

PHYSICS QUESTION PAPER

Time : 2 Hrs.

Max. Marks : 40

Q. 1 Select and write the most appropriate answer from the given alternatives for each sub-question. (8)

- (i) According to Kepler's law, the areal velocity of a planet around the sun, always (1)
(a) increases (b) decreases
(c) remains constant (d) first increases and then decreases
- (ii) Radius of gyration of a ring about a transverse axis passing through its centre is (1)
(a) $0.5 \times$ diameter of ring (b) diameter of ring
(c) $2 \times$ diameter of ring (d) (diameter of ring)²
- (iii) Poisson's ratio is the ratio of lateral strain to (1)
(a) volume stress (b) shearing strain
(c) longitudinal stress (d) longitudinal strain
- (iv) Absorption of water by filter paper is due to (1)
(a) cohesion (b) capillarity
(c) adhesion (d) elasticity
- (v) In the equation of a simple harmonic progressive wave of wavelength ' λ ' the propagation constant is given by (1)
(a) $\frac{2\pi}{\lambda}$ (b) $\pi\lambda$ (c) $\frac{\pi}{\lambda}$ (d) $\frac{\lambda}{2\pi}$
- (vi) The average distance covered by a molecule between two successive collisions is called (1)
(a) free path (b) constant path
(c) mean free path (d) free path per unit time
- (vii) An amplitude of a simple pendulum of a period ' T ' and length ' L ' is increased by 5%. The new period of that pendulum will be (1)
(a) $\frac{T}{8}$ (b) $\frac{T}{4}$ (c) $\frac{T}{2}$ (d) T
- (viii) A body cools at the rate of 0.5°C/s when it is at 50°C above the surrounding temperature. The rate of cooling at excess temperature of 30°C over the surrounding temperature is (1)
(a) 3°C/s (b) 0.3°C/s
(c) 0.2°C/s (d) 0.1°C/s

Q. 2 (A) Attempt any One : [8]

- (i) A torque of 1500 Nm acting on a body produces an angular acceleration of 3.2 rad/s^2 . Find M.I. of the body. (2)
- (ii) What pressure is required to reduce the volume of a lead block by 1%? (2)
(Given : Bulk modulus of lead = 6×10^9 S.I. unit)

(B) Attempt any Two :

- (i) Define 'angle of contact'. State its 'four' characteristics. (3)
- (ii) State the points of comparison between progressive waves and stationary waves. (3)
- (iii) Assuming the expression for pressure of an ideal gas, show that R.M.S. velocity of gas molecule is directly proportional to the square root of its absolute temperature. (3)

Q. 3 (A) Attempt any One :

- (i) Define surface tension. State its S.I. unit and dimensions. (2)
- (ii) Represent graphically the variation of potential energy, kinetic energy and total energy of a particle performing S.H.M. with time. (2)

(B) Attempt any Two :

- (i) Derive an expression for the kinetic energy of a body rotating with uniform angular speed. (3)
- (ii) Prove that work done in stretching the wire is $\frac{1}{2} \times$ load \times extension, by calculus method. (3)
- (iii) State the postulates of Prevost's theory of heat exchanges. Discuss how does it account for the exchange of heat between body and its surroundings. (3)

Q.4 (A) Attempt any Two :

- (i) Distinguish between centripetal force and centrifugal force. (2)

(ii) Define molar specific heats of a gas. How are they related to the corresponding principal specific heats ? (2)

(iii) Draw a neat labelled diagram of 'Ritchie's experiment'. (2)

(B) Attempt any One :

(i) Describe how an artificial satellite is launched in an orbit around the earth. Explain the nature of all the possible orbits of a satellite with the help of a suitable diagram. (4)

(ii) Define angular S.H.M. and prove that a bar magnet vibrating in uniform magnetic induction performs uniform angular S.H.M. Obtain an expression for its frequency. (4)

Q.5 Attempt any Two :

(i) Two sound notes have wavelengths $\frac{83}{170}$ m and $\frac{83}{172}$ m in air. These notes when sounded together produce 8 beats per second. Calculate the velocity of sound in air and frequencies of two notes. (4)

(ii) A sonometer wire is in unison with a tuning fork when stretched by a weight of specific gravity 'nine'. On completely immersing the weight in water, wire produces 4 beats per second with the fork. Calculate the frequency of the fork. (4)

(iii) An object of mass 2 kg attached to a wire of length 5 m is revolved in a horizontal circle. If it makes 60 r.p.m. find its (a) angular speed, (b) linear speed, (c) centripetal acceleration, (d) centripetal force. (4)