



INDIAN SCHOOL AL WADI AL KABIR

<b>Class: XI</b>	<b>Department: SCIENCE- 2020 – 2021</b> <b>SUBJECT : PHYSICS</b>	<b>Date of completion</b> <b>02.07.2020</b>
<b>Worksheet No:01</b> <b>With answers</b>	<b>Topic: Units and Measurements</b>	<b>Note:</b> <b>A4 FILE FORMAT</b>
<b>NAME OF THE STUDENT</b>	<b>CLASS /SECTION</b>	<b>ROLL NO.</b>

**MCQ TYPE QUESTIONS**

1. The velocity of a body is given by the equation:  $u = (b/t) + ct^2 + dt^3$ .

The dimensional formula for b is

- (a)  $[M^0L^0T^0]$       (b)  $[ML^0T^0]$       (c)  $[M^0L^0T]$       (d)  $[MLT^{-1}]$

2. Suppose a quantity y can be dimensionally represented in terms

M, L and T, that is  $[y] = [M^aL^bT^c]$ . The quantity mass;

- (a) may be represented in terms of L, T and y if  $a = 0$   
(b) may be represented in terms of L, T and y if  $a \neq 0$ .  
(c) can always be dimensionally represented in terms of L, T and y.  
(d) can never be dimensionally represented in terms of L, T and y.

3. If I is the moment of inertia and  $\omega$  the angular velocity, what is the dimensional formula of rotational kinetic energy  $\frac{1}{2} I\omega^2$ .

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

4. If  $Y = a+bt+ct^2$ , where y is in meter and t in second, then the unit of c is

- (a) m      (b)  $s^{-2}$       (c)  $ms^{-1}$       (d)  $ms^{-2}$

5. The dimensional formula  $[ML^2T^{-2}]$  represents

- (a) momentum      (b) moment of force      (c) acceleration      (d) force.

6.  $g\ cm\ s^{-2}$  stands for the unit of

- (a) Energy      (b) force      (c) momentum      (d) acceleration

7. The dimensional formula for PV, where P is pressure and V is volume is the same as that of  
 (a) work (b) power (c) Elastic modulus (d) Pressure.
8. The quantity having dimensions  $-2$  in the time is  
 (a) force (b) pressure (c) gravitational constant (d) all of these
9. in the equation  $[P+(a/V^2)](V-b) = RT$ , the S.I unit of a is  
 (a)  $Nm^2$  (b)  $Nm^4$  (c)  $Nm^{-3}$  (d)  $Nm^{-2}$
10. The physical quantities of which one is a vector and the other is a scalar, having same dimensions are  
 (a) moment and momentum (b) power and pressure  
 (c) impulse and momentum (d) torque and work.
11. given that  $r = m^2 \sin pt$ , where t represents time, the unit of m is N, then the unit of r is  
 (a) N (b)  $N^2$  (c) Ns (d)  $N^2s$
12. linear momentum and Angular momentum have the same dimensions in  
 (a) Mass and length (b) Length and time  
 (c) Mass and time (d) mass, length and time.
13. The dimensional formula of velocity gradient is  
 (a)  $[M^0L^0T^{-1}]$  (b)  $[MLT^{-1}]$  (c)  $[ML^0T^{-1}]$  (d)  $[M^0LT^{-2}]$
14. In the equation:  $S_{nth} = u+(a/2) (2n-1)$ , the letters have their usual meanings. The dimensional formula of  $S_{nth}$  is  
 (a)  $[M^1L^0T^1]$  (b)  $[M^1L^{-1}T^{-1}]$  (c)  $[M^0L^1T^{-1}]$  (d)  $[M^0L^1T^0]$
15. The dimensionless quantity  
 (a) does not exist (b) always has a unit  
 (c) never has a unit (d) may have a unit.
16. Which of the following ratios express pressure?  
 (a) Force/ Area (b) Energy/ Volume  
 (c) Energy/ Area (d) Force/ Volume

17. Which of the following are not a unit of time?

- (a) Second      (b) Parsec      (c) Year      (d) Light year

### **VERY SHORT ANSWERS TYPE QUESTIONS**

1. Why do we have different units for the same physical quantity?

Ans: - because this units are used in different parts of the world.

2. Name the device used for measuring the mass of atoms and molecules.

Ans: - mass spectrograph.

3. Express unified atomic mass unit in kg.

Ans: -  $1 \text{ amu} = 1.661 \times 10^{-27} \text{ kg}$ .

4. Why length, mass and time are chosen as base quantities in mechanics?

Ans: - In mechanics all the derived physical quantities can be derived only by length, mass and time.

### **SHORT ANSWERS TYPE QUESTIONS**

1. If the unit of force is 100 N, unit of length is 10 m and unit of time is 100 s, what is the unit of mass in this system of units?

Hints: -  $F = ml/t^2$ ,  $m = F \times t^2/l = 100\text{N} \times 10000 \text{ S}^2/ 10\text{m} = 10^5 \text{ Nm/S}^2$

2. Give an example of

(a) a physical quantity which has a unit but no dimensions.

(b) a physical quantity which has neither unit nor dimensions. (c) a constant which has a unit.

(d) a constant which has no unit.

Hints: -(a) angle, (b) strain, refractive index etc. (co-efficient of friction or spring constant).

3. Calculate the length of the arc of a circle of radius 31.0 cm which  $\pi/6$  subtends an angle of at the centre.

Hints: -  $2\pi r/12$ .

4. The displacement of a progressive wave is represented by  $y = A \sin (\omega t - kx)$ , where x is distance and t is time.

Write the dimensional formula of : (i)  $\omega$  and (ii)  $k$ .

Hints: -(i)  $[T^{-1}]$ , (ii)  $[L^{-1}]$ .

5. Which of the following time measuring devices is most precise?

- (a) A wall clock.
- (b) A stop watch.
- (c) A digital watch.
- (d) An atomic clock.

Give reason for your answer.

Hints: -(d) An atomic clock. NIST (National Institute of Standards and Technology) is world's most accurate clock which is Cesium based atomic clock. It loses only 1 second in about 30 million years. It is in USA.

### LONG ANSWERS TYPE QUESTIONS

1. A new system of units is proposed in which unit of mass is  $\alpha$  kg, unit of length  $\beta$  m and unit of time  $\gamma$  s. How much will 5 J measure in this new system?

Hints: -  $5 \text{ J} = 5 \text{ kgm}^2\text{s}^{-2} = 5 \alpha \beta^2 \gamma^{-2}$ .

2. A physical quantity  $X$  is related to four measurable quantities  $a$ ,  $b$ ,  $c$  and  $d$  as follows:  $X = a^2 b^3 c^{5/2} d^{-2}$ . The percentage error in the measurement of  $a$ ,  $b$ ,  $c$  and  $d$  are 1%, 2%, 3% and 4%, respectively. What is the percentage error in quantity  $X$ ? If the value of  $X$  calculated on the basis of the above relation is 2.763, to what value should you round off the result.

Hints: - refer to notebook same type question we have solved.

3. In the expression  $P = E l^2 m^{-5} G^{-2}$ ,  $E$ ,  $m$ ,  $l$  and  $G$  denote energy, mass, angular momentum and gravitational constant, respectively. Show that  $P$  is a dimensionless quantity.

Hints: - put dimensions of each quantity.

4. If velocity of light  $c$ , Planck's constant  $h$  and gravitational constant  $G$  are taken as fundamental quantities then express mass, length and time in terms of dimensions of these quantities.

Hints: - apply property of dimension to derive relation between two or more quantity.

### Answer Key of MCQs:-

1. (a), 2. (b), 3. (c), 4. (d), 5. (b), 6. (b), 7. (a), 8. (d), 9. (b), 10. (d), 11. (b), 12. (c), 13. (a), 14. (c), 15. (d), 16. (a, b), 17. (b, d).

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