

# I.P.E. FIRST YEAR MODEL PAPER

## SECTION-I

**I. Answer all the following questions**

**10 x 2 = 20**

1. What is the contribution of S.Chandra shekar?
2. The period of oscillation of a simple pendulum is  $T = 2\pi\sqrt{\frac{l}{g}}$ . Measured value of 'l' is 20cm known to 1mm accuracy and time for 100 oscillations of the pendulum is found to be 90s using a wrist watch of 1sec resolution. What is the accuracy in the determination of g?
3. What is the acceleration of a projectile at the top of its trajectory?
4. If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions explain.
5. By spinning eggs on a table top, how will you distinguish a hard boiled egg from a raw egg?
6. Calculate the change in length of a simple pendulum of length 1m, when its period of oscillation changes from 2 to 1.5 sec.
7. State Hooke's law of elasticity?
8. If work done by an agent to form a bubble of radius 'R' is 'W'. Then how much energy is required to increase its radius to 2R?
9. State weins displacement law?
10. Define thermal equilibrium. How does it lead to Zeroth law of thermodynamics?

## SECTION-II

**II. Answer any Six of the following questions.**

**6 x 4 = 24**

11. Show that the maximum height reached by a projectile launched at an angle of  $45^\circ$  is one quarter of its range.
12. State parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector.
13. Find the centre of mass of three particles of an equilateral triangle. The masses of the particles are 100gr, 150gr and 200 gr respectively. Each side of an equilateral triangle is 0.5 long.
14. What is orbital velocity? Obtain an expression for it.
15. What is venturimeter? Explain how it is used?
16. Pendulum clocks generally go fast in winter and slow in summer. Why?
17. Derive the relation between two specific heat capacities of gas on the basis of first law of thermodynamics.
18. How specific heat capacity of mono atomic, diatomic and poly atomic gases can be explained on the basis of Law of equipartition of Energy?

## SECTION-III

**III. Answer any Two of the following questions.**

**2 x 8 = 16**

19. (a) State and prove law of conservation of energy in case of a freely falling body?  
(b) If  $\vec{v} = i + j - 2k$  is the instantaneous velocity of a body of mass 0.5kg. Calculate its kinetic energy?
20. (a) State and prove parallel axes theorem.  
(b) Four spheres each diameter '2a' and mass 'm' are placed with their centres on the four corners of a square of side 'b'. Calculate the moment of inertia of the system about any side of the square?
21. (a) State Boyle's law and Charle's law. Hence, derive ideal gas equation.  
(b) The volume of a mass of gas at  $37^\circ\text{C}$  and a pressure of 75cm of mercury is 620 cc. Find the volume at N.T.P.?