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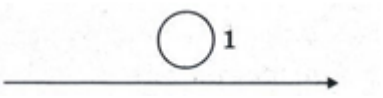
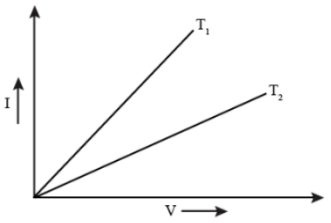
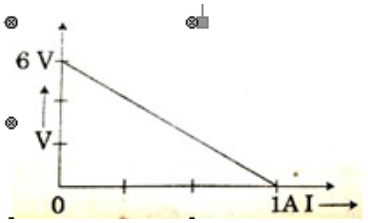
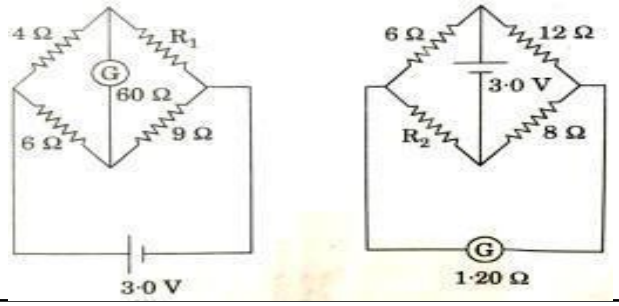
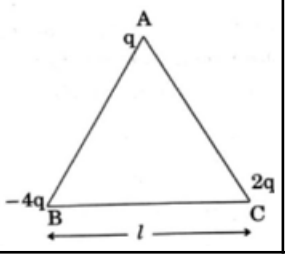
LUCKNOW REGION

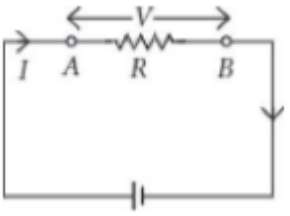
MONTHLY TEST OCTOBER 2024

SUBJECT – Physics **CLASS- 12th**

M.M. 40 **TIME: 90min**

Q. No.	SECTION A	Marks
1	Two-point charges placed in a medium of dielectric constant 5 are at a distance of r between them experiences an electrostatic force F. The electrostatic force between them in vacuum at the same distance r will be? (a) 5F (b) F (c) F/2 (d) F/5	**1**
2	The current in a device varies with time t as I = 6t, where I is in mA and t is in s. The amount of charge that passes through the device during t = 0 s to t = 3 s is (a) 10 mC (b) 18 mC (c) 27 mC (d) 54 mC	**1**
3	Above Curie temperature, (a)Ferromagnetic material becomes diamagnetic. (b) Ferromagnetic material becomes paramagnetic. (c) Paramagnetic material becomes Ferromagnetic. (d) paramagnetic material becomes diamagnetic.	**1**
4	The current in the primary coil of a pair of coils changes from 7 A to 3 A in 0.04 s. The mutual inductance between the two coils is 0.5 H. The induced emf in the secondary coil is (a) 50 V (b) 75 V (c) 100 V (d) 220 V	**1**
5	What is the direction of induced currents in metal ring when current I in the wire is increasing steadily? a) Clockwise b) Anticlockwise c) Changing d) None of these 	**1**
6	I-V graph for a metallic wire at two different temperatures $T_1$and T_2 is as shown in the figure. Then a) $T_1>T_2$ b) $T_1<T_2$ c) $T_1=T_2$ d) $T_1=2T_2$ 	**1**
7	The dimensional formula of magnetic flux is: a) $[ML^2T^{-2}A^{-1}]$ b) $[ML^2T^2A^{-1}]$ c) $[ML^{-2}T^{-2}A^{-1}]$ d) $[ML^2T^{-2}A]$	**1**
8	Two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion. C. If Assertion is true but Reason is false. D. If both Assertion and Reason are false Assertion(A): Diamagnetic substances exhibit magnetism. Reason(R): Diamagnetic materials do not have permanent magnetic dipole moment	**1**

9	Two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion. B. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion. C. If Assertion is true but Reason is false. D. If both Assertion and Reason are false Assertion(A): The direction of induced e.m.f is always such as to oppose the change that causes it. Reason(R): The direction of induced e.m.f is given by Lenz's law.	**1**
10	Derive the expression for the torque acting on an electric dipole when it is held in an uniform electric field. Identify the orientation of the dipole in the electric field in which it attains a stable equilibrium.	**2**
11	Net Capacitance of three identical capacitors in series is 1μF. What will be their net capacitance if connected in parallel? Find the ratio of energy stored in two configurations if they are both connected to the same source.	**2**
12	The plot of variation of potential difference across the combination of three identical cells in series versus the current is shown below. What is the emf and internal resistance of each cell?  OR Figure shows two circuits each having a galvanometer and a battery of 3V. When the galvanometers in each arrangement do not show any deflection, obtain the ratio R_1/R_2.  	**2**
13	State Ampere's circuital law and use it to find the magnetic field due to an infinitely long straight wire carrying current I.	**2**
14	Define the term Self Inductance. Write its SI unit. Give two factors on which self-inductance of an air core coil depends.	**2**
15	(i) Use Gauss' law to derive the expression for the electric field E due to a straight uniformly charged infinite line of charge density λ C/m. (ii) Draw a graph to show the variation of E with perpendicular distance 'r' from the line of charge.	**3**
16	Three charges q, -4q and 2q are placed at the vertices of an equilateral triangle ABC of side *'l'* as shown in figure. (i) Obtain the expression for the magnitude of the resultant electric force acting on charge q. (ii) Find out the amount of work done to separate the charge at infinite distance.  	**3**

17	Define current density and relaxation time. Derive an expression for resistivity of a conductor in terms of number density of charge carriers in the conductor and relaxation time.	**3**
18	A proton and an alpha particle enter at right angles into a uniform magnetic field of intensity B. Calculate the ratio of the radii of their paths when they enter the field with the same (a) momentum. (b) Same kinetic energy. OR Two parallel coaxial circular coil of equal radius R and equal number of turns N carry equal current I in the same direction are separated by a distance 2R. Find the magnitude and direction of the net magnetic field produced at the midpoint of the line joining their centers.	**3**
19	With the help of labelled diagram explain the principle and working of a moving coil galvanometer. Define current sensitivity and voltage sensitivity of a galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify. OR Two long straight parallel conductors carrying steady currents 'I_1' and 'I_2' are separated by a distance 'd'. Explain briefly, with the help of a suitable diagram, if the currents are flowing in the same direction how the magnetic field due to one conductor acts on the other. Obtain the expression for the force acting between the two conductors. Mention the nature of this force. Hence define one Ampere.	**5**
20	Whenever an electric current is passed through a conductor, it becomes hot after some time. The phenomenon of the production of heat in a resistor by the flow of an electric current through it is called heating effect of current or Joule heating. Thus, the electrical energy supplied by the source of emf is converted into heat. In purely resistive circuit, the energy expended by the source entirely appears as heat. But if the circuit has an active element like a motor, then a part of the energy supplied by the source goes to do useful work and the rest appears as heat. Joule's law of heating forms the basis of various electrical appliances such as electric bulb, electric furnace, electric press etc.  s (i) Which of the following is a correct statement? (a) Heat produced in a conductor is independent of the current flowing (b) Heat produced in a conductor varies Inversely as the current flowing (c) Heat produced in a conductor varies directly as the square of the current flowing (d) Heat produced in a conductor varies inversely as the square of the current flowing (ii)If the coil of a heater is cut to half, what would happen to heat produced? (a) Doubled (b) Halved (c) Remains same (d) Becomes four times (iii) A 25 W and 100 W are joined in series and connected to the mains. Which bulb will glow brighter? a) 100W (b) 25W (c) both bulbs will glow brighter (d) none will glow brighter	**4**

	(iv)The heat emitted by a bulb of 100 W in 1 min is (a) 100 J (b) 1000 J (C) 600 J (d) 6000 J	