QUESTIONS :

The answers to the questions are given below :

Q. 1.1 :- Every type of natural phenomenon which is repetitive after same intervals of time acts as reasonable time standards. For example:

(i) Rotation of earth around the sun
(ii) Change of shadows of objects
(iii) Position of sun , Position of stars
(IV) Rising of sun , rising of moon.
(V) Setting of sun , setting of moon.

Q. 1.2 :- The drawbacks are :

(i) Air Friction can change the time period badly.
(ii) Due to increase in temp. length of pendulum inc-

reas and hence time period increases.

(iii) Due to change in position from sea level gravitational acc. (g) changes and hence time period changes.

(IV) Lage amplitude, wrong adjustment etc.

Q. 1·3 :- It is very useful to have two units for the amount of substance i.e. kg, mole.

Kilogram is a macro-level unit. It gives only the amount of substance.

Mole is a microlevel unit. one mole of a substance contains the same no. of molecules, ions, no. of radicals, no. of atoms etc.

Q. 1·4 :- In these records option '(iii) 0.214 m' is correct, because the scale used has the least count of 1 mm = 0.001 m. It measures accurately upto three decimal places.

Q. 1·5 :- The analogous statement is :
"An experimental data is only as strong as its reading contains max. error."

Q. 1·6 :- Following errors are possible in the time period:

(i) Zero error of stop watch (ii) Parallex in the reading of stop watch (iii) Air friction (IV) Very large amplitude (V) Random error (VI) Systematic error.

Q.1.7 :- Two answers are possible here:

(i) yes, using dimensional analysis we can find unit of that constant (e.g. G, K=Spring const.)

(ii). If the constant is a number such as 2π, 6π etc., then dimensional analysis give no information about such constant.

Q.1.8 :- (i) **Pressure**: $\because P = \frac{F}{A} = \frac{ma}{A}$

So: $[P] = \frac{[m][a]}{[A]} = \frac{[M][LT^{-2}]}{[L^2]}$

$$[P] = [M]^1[L]^1[T]^{-2}[L]^{-2} = [M]^1[L]^{1-2}[T]^{-2}$$

$$\therefore [P] = [ML^{-1}T^{-2}]$$

(ii) **Density** :- $\rho = \frac{m}{V} \Rightarrow [\rho] = \frac{[M]}{[L^3]} = [ML^{-3}]$

$$\therefore [\rho] = [ML^{-3}].$$

Q 1.9 :- Given that: $[\lambda] = [L]$, $[v] = [LT^{-1}]$

$[f] = [T^{-1}]$.

(i) $f = v\lambda$:-

$[T^{-1}] = [LT^{-1}][L]$

or $[T^{-1}] = [L^2T^{-1}]$

As the dimensions on both sides are not same so formula (i) is incorrect

(ii) $f = \frac{v}{\lambda}$:-

$[T^{-1}] = \frac{[LT^{-1}]}{[L]} = \frac{[L][T^{-1}]}{[L]}$

$\therefore [T^{-1}] = [T^{-1}]$

As the dimensions on both sides of the eq. are same, so the formula (ii) $f = \frac{v}{\lambda}$ is dimensionally correct.

QUESTIONS

1.1 Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.

1.2 Give the drawbacks to use the period of a pendulum as a time standard.

1.3 Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?

1.4 Three students measured the length of a needle with a scale on which minimum division is 1mm and recorded as (i) 0.2145 m (ii) 0.21 m (iii) 0.214m which record is correct and why?

1.5 An old saying is that "A chain is only as strong as its weakest link". What analogous statement can you make regarding experimental data used in a computation?

1.6 The period of simple pendulum is measured by a stop watch. What type of errors are possible in the time period?

1.7 Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression? Explain.

1.8 Write the dimensions of (i) Pressure (ii) Density

1.9 The wavelength λ of a wave depends on the speed v of the wave and its frequency f. Knowing that

$$[\lambda] = [L], \qquad [v] = [LT^{-1}] \qquad \text{and} \qquad [f] = [T]^{-1}$$

Decide which of the following is correct, $f = v\lambda$ or $f = \frac{v}{\lambda}$.