

Time: 1:30

12th Physics

Marks -70

PART – I

1. An electric dipole consists of two charges of $0.1 \mu\text{C}$ separated by a distance of 2.0 cm. The dipole is placed in an external field of 105 N/C. What maximum torque does the field exert on the dipole? (a) $4 \times 10^{-4} \text{ Nm}$ (b) $4 \times 10^4 \text{ Nm}$ (c) $4 \times 10^{-5} \text{ Nm}$ (d) $4 \times 10^5 \text{ Nm}$
2. 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 remain same
3. A toaster operating at 240V has a resistance of 120Ω . The power is
(a) 240W (b) 400W (c) 2W (d) 480W
4. As the temperature increases, the electrical resistance
(a) Increases for both conductors and semiconductors
(b) Decreases for both conductors and semiconductors
(c) Increases for conductors but decreases for semiconductors
(d) Decreases for conductors but increases for semiconductors
5. An electric dipole is placed at an alignment angle of 30° with an electric field of $2 \times 10^5 \text{ NC}^{-1}$. It experiences a torque equal to 8 Nm. 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
6. In meterbridge for measurement of resistance, the known and the unknown resistance are interchanged. The error so removed is
(a) end correction (b) gross error (c) random error (d) due to temperature effect
7. The temperature coefficient of resistance of a wire is 0.00125 per $^\circ\text{C}$. At 20°C , its resistance is 1Ω . The resistance of the wire will be 2Ω at
(a) 800°C (b) 700°C (c) 850°C (d) 820°C
8. Two identical conducting balls having positive charges q_1 and q_2 are separated by a centre to centre distance r . If they are made to touch each other and then separated to the same distance, the force between them will be
(a) less than before (b) same as before (c) more than before (d) zero
9. The electric field due to point charge at a distance of 3 m from it is 500 NC^{-1} . The magnitude of the charge is [$4\pi\epsilon_0 = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$]
(a) $2.4 \mu\text{C}$ (b) $1.0 \mu\text{C}$ (c) $2.0 \mu\text{C}$ (d) $0.5 \mu\text{C}$
10. A carbon resistor of $(47 \pm 4.7) \text{ k} \Omega$ to be marked with rings of different colours for its identification. The colour code sequence will be...
(a) Yellow – Green – Violet – Gold (b) Yellow – Violet – Orange – Silver
(c) Violet – Yellow – Orange – Silver (d) Green – Orange – Violet – Gold

PART – II

Note : Answer any five questions. Question No. 18 is compulsory.

6x2=12

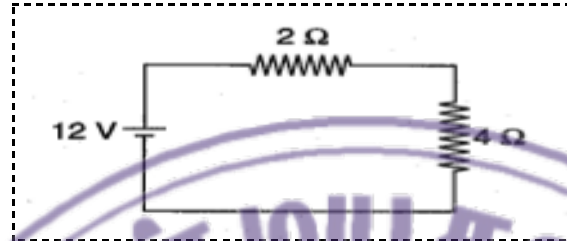
11. State Joule's law of heating.
12. Define electric flux. Give its SI unit.
13. Distinguish between electric energy and electric power.

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14. State the principle of Potentiometer.
15. What is called electric dipole? Give an example.
16. During lightning, it is safer to sit inside car than in an open ground or under tree. Why?
17. Distinguish between Polar molecules and Non - Polar molecules.
18. Calculate the equivalent resistance for the circuit which is connected to 12 V battery and also find the potential difference across 2Ω and 4Ω resistors in the circuit.



PART - III

Note : Answer any five questions. Question No. 26 is compulsory. 6x3=18

19. State and explain Kirchoff's rules.
20. Obtain an expression for energy stored in the parallel plate capacitor.
21. Explain the equivalent resistance of a series resistance network.
22. The resistance of a nichrome wire at 20°C is 10Ω . If its temperature coefficient of resistance is $0.004/^\circ\text{C}$, find its resistance at boiling point of water. Comment on the result.
23. Derive an expression for torque experienced by an electric dipole placed in the uniform electric field.
24. What is the Seebeck effect? State the applications of Seebeck effect.
25. List the properties of electric field lines.
26. A parallel plate capacitor has square plates of side 5 cm and separated by a distance of 1 mm. (a) Calculate the capacitance of this capacitor. (b) If a 10 V battery is connected to the capacitor, what is the charge stored in any one of the plates? (The value of $\epsilon_0 = 8.85 \times 10^{-12} \text{ Nm}^2 \text{ C}^{-2}$)

PART - IV

Note : Answer all the questions.

4x5=20

27. i) Obtain an expression for the electric field due to an infinitely long charged wire. (OR)
- ii) Explain in detail the construction and working of Van de Graaff generator.
28. i) Calculate the electric field due to a dipole on its axial line. (OR)
- ii) Explain the determination of the internal resistance of a cell using voltmeter.
29. i) Obtain the condition for bridge balance in Wheatstone's bridge. (OR)
- ii) Describe the microscopic model of current and obtain a general form of Ohm's law.
30. i) How the emf of two cells are compared using potentiometer? (OR)
- ii) Derive an expression for electrostatic potential due to a point charge