

SIR CV RAMAN COACHING CENTRE IDAPPADI, SALEM – 2024**XLL PHYSICS – FIRST MID TERM MODEL QUESTION PAPER****LESSON 1 TO 3 code: 241610199964****Totalmark : 70 m****Date : 30.05.2024****Choose the best correct answer (15 x 1= 15 m)**

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 remain same

2. 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

3.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

4. In India electricity is supplied for domestic use at 220 V . It is supplied at 110 V in USA. If the resistance of a 60W bulb for use in India is R , the resistance of a 60W bulb for use in USA will be

- (a) R (b) $2R$ (c) $R/4$ (d) $R/2$

5. In a large building, there are 15 bulbs of 40 W , 5 bulbs of 100 W , 5 fans of 80 W and 1 heater of 1kW are connected. The voltage of electric mains is 220 V . The maximum capacity of the main fuse of the building will be

- (a) 14 A (b) 8 A (c) 10 A (d) 12 A

6.Three wires of equal lengths are bent in the form of loops. One of the loops is circle, another is a semi-circle and the third one is a square. They are placed in a

uniform magnetic field and same electric current is passed through them. Which of the following loop configuration will experience greater torque ?

- (a) Circle (b) Semi-circle (c) Square (d) All of them

7. A thin insulated wire forms a plane spiral of $N = 100$ tight turns carrying a current $I = 8 \text{ mA}$ (milli ampere). The radii of inside and outside turns are $a = 50 \text{ mm}$ and $b = 100 \text{ mm}$ respectively. The magnetic induction at the centre of the spiral is

- (a) $5 \mu\text{T}$ (b) $7 \mu\text{T}$ (c) $8 \mu\text{T}$ (d) $10 \mu\text{T}$

8. A non-conducting charged ring carrying a charge of q , mass m and radius r is rotated about its axis with constant angular speed ω . Find the ratio of its magnetic moment with angular momentum is

- (a) q/m (b) $2q/m$ (c) $q^2/2m$ (d) $q/2m$

9. The electrostatic force obeys Newton's law

- a) First b) Second c) Third d) All

10. The electrical power produced (dissipated) by a resistor is $I^2 R$. It depends on the square of the current. Hence, if current is doubled, the power will increase by times.

- a) 2 b) 3 c) 4 d) Not change

11. In metals like platinum, nickel, cobalt, and mercury in Thomson effect

- a) positive b) negative c) zero d) All

12. A toaster operating at 120 V has a resistance of 60Ω . Its power is

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

13. Meissner effect – superconductors behave like perfectmagnetic materials below transition temperature T_C .

- a) dia b) para c) ferro d) none of the above

14. magnetic Pole strength is a quantity

- a) Scalar b) vector c) tensor d) none of the above

15. A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of

- a) each of them increases b) each of them decreases
c) copper increases and germanium decreases d) copper decreases and germanium increase

Answer any six questions compulsory Q.NO 24 (6 x 2 = 12 m)

16. Define magnetic dipole moment.

17. What is Peltier effect?

18. What is meant by quantisation of charges?

19. What is corona discharge?

20. Consider a point charge $+q$ placed at the origin and another point charge $-2q$ placed at a distance of 9 m from the charge $+q$. Determine the point between the two charges at which electric potential is zero.

21. A potential difference across 2Ω resistor is 12 V. What is the current through the resistor?

22. State Kirchhoff 's current rule

23. Define ampere.

24. Compute the magnitude of the magnetic field of a long, straight wire carrying a current of 1 A at distance of 1m from it. Compare it with Earth's magnetic field.

Answer any six questions compulsory Q.NO 33 (6 x 3 = 18 m)

25. Applications of capacitors

26. Derive an expression for the torque experienced by a dipole due to a uniform electric field

27. Explain the equivalent resistance of a Series .

28. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35 cm length of the 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?
29. Give the properties of ferromagnetic materials.
30. Give an account of magnetic Lorentz force
31. State Fleming's left hand rule
32. What is electric power and electric energy?
33. Dielectric strength of air is 3×10^6 V/m. Suppose the radius of a hollow sphere in the Van de Graff generator is $R = 0.5$ m, calculate the maximum potential difference created by this Van de Graaff generator.

Answer all questions compulsory (5x 5 = 25 m)

34.a) Explain in detail the construction and working of a Van de Graff generator.

(or)

b) (i) Define electric dipole (ii) Calculate the electric field due to a dipole on its axial line

35.a) Describe the microscopic model of current and obtain general form of Ohm's law

(or)

b) How the emf of two cells are compared using potentiometer?

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

(or)

b) Derive the expression for the force between two parallel, current-carrying conductors

37 a) 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 centre of the bar magnet along (a) axial line of the bar magnet and (b) normal bisector of the bar magnet

(or)

b) Discuss the working of cyclotron in detail.

38.a) (i) State Gauss law (ii) Obtain the expression for electric field due to an uniformly charged spherical shell.

(or)

b) 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?

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