MC SQUARE ACADEMY

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MM: 50   **Physics (XI)**   **TT: 2 hours**

1. Explain following with proper reason.

   a. Why blood pressure in humans is greater at the feet than at brain.

   b. Water wets the glass surface while mercury does not.   [2]

2. If Earth were suddenly shrink to ½ of its present radius without change in mass. What is the effect on duration of day?   [2]

3. Explain with reason Why:

   a. A brass tumbler feels much colder than a wooden tray on a chilly day.

   b. The earth without its atmosphere would be inhospitably cold.   [2]

4. Derive the necessary relation for orbital velocity of a satellite and prove that $T^2 \alpha R^3$ using it.   [3]

5. Define molar specific heat capacities at constant volume and pressure. Show that $C_P - C_V = R$. Where Symbols have their usual meaning.   [3]

6. What do you mean by acceleration due to gravity? Derive the necessary relation for variation of g with depth.   [3]

7. State Stokes' law and derive the expression for critical velocity in case of a small spherical body falling through a viscous fluid like Glycerin.   [3]

8. State Pascal's law. How it can be used in Hydraulic lift.   [3]

9. A transverse harmonic wave on a string is described $Y(x,t) = 8\sin(6t + 0.045x + \frac{\pi}{6})$ Where x and y are in cm and t in sec. The positive direction of x is from left to right.

   a. Is this a travelling or a stationary wave? If it is travelling, what is the direction of its propagation?

   b. What are its amplitude and frequency?   [3]

10. State law of equi-partition of energy. Derive an expression for γ of an ideal gas whose degree of freedom is n.   [3]

11. A liquid drop of diameter 8 mm breaks into 64 droplets of equal size. Calculate the amount of work done in the process. (The surface tension of the liquid is 0.07 N/m at 20^0C)   [3]

12. A body of mass m is executing SHM with displacement – time relation y= A sin ωt .Derive relation for velocity and acceleration and draw the graphs to show the variation of displacement, velocity and acceleration as function of time.

   a. What is the effect on time period of a pendulum of length 1m and time period 2s, when length increases to double of its original length?

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OR

a) Derive expressions for the kinetic energy and potential energy of a particle of mass m executing SHM of which

Displacement – time relation is given as $y = A \sin\omega t$. Show that total energy is conserved in SHM. Draw the graphs to show the variation of KE and PE as function of displacement.

b) At what distance from mean position Kinetic energy and potential energy of a body executing SHM is equal in magnitude. [5]

13. (a) State Stoke's Law. A metallic ball of radius r and density ρ is falling through a liquid of density η then derives the relation for terminal velocity?

(b) In a hydraulic lift the cross section area of smaller and larger pistons are $20cm^2$ and $3m^2$ respectively. What will be the force experienced by a car kept on larger piston when a force of 20 kN applied on smaller side.

OR

14. (a) Describe stress- strain relationship for a loaded steel wire and hence explain its various portions briefly.

(b) The average depth of Indian Ocean is about 3000 m. calculate the fractional compression, $\Delta V/V$, of water at the bottom of ocean. Given that the bulk modulus of water is $2.2 \times 10^9 N/m^2$. Take $g = 9.8 m/s^2$

[5]

15. Answer
    a. What is angle of contact? When it is obtuse? When it is acute?
    b. Show that excess pressure inside a drop of radius r is $P_i - P_o = 2S/R$.
    OR
    State and prove Bernoulli's theorem. Explain any one application of it. [5]

16. State Hooke's law. Explain Stress – Strain curve of a material when subjected under extended load.

[5]

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