

**BRAIN INTERNATIONAL SCHOOL**

TERM-II

CLASS-11

2018-19

**SUB: -PHYSICS REVISION SHEET**

**Chapter 1: UNITS AND DIMENSIONS**

- 1) Find the dimension of  $a/b$  in relation  $P = b \cdot x^2 / at$ . Where  $p$  is power,  $x$  is distance and  $t$  is time.
- 2) The velocity of a freely falling body is a function of the distance fallen through ( $h$ ) and acceleration due to gravity  $g$ . Show by method of dimensions that  $v = k$  under root  $gh$ .
- 3) The error in the measurement of radius of a sphere is 2%. What would be the error in the volume of the sphere?
- 4) A physical quantity  $Q = A^2 B^{3/2} / C^4 D^{1/2}$ . The percentage error in  $A$ ,  $B$ ,  $C$  and  $D$  are 1%, 2%, 4% and 2% respectively. Find the percentage error.
- 5) A car travels along a straight line for the first half time with speed 50km/h and the second half time with the speed 60km/h. Find the average speed of the car.
- 6) The dimension of a particle varies with time  $t$  as  $x = 4t^2 - 15t + 25$ .
- 7) The distance  $x$  of a particle moving in one dimension under the action of a constant force is related to time  $t$  by the equation  $t = x^{1/2} + 3$ , where  $x$  is in metre and  $t$  in seconds. Find the displacement of the particle when its velocity is zero
- 8) A ball is thrown vertically up with speed  $u$ , find the distance covered during the last second of its ascent.
- 9) State and prove parallelogram law of vector addition.
- 10) Find the angle between two vectors  $p$  and  $Q$  if resultant of the vector is given by
- 11) Derive the equation. Where each terms have their usual meaning.
- 12) If  $A = 3i + 4j$  and  $B = 7i + 24j$ . Find a vector having the same magnitude as  $B$  and parallel to
- 13) Find a unit vector parallel to the resultant of the vector  $A = 2i - 6j - 3k$  and  $B = 4i + 3j - k$ .
- 14) Find the angle between the following vectors  $A = i + j + k$  and  $B = -2i - 2j - 2k$ .

15) Find the moment about the point (1,-1,-1) of the force  $3\mathbf{i}+4\mathbf{j}-5\mathbf{k}$ .

**LAWS OF MOTION:**

- 1) Two billiards ball of mass 50g moving in opposite direction with speed 16m/s collide and rebound with the same speed. What he impulse imparted by each ball to the other.
- 2) Show that the Newton 2<sup>nd</sup> law of motion is the real law.
- 3) The strings of a parachute can bear a maximum tension of 72 kg wt. By what minimum acceleration can a person of 96 kg descend by means of this parachute?
- 4) A bullet of mass 7 kg is fired in to a block of metal weighing 7 kg. The block is free to move. After the impact, the velocity of bullet and the block is 70 m/s.what is the initial velocity of bullet.
- 5) Define angle of friction and angle of repose.
- 6) Why is it easier to pull a lawn roller than to push it? Explain.
- 7) A monkey of mass 4kg climbs on a rope which can stand a maximum tension of 600N. In which of the following cases will the rope break. The monkey
  - i. Climbs up with an acceleration of  $6\text{m/s}^2$ .
  - ii. Climbs down with an acceleration of  $4\text{m/s}^2$ .
  - iii. Climbs up with a uniform speed of  $5\text{m/s}^2$ .
  - iv. Falls down the slope nearly freely under gravity ( $g = 10\text{m/s}^2$ ).

**WORK, ENERGY AND POWER:-**

- 1) Derive expression for kinetic energy.
- 2) A man weighing 50kgf supports a body of 25kgf on his head. What is the work done when he moves a distance of 20m up an incline of 1 in 10?
- 3) A force  $F = (15+0.50x)$  N acts on a particle in the x-direction, where x is the distance in metre. Find the workdone by this force during a displacement from  $x=0$  to  $x=2\text{m}$ .

- 4) State the work energy theorem. Prove it for a constant force.
- 5) If linear momentum of a body increases by 20%. What will be the % increase in the kinetic energy of the body?
- 6) If kinetic energy of a body increases by 300%, by what % will the linear momentum of the body increase?
- 7) What is conservative and non-conservative force?
- 8) Calculate the velocity of the bob of a simple pendulum at its mean position if it is able to rise to a vertical height of 10cm. Take  $g=9.8\text{m/s}^2$ .
- 9) Derive expression for spring potential energy.
- 10) A ball is dropped from a height of 3m. What is the height up to which the ball will rebound? The coefficient of restitution is 0.5.

#### **SYSTEM OF PARTICLES & ROTATIONAL MOTION:-**

- 1) Two bodies of masses of 1kg and 2 kg are located at (1, 2) and (-1, 3) respectively. Calculate the co-ordinates of centre of mass.
- 2) Deduce relation between torque and angular momentum.
- 3) State theorems of perpendicular and parallel axes.
- 4) Calculate the moment of inertia of a cylinder of length 1.5m, radius 0.05m and density  $8 \times 10^3 \text{kgm}^{-3}$  about the axis of the cylinder.
- 5) Derive relation between torque and angular acceleration.
- 6) Obtain the expression for the linear acceleration of a cylinder rolling down an inclined plane and hence find the condition for the cylinder to roll down without slipping.
- 7) The angular momentum of a body is 31.4Js and its rate of rotation is 10 cycles per second. Calculate the moment of inertia of the body about the axis of rotation.
- 8) What will be the duration of the day, if earth suddenly shrinks to  $1/64$  of its original volume, mass remaining the same?

- 9) A solid cylinder of radius 4cm and mass 250g rolls down an inclined plane (1in10). Calculate the acceleration and total energy of the cylinder after 5 sec.
- 10) If angular momentum is conserved in a system whose moment of inertia is decreased, will its rotational kinetic energy be conserved?

### **GRAVITATION:-**

- 1) A mass M is broken into two parts of masses  $m_1$  and  $m_2$ . How are  $m_1$  &  $m_2$  related so that the force g gravitational attraction between two parts is maximum?
- 2) Derive expression for the potential energy due to earth.
- 3) Derive expression of escape velocity.
- 4) Derive expression for the variation of 'g' due to depth and height.
- 5) Define gravitational potential. Also find expression for it.
- 6) Give a relationship between gravitational potential and gravitational intensity.
- 7) State Kepler's law of planetary motion.
- 8) How far away from the surface of Earth does the value of g reduces to 4% of its value on the surface of Earth.

### **MECHANICAL PROPERTIES OF SOLIDS AND FLUIDS**

- 1) Define bulk modulus of elasticity. Give its unit and dimension.
- 2) Define compressibility?
- 3) What is elastic after effect?
- 4) Define Poisson's ratio. Write an expression for it.
- 5) Define Young's modulus of elasticity. Give its unit and dimension.
- 6) Explain how is Pascal law is applied in hydraulic lift.
- 7) With the help of a labelled diagram, explain the working of hydraulic brakes?
- 8) Describe mercury barometer for measuring atmospheric pressure.
- 9) What is the pressure on a swimmer 10 m below the surface of a lake.
- 10) What is viscosity ? explain the cause of viscosity.
- 11) What is meant by coefficient of viscosity ? give its dimension and units.

- 12) State Stokes law. Deduce Stokes' law on the basis of dimensional analysis.
- 13) Derive the expression for terminal velocity of a ball moving in a viscous medium.
- 14) An iron ball of radius 0.3cm falls through a column of oil of density  $0.94\text{g/cm}^3$ . It is found to attain a terminal velocity of 0.5cm/s. Determine the viscosity of the oil. Given that the density of iron is  $7.8\text{g/cm}^3$ .
- 15) Obtain the equation of continuity for the incompressible non-viscous fluid having a steady flow through a pipe.
- 16) State and prove Bernoulli's principle for the flow of non-viscous fluids. Also give its limitations.
- 17) Derive an expression for the rise of liquid in a capillary tube and show that the height of the liquid column supported is inversely proportional to the radius of the tube.
- 18) Explain what happens when the length of a capillary tube is less than the height up to which the liquid may rise in it.
- 19) A liquid rises to a height of 7cm in a capillary tube of radius 0.1mm. The density of the liquid is  $0.8 \times 10^3 \text{ kg/m}^3$ . If the angle of contact between the liquid and the surface of the tube be zero, calculate the surface tension of the liquid.
- 20) Two soap bubbles having radii in the ratio 2:3. Compare the excess of pressure inside these bubbles. Also compare the work done in blowing these bubbles.

### THERMAL PROPERTIES OF MATTER

- 1) What is meant by thermal expansion of a body? what are different types of thermal expansion?
- 2) Derive the relation between  $\alpha$ ,  $\beta$  and  $\gamma$ .
- 3) Define the term specific heat and molar specific heat.
- 4) What is latent heat? give its unit.

- 5) State the factors on which the conduction of heat through a substance depends. Obtain an expression for the heat conducted and hence define the coefficient of thermal conductivity and give its units and dimensions.
- 6) State Newton's law of cooling . Express it mathematically .

### **THERMODYNAMICS**

- 1) State and explain zeroth law of thermodynamics?
- 2) State and explain first law of thermodynamics?
- 3) Derive an expression for the work done during the isothermal expansion of an ideal gas.
- 4) Derive an expression for the work done during the adiabatic expansion of an ideal gas.
- 5) What is heat engine .Explain its working principle. Define efficiency.
- 6) State and explain second law of thermodynamics.
- 7) Describe the operation of a Carnot engine. Also calculate its efficiency .
- 8) Describe the working of a reverse heat engine.

### **WAVES AND OSCILLATIONS**

- 1) What is meant by simple harmonic motion? Give some example.
- 2) Deduce an expression for the velocity of a particle executing S.H.M. when is the particle velocity Maximum and Minimum?
- 3) A particle executes S.H.M of amplitude 25 cm and time period 3 sec. What is the minimum time required for the particle to move between two points 12.5cm on either side of the mean position ?
- 4) A particle executing linear S.H.M has a maximum velocity of 40 m/s and a maximum acceleration of  $50 \text{ m/s}^2$  .find its amplitude and the period of oscillation.
- 5) Derive expression for kinetic and potential energies of a simple harmonic motion.
- 6) Define longitudinal and transverse wave.

- 7) How far does the sound travel in air when a tuning fork of frequency 256 Hz makes 64 vibrations ? velocity of sound in air is 320 m/s.
- 8) A wave travelling along a string is given by  $y(x, t) = 0.005\sin(80x - 3t)$  where each term has its usual meaning. Calculate  
(a) Frequency of the wave (b) velocity of the wave (c) amplitude of particle velocity.
- 9) Write the equation of plane progressive wave propagating along the positive x-direction, whose amplitude is 5cm, frequency 250Hz and velocity 500m/s.
- 10) State and explain the principle of superposition of waves.