BLESSING TUITION & TUTORIAL CENTRE

12TH STD PHYSICS 1ST MID TERM EXAM MODEL QUESTION PAPER - 2026 & 27

Time : 1.30 Hrs

FIRST MID-TERM TEST – JULY 2025

PHYSICS

Std : 12

Marks : 35

I. Choose the Correct Answer: 10×1=10

1. Two points A and B are maintained at a potential of 7 V and −4 V respectively. The work done in moving 50 electrons from A to B is

(a) 8.80×10^{-17} J (b) -8.80×10^{-17} J (c) 4.40×10^{-17} J (d) 5.80×10^{-17} J

2. An electric dipole is placed at an alignment angle of 30° with an electric field of 2×10^{5} N C^{-1}. It experiences a torque equal to 8 N m. The charge on the dipole if the dipole length is 1 cm is

(a) 4 mC (b) 8 mC (c) 5 mC (d) 7 mC

3. Which charge configuration produces a uniform electric field?

(a) point charge (b) uniformly charged infinite line

(c) uniformly charged infinite plane (d) uniformly charged spherical shell

4. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2} C and 5×10^{-2} C respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is

(a) 3×10^{-2} C (b) 4×10^{-2} C (c) 1×10^{-2} C (d) 2×10^{-2} C

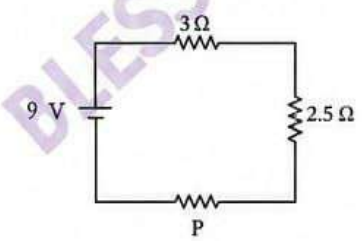
5. A toaster operating at 240 V has a resistance of 120 Ω. The power is

(a) 400W (b) 2 W (c) 480W (d) 240W

6. A wire connected to a power supply of 230 V has power dissipation P_1. Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is P_2. The ratio $\frac{P_2}{P_1}$ is

(a) 1 (b) 2 (c) 3 (d) 4

7. There is a current of 1.0 A in the circuit shown below. What is the resistance of *P* ?



(a) 1.5 Ω (b) 2.5 Ω (c) 3.5 Ω (d) 4.5 Ω

8. The resistance of a wire is 10 Ω. It is stretched twice of its original length, it's resistance becomes,

(a) 10 Ω (b) 20 Ω (c) 30 Ω (d) 40 Ω

9. The magnetic length of a uniform bar magnet if the geometrical length of the magnet is 6 cm

(a) 5 cm (b) 6 cm (c) 12 cm (d) 10 cm

10. The potential energy of magnetic dipole whose dipole moment is $\vec{p}_m = (-5\hat{i} + 0.4\hat{j})$ Am^2 kept in uniform magnetic field $\vec{B} = 0.2\hat{i}$ T

(a) −0.1 J (b) −0.8 J (c) 0.1 J (d) 0.8 J

II. Answer any 3 questions. Question No. 15 is compulsory. 3×2=6

11. The electric field lines never intersect. Why?

12. What is Corona discharge?

13. Define electrical resistivity?

14. Define magnetic flux.

15. If the resistance of coil is 3 Ω at 20°C and α = 0.004/°C, then determine its resistance at 100°C.

III. Answer any 3 questions. Question No. 20 is compulsory. 3×3=9

16. Derive the expression for resultant capacitance when capacitors are connected in series.

17. State Kirchoff's current rule and voltage rule.

18. What are the applications of Seebeck effect?

19. Write the properties of Ferromagnetic materials.

20. A water molecule has an electric dipole moment of 6.3×10^{-30} C m. A sample contains 10^{22} water molecules, with all the dipole moments aligned parallel to the external electric field of magnitude 3×10^{5} N C^{-1}. How much work is required to rotate all the water molecules from θ = 0° to 90° ?

IV. Answer the following questions: 2×5=10

21. (a) Obtain the expression for electric field due to a dipole along its axial line.

(OR)

(b) Explain in detail the construction and working of Vande Graff Generator.

22. (a) Obtain the condition for bridge balance in Wheatstone's bridge.

(OR)

(b) i) What is magnetic susceptibility?

ii) Two materials X and Y are magnetized, whose intensity of magnetization are 500 A m^{-1} and 2000 A m^{-1}, respectively. If the magnetizing field is 1000 A m^{-1}, then which one among these materials can be easily magnetized?

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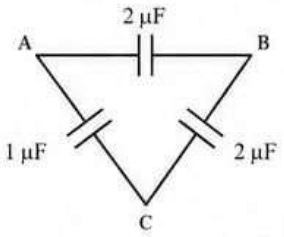
Time: 1.30 Hours | Marks: 35

PART - I (8 X 1 = 8)

Answer all the Questions:

1. Which charge configuration produces a uniform electric field ?
   a) Point charge
   b) Uniformly charged infinite line
   c) Uniformly charged infinite plane
   d) Uniformly charged spherical shell
2. The relative permittivity of a medium is 10. The permittivity of that medium is
   a) $8.85 \times 10^{-12}\ C^{-2}\ N^{-1}\ m^{-2}$
   b) $8.85 \times 10^{-11}\ Nm^2\ C^{-2}$
   c) $8.85 \times 10^{-12}\ Nm^2\ C^{-2}$
   d) $8.85 \times 10^{-11}\ C^2\ N^{-1}\ m^{-2}$
3. If Voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.
   a) 'Q' remains the same, 'C' is doubled
   b) 'Q' is doubled, 'C' is doubled
   c) 'C' remains the same, 'Q' is doubled
   d) Both 'Q' and 'C' remains same,
4. Three capacitors are connected in triangle as shown in the figure. The equivalent capacitance between the point 'A' and 'B' is



   a) 1 μF
   b) 1/4 μF
   c) 2/5 μF
   d) 8/3 μF
5. A toaster operating at 240 V has a resistance of 120 Ω. Is power is.
   a) 400 W
   b) 2 W
   c) 480 W
   d) 240 W
6. The internal resistance of a 2.1 V cell which gives a current of 0.2A through a resistance of 10 Ω is.
   a) 0.2 Ω
   b) 0.5 Ω
   c) 0.8 Ω
   d) 1 Ω
7. If the junctions of a C_u - F_e thermocouple are maintained at two different temperatures, thermoelectric current flows from.
   a) C_u to F_e at the Cold junction
   b) C_u to F_e at the hot junction
   c) F_e to C_u at the hot junction
   d) All the above
8. In Joule's heating laco, when 'R' and 't' are constant, if the Heat produced (H) is taken along the Y-axis and 'I' along the X-axis. the graph is
   a) Straight line
   b) Parabola
   c) Circle
   d) Ellipse

PART - II (4 X 2 = 8)

Answer Any 4 Questions:
Note: Q.No: 14 is Compulsory

9. The electric field lines never intersect. Justify.
10. What is Corona discharge?
11. A sample of HCl gas is placed in a uniform electric field of magnitude $3 \times 10^4\ NC^{-1}$. The dipole moment of each HCl molecule is 3.4×10^{-30} Cm. Calculate the maximum torque experienced by each HCl molecule.
12. Define: Electrical resistivity ?
13. What is Thomson effect ?
14. Resistance of a material a 20°C and 40°C are 45 Ω and 85 Ω respectively. Find its temperature co-efficient of resistivity.

PART - III (3 x 3 = 9)

Answer Any 3 Questions:
Note: Q.No: 19 is Compulsory

15. Mention the uses of Capacitors.
16. Derive an expression for the torque experienced by a dipole due to a uniform electric field.
17. State Kirchhoff's Laws and Ohm's Law.
18. Derive the expression for equivalent resistance when a number of resistors are connected in series.
19. The resistance of a wire is 20 Ω. What will be the new resistance, if it is stretched uniformly 8 times its original length?

PART - IV (2 x 5 = 10)

Answer all the Questions:

20. **a)** Derive the expression for electrical potential at a point due to an electric dipole.
    (or)
    b) How will you determine the internal resistance of a cell using potentiometer?
21. **a)** i) Derive the expression for energy stored in a capacitor.
    ii) A parallel plate capacitor filled with mica having $\varepsilon_r = 5$ is connected to a 10 V battery. The area of each plate is 6 cm^2 and separation distance is 6 mm. Find the capacitance of the capacitor.
    (or)
    b) Obtain the condition for bridge balance in Wheatstone's Bridge.

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Marks: 50

Part – I

Marks : 50

I. Choose the correct answer: 10 × 1 = 10

1. If voltage applied on a capacitor is increased from V to 2V choose the correct conclusion.
   a) Q remains the same, C is doubled b) Q is doubled, C doubled
   c) C remains same, Q doubled d) Both Q and C remains same
2. A charge q is placed at the centre of the line joining two equal charges Q. The system of the three charges will be in equilibrium if q is equal to :
   a) $-\frac{Q}{2}$ b) $-\frac{Q}{4}$ c) $+\frac{Q}{4}$ d) $+\frac{Q}{2}$
3. An electric field $\vec{E} = 10\,\hat{i}$ exists in a certain region of space. Then the potential difference $V = V_2 - V_1$, V_2 is the potential at the origin and V_1 is the potential at $x = 2$ m is:
   a) 10 V b) −20 V c) +20 V d) −10 V
4. A wire of resistance is stretched to double it's length, find the new resistance ?
   a) R b) 2R c) 4 R d) $\frac{R}{2}$
5. In Joule's heating law, when R and t are constant if the H is taken along the y–axis and I^2 along the x–axis the graph is
   a) Straight line b) Parabola c) Circle d) Ellipse
6. A circular coil of radius 5 cm and 50 turns carries a current of 3 ampere. The magnetic dipolemoment of the coil is nearly
   a) 0.8 A m^2 b) 1.0 A m^2 c) 0.5 A m^2 d) 1.2 A m^2
7. The vertical component of Earth's magnetic field at a place component. What is the value of angle of dip at this place?
   a) 30° b) 45° c) 60° d) 90°
8. The potential energy of the magnetic dipole moment is $\overrightarrow{P_m} = \left(-0.5\,\hat{i} + 0.4\,\hat{j}\right)$ Am^2 kept in uniform magnetic field $\vec{B} = 0.2\,\hat{i}$ T
   a) −0.1 J b) −0.8 J c) 0.1 J d) 0.8 J
9. A toaster operating at 240 V has a resistance of 120 Ω. Its power is
   a) 400 J/s b) 400 J/s c) 240 J/s d) 440 J/s
10. A Carbon resistor of (47 ± 4.7) kΩ to be marked with rings of different colours for its Identification. The colour code sequence will be
    a) Yellow – Green – Violet – Gold b) Yellow – Green – Violet – Silver
    c) Yellow – Violet – Orange – Silver d) Yellow – Violet – Green – Gold

Part - II

II. Answer any 5 questions. (Q.No.16 is compulsory) 5 × 2 = 10

11. Define electric flux. Give its unit.
12. What is Corona discharge?
13. Define Current density and give its unit.
14. Distinguish between Drift velocity and Mobility.
15. Calculate the number of electrons in 1 μC of negative charge.
16. Two materials X and Y are magnetised whose values of intensity of magnetisation are 500 A m^{-1} and 2000 A m^{-1} respectively. If the magnetising field is 1000 A m^{-1}, then which one among these materials can be easily magnetized?
17. What is meant by Hysteresis ?
18. State Kirchoff's current rule.

Part - III

III. Answer any 5 questions. (Q.No.24 is compulsory) 5 × 3 = 15

19. Give the properties of Dia magnetic material.
20. Give the applications of Capacitor.
21. Obtain an expression for electric potential at a point due to point charge.
22. State and explain Biot – Savart law.
23. Derive the expression for resultant capacitance, when two capacitors are connected in parallel.
24. A sample of HCl gas is placed in a uniform electric field of magnitude 3×10^4 NC^{-1}. The dipole moment of each HCl molecule is 3.4×10^{-30} cm. Calculate the maximum torque experienced by each HCl molecule.
25. Explain the relation between Current and Drift velocity.
26. Explain the determination of the internal resistance of a cell using voltmeter.

Part - IV

3 × 5 = 15

IV. Answer all the questions.

27. a) Calculate the electric field due to a dipole on its axial line.

    (OR)

    b) i) Compute the torque experienced by a magnetic needle in a uniform magnetic field.

    ii) A short bar magnet has a magnetic moment of 0.5 J T^{-1}. Calculate magnitude and direction of the magnetic field produced by the bar magnet which is kept at a distance of 0.1 m from the center of the bar magnet along axial line of the bar magnet.

28. a) Obtain the condition for bridge balance in Wheatstone's bridge.

    (OR)

    b) Derive an expression for electrostatic potential due to an electric dipole.

29. a) Deduce the relation for magnetic field at a point due to an infinitely long straight conductor carrying current.

    (OR)

    b) i) Explain the equivalent resistance of a series resistor network.

    ii) If an electric field of magnitude 570 NC^{-1} is applied in the copper wire, find the acceleration experienced by the electron.

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