

**Shree Sanatan Dharm Education Centre**

**Class XI Physics Revision Sheet**

**Topic: Dimensional Analysis**

- 1) The wavelength  $\lambda$  associated with a moving electron depends upon the mass  $m$  and velocity  $v$  and Planck's constant  $h$ . Deduce a formula dimensionally.
- 2) If velocity of sound in a gas depends on its elasticity and density derive the relation for the velocity of sound by method of dimensions?
- 3) Convert a pressure of 76 cm of mercury into  $\text{kgf m}^{-2}$ .
- 4) The period of vibration of a tuning fork depends on the length of its prong, density  $d$  and Young's Modulus  $Y$  of the material. Deduce an expression for the period of vibration on the basis of dimensional analysis.
- 5) The volume of a liquid flowing out per second through a capillary tube depends on i) coefficient of viscosity ii) radius  $r$  of the tube iii) pressure gradient set up along the capillary tube. Using the dimensional method derive an expression for volume of liquid flow.
- 6) In the equation  $(P + a/V^2)(V - b) = RT$  find the dimensions of  $a$  and  $b$  Constants.
- 7) Check dimensional correctness of the formula  $\tau = I\alpha$ .

**Topic: Plane Motion**

- 1) Resultant of two vectors  $a$  and  $b$  inclined at an angle  $\theta$  is  $c$ . Calculate  $\theta$ . Given  $a = b = c$ .
- 2) A motor boat is racing towards north at 25kmph and the water current in that region is 10kmph in the direction  $60^\circ$  east of south. Find the resultant velocity of the boat.
- 3) I A particle moves from position  $3i + 2j - 6k$  to  $14i + 13j + 9k$  in meter under the action of a constant force of  $4i + j + 3k$  N. Calculate the work done.
- 4) Find the torque of force  $7i - 8j - 5k$  about the origin, which acts on a particle whose position vector is  $i + j - k$ .
- 5) Find the scalar product and vector product of two vectors  $3i - 4j + 5k$  and  $2i + j - 3k$ .  
Find the value of linear velocity of  $r = 3i - 4j + 4k$  and  $\omega = 5i - 6j + 4k$
- 6) The maximum range of a projectile is  $2\sqrt{3}$  times its usual range. What is the angle of projection for the actual range?
- 7) Derive the formula for a) maximum height b) time of flight c) Range of a projectile when a projectile is thrown from an angle of  $\theta$  with the horizontal.

**Topic : Work power Energy**

- 1) Derive an expression for the work done against friction when a body is made to slide down an inclined plane.
- 2) What are inelastic collisions?
- 3) What is power give mathematical formula for it.
- 4) Two bodies of masses 3 kg and 5 kg are connected by a string which hangs over a frictionless pulley at the top of frictionless inclined plane of slope 1 in 3, the first body hanging vertically and the second body resting on the plane. The system is released from rest. Find the velocity when the first body has descended 6m.  $g = 10 \text{ m/s}^2$ .
- 5) A lorry and a car are having the same kinetic energy are brought to rest by the application of brakes of equal retarding force. Which of them will come to rest in a shorter distance? Why?

### **Topic: Rotational Kinematics**

- 1) A ladder is at rest with its upper end against a wall and the lower end on the ground. Is the ladder more likely to slip when a man stands on it at the bottom or top? Explain
- 3) Does the moment of inertia of a body depend upon the angular velocity of the body?
- 4) Define radius of gyration of a body rotating about an axis. Derive an expression for it. On what factors does it depend upon?
- 5) Explain law of conservation of law of angular momentum. Give one example.
- 6) Derive the theorms of parallel axis and perpendicular axis.

### **Topic: Gravitation**

- 1) What happens to the acceleration due to gravity when a body is taken to a height h. derive the formula.
- 2) State and explain Kepler's laws of planetary motion
- 3) How does the acceleration due to gravity change with the altitude of the body above the surface of the earth. Draw a graph to show this variation. How much above the earth does the acceleration due to gravity reduces by 64% of its value on the surface of the earth. Radius of the earth 6400 km.
- 4) What is binding energy of satellite? Derive a formula for it.
- 5) Give two reasons why the value of acceleration due to gravity on earth's surface greater at the poles?

### **Topic: Mechanical properties of solids and fluids**

- 1) At a depth of 1000m in an ocean a) what is the absolute pressure? b) What is the gauge pressure? c) Find the force acting on the window of area 20 x 20 cm of a submarine at this depth, the interior of which is maintained at sea level atmospheric pressure. Density of sea water is  $1.03 \times 10^3 \text{ kg/m}^3$ ,  $g = 10 \text{ m/s}^2$  Atmospheric pressure  $1.01 \times 10^5 \text{ Pa}$ .
- 2) A drop of oil over a clean surface of water spreads into a thin film but floats as a globule on a greasy surface. Why?
- 3) Derive an expression for rise/fall of a liquid in a capillary tube. What happens when the length of the capillary tube is insufficient?
- 4) What is the velocity of Efflux? Derive an expression for it. The height of a water in a tank  $h = 96 \text{ cm}$ . Find the range of water stream coming out of a hole at depth of  $h/4$  from the upper surface of water.
- 5) State and prove Bernoulli's theorem.
- 6) Define coefficient of viscosity and derive a formula for it when two layers of fluid are moving.

### **Topic: Oscillations**

- 1) A body oscillates with SHM according to the equation  $x = 5.0 \text{ m} \cos [(2\pi \text{ rad/s})t + \pi/4]$  At  $t = 1.5 \text{ sec}$  calculate the i) displacement ii) speed ii) acceleration of the body.
- 2) A SHM is represented by  $x = A \sin \omega t$ . Write expression for velocity and acceleration. Find the values of displacement, velocity and acceleration for time  $0, T/4, 2T/2, 3T/4$  and  $4T/4$ . Hence draw graphs of displacement – time, velocity – time and acceleration – time. What conclusions do you draw from these graphs?
- 3) A particle executes SHM with a time period of 2 seconds and amplitude 5 cm. Find displacement, velocity and acceleration after  $\frac{1}{3}$  second, starting from mean position.

- 4) A simple pendulum has time period  $T_1$ . The point of suspension is now moved to an upward displacement  $y$ , given by the relation  $y = kt^2$  ( $k = 1 \text{ m/s}^2$ ). The time period becomes  $T_2$ . Find the ratio  $T_2^2/T_1^2$ . Given  $g = 10 \text{ m/s}^2$ .
- 5) Derive an equation for a plane progressive wave.
- 6) A mass  $M$  attached to a spring oscillates every 2 seconds. If the mass is increased by 2 kg the period increase by one second. Find the initial mass  $M$ , assuming Hooke's law is obeyed.