as shown in the figure given below. [2]
Another wire PQ of length 1 m, mass 2.5 g, carries the same current but in the opposite direction.
The wire PQ is free to slide up and down. To what height will PQ rise?



(b) The figure given below shows a long straight wire of a circular cross-section (radius a) carrying steady current I. The current I is uniformly distributed across this cross-section. Using Ampere's Circuital law, calculate the magnetic field in the region r < a and r > a. [3]