

UNIT TEST

Std. 12 (Science Stream)

Time : 1 hour

Subject : Physics

Marks : 25

PART : A

- There are 9 objective type questions in Part A and all questions are compulsory.
 - The questions are serially numbered from 1 to 9 and each carries 1 mark.
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◆ **Choose appropriate option :** [9]

1. A steady current flows in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor ?
(A) Current (B) Current density (C) Electric field (D) Drift-speed
2. Two conductors are made of the same material and have the same length. Conductor A is a solid wire of diameter 1 mm. Conductor B is a hollow tube of outer diameter 2 mm and inner diameter 1 mm. The ratio of resistance R_A to R_B is
(A) 1:1 (B) 2:1 (C) 3:1 (D) 1:3
3. A resistance R is to be measured using a meter bridge. Student chooses the standard resistance S to be 100Ω . He finds the null point at $l_1 = 2.9$ cm. He is told to attempt to improve the accuracy. Which of the following is a useful way ?
(A) He should measure l_1 more accurately.
(B) He should change S to 1000Ω and repeat the experiment.
(C) He should change S to 3Ω and repeat the experiment.
(D) He should give up hope of a more accurate measurement with a meter bridge.
4. The dimensional formula of conductivity is
(A) $ML^3T^{-3}A^{-2}$ (B) $M^{-1}L^{-3}T^3A^2$ (C) $ML^2T^{-3}A^{-2}$ (D) $M^{-1}L^{-2}T^3A^2$
5. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35 cm length of wire. If the cell is replaced by another cell and the balance point shifts to 63 cm, what is the emf of the second cell ?
(A) 2.35 V (B) 3.52 V (C) 1.80 V (D) 2.25 V
6. A straight wire of mass 200 g and length 1.5 m carries a current of 2 A. To be suspended in mid-air by a uniform horizontal magnetic field \vec{B} , the magnitude of magnetic field $B = \dots\dots\dots$ T
(A) 0.65 (B) 1.30 (C) 1.53 (D) 0.25
7. The SI unit of magnetic moment is
(A) Am (B) Nm rad⁻¹ (C) Tm A⁻¹ (D) JT⁻¹
8. A long straight wire carries a current of 35 A. What is the magnitude of the field at a point 20 cm from the wire ?
(A) 11.14×10^{-6} T (B) 35×10^{-6} T
(C) 70×10^{-6} T (D) 12.75×10^{-6} T

9. The gyro-magnetic ratio of an electron in an H-atom, according to Bohr model is
- (A) Dependent of which orbit it is in.
 (B) negative
 (C) positive
 (D) increase with the quantum number n .

PART : B

Section - A

◆ **Question no. 1 to 3 do as directed (Each question carries 2 marks) [6]**

1. What is current density ? Obtain ohm's law in vector form.
2. Explain potentiometer principle.

OR

A silver wire has a resistance of 2.1Ω at 27.5°C and a resistance of 2.7Ω at 100°C . Determine the temperature coefficient of resistivity of silver.

3. What is shunt ? Derive the equation of shunt.

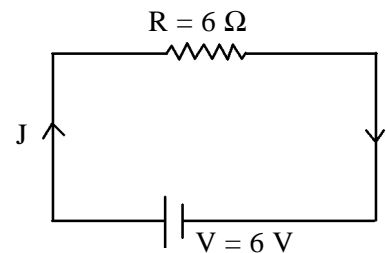
Section - B

◆ **Question no. 4 and 5 do as directed (Each question carries 3 marks) [6]**

4. Derive expression for magnetic field on the axis of a circular current loop.
5. A storage battery of emf 8 V and internal resistance 0.5Ω is being charged by a 120 V dc supply using a series resistor of 15.5Ω . What is the terminal voltage of the battery during charging ? What is the purpose of having a series resistor in the charging circuit ?

OR

In given figure, how much energy is absorbed by electrons from the initial state of no current (ignore thermal motion) to the state of drift velocity ? Number of electrons per unit volume = 10^{29} m^{-3} , length of circuit = 10 cm , cross-section area = 1 (mm)^2 .



Section - C

◆ **Answer the following question : [4]**

6. A room has AC run for 5 hours a day at a voltage of 220 V . The wiring of the room consists of Cu of 1 mm radius and a length of 10 m . Power consumption per day is 10 commercial units. What fraction of it goes in the joule heating in wires ? What would happen if the wiring is made of aluminium of the same dimensions ?

$[\rho_{\text{Cu}} = 1.7 \times 10^{-8} \Omega \text{ m}, \quad \rho_{\text{Al}} = 2.7 \times 10^{-8} \Omega \text{ m}]$

OR

Derive the equation of torque on a Rectangular Current loop in a uniform magnetic field.

