St. Mary’s School, Dwarka
Holidays Homework
Class – XI
Subject: Physics
Week 3
Worksheet – 3

Objective:

- Revision of concepts
- Skills to carry out research and develop scientific aptitude
- Encouraging learning through experiences

Instructions:

- Neatly write all the answers in your Physics note book.
- Attempt the questions keeping in mind the weightage of each question.
- Assignment ‘Summer Holiday Homework’ will be created on TEAMS. PDF of handwritten work should be uploaded on it.

No. of questions: 10 **M.M : 25**

Q1. Convert the following as directed : 2

(i) $3.0 m/s^2$ = --------------------- km/hr^2

(ii) $6.67\ 10^{-11} Nm^2/kg^2$ = ------------------------- $g^{-1}cm^3s^{-2}$

Q2. The farthest objects in our Universe discovered by modern astronomers are so distant that light emitted by them takes billions of years to reach the Earth. These objects (known as quasars) have many puzzling features, which have not yet been satisfactorily explained. What is the distance in km of a quasar from which light takes 3.0 billion years to reach us? 2

Q3 Given E, m, L and G denote energy, mass, angular momentum and gravitational constant respectively. Determine the dimensions of EL^2 / m^5G^2 2

Q4. A force F is given by F = at + bt², where t is time. What are the dimensions of a and b? 2

Q5(i). Young’s modulus of steel is $1.9 \times 10^{11}\ N/m^2$. When expressed in CGS units of dynes/cm², it will be equal to (Given : $1N = 10^5$ dyne, $1m^2 = 10^4\ cm^2$) 2

(a) 1.9×10^{10} (b) 1.9×10^{11} (c) 1.9×10^{12} (d) 1.9×10^{13}

(ii) Which one of the following represents the correct dimensions of the coefficient of viscosity?

(a) $[ML^{-1}T^{-2}]$ (b) $[MLT^{-1}]$ (c) $[ML^{-1}T^{-1}]$ (d) $[ML^{-2}T^{-2}]$

Q6. Use method of dimensions to check the correctness of the following equations : (1.5x2=3)

(i) x = x0 + ut + (1/2) at^2 where, x is displacement at given time t, xo is the displacement at t = 0, u is the velocity at t = 0 and a represents acceleration.

(ii) $P = (\rho g h)^{1/2}$ where P is the pressure, ρ is the density, g is gravitational acceleration and h is the height.

Q7. The kinetic energy K of a rotating body depends on its moment of inertia I and its angular speed ω. Considering the relation to be $K = kI^a\omega^b$ where k is dimensionless constant. Find a and b. Moment of Inertia of a sphere about its diameter is $(2/5)Mr^2$. 3

Q8. The centripetal force (F) acting on a particle (moving uniformly in a circle) depends on the mass (m) of the particle, its velocity (v) and radius (r) of the circle. Derive dimensionally formula for force (F). 3

Q9(i) . If momentum (P), area (A) and time (T) are taken to be fundamental quantities, then energy has the dimensional formula 3

(a) $(P^1 A^{-1} T^1)$ (b) $(P^2 A^1 T^1)$ (c) $(P^2 A^{-1/2} T^1)$ (d) $(P^1 A^{1/2} T^{-1})$

Explain with the steps of derivation.

(ii) The dimensions of kinetic energy is

(a) $[M^2L^2T]$ (b) $[ML^2T]$ (c) $[ML^2T^{-2}]$ (d) $[ML^2T^{-1}]$

Q10. A book with many printing errors contains four different formulas for the displacement *y* of a particle undergoing a certain periodic motion: 3

(a) $y=a \sin(2\pi t/T)$

(b) $y = a \sin vt$

(c) $y= (a/T)\sin(t/a)$

(d) $y=(a/\sqrt{2})\ [(\sin 2\pi t/T)+ (\cos 2\pi t/T)]$

(a = maximum displacement of the particle, v = speed of the particle. T = time-period of motion). Rule out the wrong formulas on dimensional grounds).