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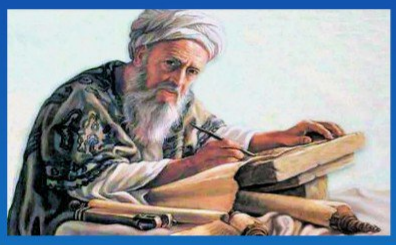
SEVEN MUSLIMS NOTES

PHYSICS 11



Al-Biruni (973–1048) calculated the Earth's radius and worked on the physics of planetary motion.

Best Regards to

Sir Muhammad Ali

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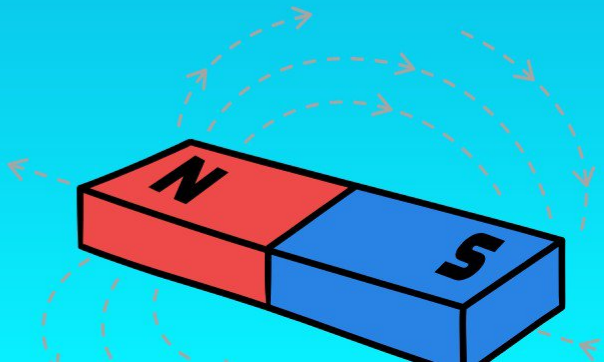

MEASUREMENTS

EXERCISE SHORT QUESTIONS

1.1. Name the several repetitive phenomenon which could serve as reasonable time standards.

The several repetitive phenomenon which could serve as reasonable time standard are given below.

1. Day and night cycles
2. Human pulse rate
3. Seasonal changes
4. Pendulum swings (Mechanical oscillation)
5. Half life of radioactive elements

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

The time period of a simple pendulum is given as

$$T = 2\pi \sqrt{\frac{l}{g}}$$

The length of a pendulum varies with temperature, and the value of g varies with height. Therefore, we cannot use time period of simple pendulum as a time standard.

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

It is useful to have two units for amount of substance. Kilogramme is used to measure a specific amount of mass ignoring microscopic atoms. While, mole is used to get a fixed number of atoms of a substance.

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

As the least count of the scale is 1mm = 0.001m therefore, the measurement 0.214m is correct.

1.5. An old saying is that " A chain is only as strong as its weakest link". …. (Skip this Question)

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

Following type of errors can occur in the time period of simple pendulum.

1. Random error
2. Systematic error
3. Personal error

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

Dimensional analysis does not give any information on the constant of proportionality; its value can be found experimentally.

1.8. Write the dimensions of

i) Pressure ii) Density

Ans.

i) Pressure

$$P = \frac{F}{A}$$

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

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

ii) Density

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Dimensions of density} = \frac{[M]}{[L^3]}$$

$$[\text{Density}] = [\,ML^{-3}]$$

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

[λ] = [L]
[v] = [LT^{-1}]
[f] = [T^{-1}]

Decide which of the following is correct

f = v λ **Or** **$f = \frac{v}{\lambda}$**

i) f = vλ

As dimensions of

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

$$v = [LT^{-1}]$$

$$\lambda = [L]$$

After putting the values in f = vλ

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

$$[T^{-1}] \neq [L^2T^{-1}]$$

Thus the equation f = vλ is not dimensionally correct.

ii) $f = \frac{v}{\lambda}$

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

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

Thus the equation $f = \frac{v}{\lambda}$ is dimensionally correct.