

XIIth 2023-24

Date : 06/11/2023

Physics Theory Round-02

Max.Marks :- 35

Time 90 Mins.

General Instructions : The question paper is divided into four sections.

(1) **Section A :** Q.No.1 contains Five Multiple choice type of question carrying **One** mark each.

Q.No.2 contains Five very short answer type of questions carrying **One** mark each.

(2) **Section B :** Q.No.3 to Q.9 are short answer type of question carrying **Two** marks each.

(3) **Section C :** Q.No.10 to Q. No.14 are short answer type of questions carrying **Three** marks each

(4) **Section D:** Q.No.15 to Q.No.18 are long answer type of questions carrying **Four** marks each.

(5) Figures to the right indicate full marks

Section -A

[05]

Q.1 Select and write the correct answer.

(i) A liquid rises in glass capillary tube upto a height of 2.5 cm at room temperature. If another glass capillary tube having radius half that of the earlier tube is immersed in the same liquid, the rise of liquid in it will be :

- (a) 1.25 cm (b) 2.5 cm
(c) 5 cm (d) 10 cm

(ii) The angle at which maximum torque is exerted by the external uniform electric field on the electric dipole is

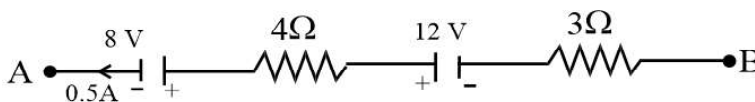
- (a) 0° (b) 30°
(c) 45° (d) 90°

(iii) Which one of the following is not a characteristics of SHM?

- (a) Its acceleration is maximum in the extreme position.
(b) It is the projection of a uniform circular motion on a diameter.
(c) Its velocity is maximum at the mean position.
(d) Its velocity time graph is a straight line.

(iv) The figure shows part of an electric circuit. The potential difference $V_A - V_B$ is

- (a) 9.0 V (b) 7.5 V
(c) 6.0 V (d) 4.5 V



(v) Which of the following statement is correct for diamagnetic materials?

- (a) Susceptibility is negative and law.
(b) Susceptibility is does not depend on temperature.
(c) $\mu_r < 1$
(d) All of above.

Q.2. Answer the following questions.

[05]

- (i) What is the value of resistance for an ideal voltmeter?
- (ii) What is the value of force on a closed circuit in a magnetic field?
- (iii) Calculate the velocity of particle performing S.H.M. after 1 second, if its displacement is given by
$$x = 5 \sin \left(\frac{\pi t}{3} \right) m.$$
- (iv) State the formula for critical velocity in terms of Reynold's number for a flow of liquid.
- (v) State the formula for magnetic potential energy.

Section -B : Attempt any 4 (Q.3 to 9)

[08]

Answer the following questions :

- Q.3. Define coefficient of viscosity. State its formula and S.I. units.
- Q.4. How will you convert a moving coil galvanometer into an ammeter?
- Q.5. A bar magnet of mass 120 gm in the form rectangular parallelepiped, has dimensions $l = 40$ mm, $b = 10$ mm and $h = 80$ mm, with its dimensions 'h' vertical, the magnet performs angular oscillations in the plane of the magnetic field with period π seconds. If the magnetic moment is 3.4 Am^2 determine the influencing magnetic field.
- Q.6. Distinguish between potentiometer and voltmeter.
- Q.7. An electron in an atom is revolving round the nucleus in a circular orbit of radius $5.3 \times 10^{-11} \text{ m}$ with a speed of $3 \times 10^6 \text{ m/s}$. Find the angular momentum of electron.
- Q.8. The wires which connect the battery of an automobile to its starting motor carry a current of 300 A (For a short time). What is the force per unit length between the wires if they are 70 cm long and 1.5 cm apart?
- Q.9. State and explain Newton's law of viscosity.

Section -C : Attempt any 3 (Q.10 to 14)

[09]

- Q.10. (a) Define and state unit and dimensions of magnetization.
(b) Explain magnetic susceptibility.
- Q.11. Explain the use of potentiometer to determine internal resistance of the cell.
- Q.12. State the differential equation of linear S.H.M. Hence, obtain expression for
(a) acceleration (b) velocity
- Q.13. Calculate the current flowing through two long parallel wires carrying equal currents and separated by a distance of 1.35 cm experiencing a force per unit length of $4.76 \times 10^{-2} \text{ N/m}$.
- Q.14. Derive an expression for terminal velocity of a spherical object falling under gravity through a viscous medium.

Section -D : Attempt any 2 (Q.15 to 18)

[08]

- Q.15. Obtain the relation between surface energy and surface tension.
Calculate the work done in blowing a soap bubble to a radius of 1 cm. The surface tension of soap solution is $2.5 \times 10^{-2} \text{ N/m}$.
- Q.16. Draw a neat labelled diagram of suspended coil type moving coil galvanometer.
The initial pressure and volume of a gas enclosed in a cylinder are $2 \times 10^5 \text{ N/m}^2$ and $6 \times 10^{-3} \text{ m}^3$ respectively. If the work done in compressing the gas at constant pressure is 150 J. Find the final volume of the gas.
- Q.17. Define seconds pendulum. Derive a formula for the lengths of second pendulum.
A particle performing linear S.H.M. has maximum velocity 25 cm/sec and maximum acceleration 100 cm/s^2 . Find period of oscillations.
- Q.18. An iron is subjected to a magnetising field of 1200 Am^{-1} . The susceptibility of iron is 599. Find the permeability and the magnetic field produced.
Draw the graph for variation of magnetic susceptibility (χ) of a material with temperature (T) and hence explain curie temperature.