Class : 11

Register Number

COMMON HALF YEARLY EXAMINATION - 2024 - 25

Time Allowed : 3.00 Hours] PHYSICS [Max. Marks : 70

PART-I

Note: (i) Answer all the questions 15x1=15

(ii) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

1. A sound wave whose frequency is 5000 Hz travels in air and then hits the water, surface. The ratio of its wavelength in water and air is
   (a) 4.30 (b) 0.23 (c) 5.30 (d) 1.23
2. In a simple harmonic oscillation, the acceleration against displacement for one complete oscillation will be
   (a) an ellipse (b) a circle (c) a parabola (d) a straight line
3. The efficiency of a heat engine working between the freezing point and boiling point of water is
   (a) 6.25 % (b) 20% (c) 26.8% (d) 12.5%
4. The ratio $\gamma = \frac{C_p}{C_v}$ for a gas mixture consisting of 8 gram of Helium and 16 gram of Oxygen is
   (a) $\frac{23}{15}$ (b) $\frac{15}{23}$ (c) $\frac{27}{17}$ (d) $\frac{17}{27}$
5. In a horizontal pipe of non - uniform cross - section, water flows with a velocity of1 ms^{-1} at a point where the diameter of the pipe is 20 cm. The velocity of water (1.5 ms^{-1}) at a point where the diameter of the pipe is (in cm)
   (a) 8 (b) 16 (c) 24 (d) 32
6. According to Kepler's second law, The radial vector to a planet from the sun sweeps out equal areas in equal interval of time. This law is a consequence of
   (a) Conservation of Linear momentum (b) Conservation of Angular momentum
   (c) Conservation of Energy (d) Conservation of Kinetic energy
7. Two blocks of masses 'm' and '2m' are placed on a smooth horizontal surface as shown. In the first case. only a force F_1 is applied from the left. Later only a force F_2 is applied from the right. If the force acting at the interface of the two blocks in the two cases is same, then $F_1 : F_2$ is

   (a) 1 : 1 (b) 1 : 2 (c) 2 : 1 (d) 1 : 3
8. A body of mass 1 Kg is thrown upwards with a velocity of 20 ms^{-1}. It momentarily comes to rest after attaining a height of 18 metre. How much energy is lost due to air friction (Take g = 10 ms^{-2})
   (a) 20 J (b) 30 J (c) 40 J (d) 10 J
9. The speed of a solid sphere after rolling down from rest without sliding on an inclined plane of vertical height 'h' is
   (a) $\sqrt{\frac{4}{3}gh}$ (b) $\sqrt{\frac{10}{7}gh}$ (c) $\sqrt{2gh}$ (d) $\sqrt{\frac{1}{2}gh}$
10. Two objects are projected at angles 30° and 60° respectively with respect to the horizontal direction. The range of two objects are denoted as R_{30° and R_{60°. Choose the correct relation from the following.
    (a) $R_{30^\circ} = R_{60^\circ}$ (b) $R_{30^\circ} = 4R_{60^\circ}$ (c) $R_{30^\circ} = \frac{R_{60^\circ}}{2}$ (d) $R_{30^\circ} = 2R_{60^\circ}$
11. The velocity of a particle 'v' at an instant 't' is given by $v = at + bt^2$. The dimensions of 'b' is
    (a) [L] (b) $[LT^{-1}]$ (c) $[LT^{-2}]$ (d) $[LT^{-3}]$
12. An equation of SHM is given as $y = 0.06 \sin(100t + \pi/2)$. Its maximum velocity is
    (a) 0.6 cms^{-1} (b) 0.06 ms^{-1} (c) 100 ms^{-1} (d) 60 ms^{-1}
13. In a stationary wave, Changes in pressure are maximum at ----------
    (a) Antinodes (b) Nodes (c) Crests (d) Troughs

14. What is the time taken by 2 Kg mass iron ball fell down from 10 metre height?
(a) 2 s (b) 4 s (c) 1.414 s (d) 3.144 s

15. Excess pressure in Soap bubble is
(a) $\frac{2T}{R}$ (b) $\frac{T}{R}$ (c) $\frac{3T}{R}$ (d) $\frac{4T}{R}$

PART - II

Note : Answer any six questions. Question Number 24 is Compulsory. 6x2=12

16. Define Significant Figure. Give an example.
17. A box is pulled with a force of 25 N to produce a displacement of 15 m. If the angle between the force and displacement is 30°, Find the workdone by the force.
18. State the law of Conservation of Angular momentum.
19. Why is there no lunar eclipse and Solar eclipse every month.
20. Define Surface tension of a liquid. Mention its SI unit and dimension.
21. What is Doppler Effect?
22. An object is thrown with initial speed 5 ms^{-1} with an angle of Projection 30°. What is the height attained by it.
23. What are the factors affecting Brownian Motion?
24. Compute the position of an Oscillating particle when its Kinetic Energy and Potential Energy are equal.

PART - III

Note : Answer any six questions. Question Number 33 is Compulsory. 6x3=18

25. What happens to the pressure inside a soap bubble when air is blown into it?
26. Derive the time period of the satellite orbiting the Earth?
27. In an Adiabatic expansion of the air, The volume is increased by 4%, What is the percentage change in pressure? (For air $\gamma = 1.4$)
28. Derive the expression for Centripetal Acceleration.
29. Compare Elastic and Inelastic Collision.
30. Explain how overtones are produced in a closed organ pipe.
31. A uniform disc of mass 100 gram has a diametre of 10 cm. Calculate the total energy of the disc when rolling along a horizontal table with a velocity of 20 cms^{-1}. (Take the surface of the table as reference)
32. State the laws of Simple Pendulum.
33. A football player kicks a 0.8 Kg ball and imparts it a velocity 12 ms^{-1}. The contact between the foot and ball is only one - sixth of a second. Find the average kicking force.

PART - IV

Note : Answer all the questions. 5x5=25

34. (a) If the value of Universal Gravitational constant in SI is 6.6×10^{-11} $Nm^2 Kg^{-2}$, Then find its value in CGS system?

(OR)

(b) What is meant by Angular Harmonic Oscillation? Compute the time period of angular harmonic oscillation.

35. (a) Show that the velocity of a travelling wave produced in a string is $v = \sqrt{\frac{T}{\mu}}$

(OR)

(b) Explain in detail the triangle law of addition.

36. (a) Explain the need for Banking of Tracks.

(OR)

(b) Explain in detail the Working of a Refrigerator.

37. (a) Derive the expression of pressure exerted by the gas on the walls of the container.

(OR)

(b) Derive an expression for escape Velocity.

38. (a) State and Prove Bernoulli's Theorem for a flow of incompressible, Non Viscous and streamlined flow of fluid.

(OR)

(b) Derive the expression for moment of Inertia of a uniform disc about an axis passing through the centre and perpendicular to the plane.