Pakistan School
Kingdom of Bahrain

Basic Rules of the Class:

- 1) Always be on time for all your classes
- 2)Always Respect your all Class fellows.
- 3)Do not create any disturbance.
- 4)Raise hand if you have any question or you wish to answer any question.
- 5)Pay attention to your teacher.
- 6)Please, Enter into the class with your actual Name and CPR number.
- 7)Always follow your Time Table.

Engaging Starter

π radian = 180^0

Welcome back to all!

Grade 11th " Physics "

Unit: 1

"Measurements"

Chap no. 1 " Exercise "

“Exercise”

Exercise: MCQ's

Select the correct answers of the following questions.

iv) What is the SI unit of constant k in the following equation?

$F = 6\pi\eta r v = k r v$ where F = force, v = velocity and r = radius

(a) $kg\ m^{-1}\ s^{-1}$ (b) $kg\ m\ s$ (c) $kg^{-1}\ m^2\ s$ (d) $Kg\ m^2 s^2$

v) Which of the following is a smallest value?

(a) 1 mm × 1 pm (b) 1 cm × 1 km

(c) 1 Gm × 1 Em (d) 1 nm × 1 m

vi) $\frac{1\,km}{1\,Gm} =$ .....?

(a) 10^{-6} m (b) μ (c) 10^6 (d) $10\,\mu$

vii) In a cricket match 500 spectators are counted one by one. How many significant figures will be there in the final result?

(a) 3 (b) 1 (c) 2 (d) 0

Exercise: Conceptual Questions.

Q.No.4 :Why do we find it useful to have two units for the amount of substance kilogram and mole ?

1. Kilogram.

- When the amount of substance is measured in mass then unit kilogram is used.

2. Mole.

- When the amount of substance is measured in the form of elementary entities i.e. Atoms, Molecules, Ions, electrons etc then the unit mole is used.

Exercise: Conceptual Questions.

Q.5 Show that the famous "Einstein equation" $E=mc^2$ is dimensionally consistent.

Ans: Dimensions of energy = $[ML^2T^{-2}]$

Dimension of mass m= [M]

Dimension of velocity c= $[LT^{-1}]$

Putting in equation $E=mc^2$

$[ML^2T^{-2}] = [M]\,[LT^{-1}]^2$

$[ML^2T^{-2}] = [M]\,[L^2T^{-2}]$

$[M^2LT^{-2}] = [ML^2T^{-2}]$

Dimension LHS = Dimensions of RHS

Hence the famous Einstein equation is dimensionally consistent

Exercise: Conceptual Questions.

Q.6 **Deduce the dimensions of the gravitational constant.**

Ans. The gravitational force is $F = \frac{Gm_1m_2}{r^2}$

$$G = \frac{Fr^2}{m_1m_2} \quad \text{——(i)}$$

Dimensions of force $F = [MLT^{-2}]$

Dimensions of distance $r = [L]$

Dimensions of mass $m = [M]$

Putting in eq. (i)

$$\text{Dimensions of } G = \frac{[MLT^{-2}][L]^2}{[M][M]}$$

$$\text{Dimensions of } G = \frac{[MLT^{-2}][L^2]}{[M]^2}$$

$$\text{Dimensions of } G = [MLT^{-2} \times L^2 \times M^{-2}]$$

$$\text{Dimensions of } G = [M^{-1}L^3T^{-2}]$$

Exercise: Numerical Problems.

3. **The length of a pendulum is 100±0.1cm. If acceleration of free fall is 9.8±0.1 ms^{-2}. Calculate the percentage uncertainty in the time period of pendulum.**

Solution:

Length of pendulum $\ell = 100 \pm 0.1$ cm $= 1.0 \pm 0.001$m

Value of 'g' $g = 9.8 \pm 0.1\ ms^{-2}$

% uncertainty in time period = ?

The time period of simple pendulum is $T = 2\pi \sqrt{\ell/g}$

$$T = 2 \times 3.14 \sqrt{\frac{1.0}{9.8}}$$

$T = 2.006 \approx 2.0$ second

$$\% \text{ uncertainty in length} = \frac{0.001}{1.0} \times 100 = 0.1\%$$

$$\% \text{ uncertainty in value of 'g'} = \frac{0.1}{9.8} \times 100 = 1.02\%$$

From the relation of time period of simple pendulum

$$T = 2\pi \sqrt{\ell/g}$$

$$T = 2\pi \left(\ell/g\right)^{\frac{1}{2}}$$

In case of power, the power is multiplied by percentage uncertainty and for division the percentage uncertainties are added.

% uncertainty in time = power (% uncertainty in length + %uncertainty in 'g')

$$\% \text{ uncertainty in time} = \frac{1}{2}(0.1\% + 1.02\%)$$

$$\% \text{ uncertainty in time} = \frac{1}{2}(1.12\%)$$

% uncertainty in time = 0.56% when rounded off is 0.6%

Exercise: Numerical Problems.

5.(a) Suppose that the displacement of an object is related to time according to the expression $x = \beta t^2$ what are the dimension of β.

(b) A displacement is related to time as $x=A \sin 2\pi ft$ where A and f are constant. Find the dimension of A.

Solution:

(a) $x=\beta t^2$

$$\beta=\frac{x}{t^2}$$

Dimensions of β= ?

Dimensions of displacement x = [L]

Dimensions of time t= [T]

Dimensions of $\beta = \frac{[L]}{[T]^2}$ = $[L]\,[T]^{-2} = [LT^{-2}]$

Dimension of $\beta = [LT^{-2}]$

Exercise: Numerical Problems.

(b) The displacement and time relation is

$x = A \sin 2\pi ft$

Dimensions of A =?

Dimensions of displacement x = [L]

Since: It has no dimensions:

Value of $\sin 2\pi ft$ is dimensionless

[L] = A

Dimensions of A = [L]

Closure

1. Giga is equal to ?
2. Pico is equal to ?
3. Micro is equal to ?
4. Why do we use two units to measure the amount of substance ?

Home Work

- Students should Revise and Practice today's Topic and Exercise questions….. at home and should enhance their knowledge by Searching and Exploring related topics by using internet resources.

Thank you.....