



**JAIN COLLEGE, J C Road Bangalore**  
**Mock Paper January - 2016**  
**I PUC- Physics (33)**

**Time: 3 Hours 15 Minutes**

**Max. Marks :70**

- I. Answer the following.** **10 × 1 = 10**
1. Give an example for dimensionless physical quantity.
  2. Write the dimensional formula for moment of a couple.
  3. For what angle of projection is the range maximum?
  4. Which physical quantity is conserved during both elastic and inelastic collision?
  5. Define inertia.
  6. State Pascal's law.
  7. How does boiling point varies with increase in pressure?
  8. What is the change in internal energy of an ideal gas at constant temperature?
  9. State Boyle's law.
  10. At what position is the energy entirely kinetic in SHM.
- II. Answer any FIVE of the following questions.** **5 × 2 = 10**
11. Mention the fundamental forces in nature.
  12. Check the correctness of the equation  $f = \frac{1}{2l} \sqrt{\frac{T}{m}}$  using dimensional analysis.
  13. Draw the graphs for an object under free fall (a) variation of acceleration w.r.t. time (b) variation of velocity w.r.t. time.
  14. Define conservative and non conservative forces.
  15. Define Poisson's ratio. Write the expression for it.
  16. State the conditions of equilibrium of a rigid body.
  17. Give Kelvin-Planck and Clausius statement of the second law of thermodynamics.
  18. Define damped oscillation. How does the period of oscillation of a particle depend on its amplitude?
- III. Answer any FIVE of the following questions.** **5 × 3 = 15**
19. Derive the expression for the centripetal acceleration.
  20. What is limiting friction? Why static friction is called self-adjusting force?
  21. Arrive at the expression for escape speed of the body from the surface of earth
  22. How does surface tension of a liquid vary with temperature? Mention any two applications of Bernoulli's theorem.
  23. Define modulus of elasticity. Give its various forms. Which modulus is used for all states of matter?
  24. State and explain Wein's displacement law. What is its importance?
  25. Define degrees of freedom. Calculate the degrees of freedom for monoatomic, diatomic and triatomic gas molecules.
  26. Write any three differences between progressive and stationary waves.
- IV. Answer any TWO of the following questions** **2 × 5 = 10**
27. Show that  $v^2 = u^2 + 2as$  by graphical method.
  28. Derive the expression for the potential energy of a spring and hence define spring constant.
  29. State and explain the law of parallel and perpendicular axis theorem.
- V. Answer any TWO of the following questions.** **2 × 5 = 10**
30. Obtain an expression for work done in an isothermal process.
  31. What is Doppler Effect? Derive the expression for apparent frequency when the source is moving towards the observer and the observer moving away from the source.
  32. Explain the working of Carnot's engine with the help of p-v diagram.
- VI. Answer any THREE of the following questions.** **3 × 5 = 15**

33. Two forces  $P$  and  $2P$  act a point. If the first force is increased by  $5\text{ N}$  and the other tripled, the direction of the resultant is not altered. Find  $P$ .
34. A gun of mass  $20\text{ kg}$  fires a bullet of mass  $0.010\text{ kg}$  in a horizontal direction. If the gun recoils at  $0.05\text{ m/s}$  then calculate the velocity of the bullet. If the gun has to be stopped within a period of  $0.1\text{ s}$  then what force should be exerted on the gun?
35. A sphere of mass  $40\text{ kg}$  is being attracted by another sphere of mass  $80\text{ kg}$  with a force equal to  $\frac{1}{4}$  of a milligram weight when their centres are  $30\text{ cm}$  apart. Calculate the value of  $G$ .
36. A brass boiler has a base area of  $0.15\text{ m}^2$  and thickness  $1\text{ cm}$ . It boils water at the rate of  $6\text{ kg/min}$  when placed on a gas stove. Estimate the temperature of the part of the flame in contact with the boiler. Given  $K$  of brass= $109\text{ W/m/K}$ ,  $L$  of steam= $2.26\times 10^6\text{ J/kg}$ .
37. A simple harmonic oscillation is represented by the equation  $y=0.4\sin(440t+0.61)$ , here  $y$  and  $t$  are in  $\text{m}$  and  $\text{s}$  respectively. Find (i) Amplitude (ii) angular frequency (iii) frequency of oscillations (iv) time period (v) initial phase.