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# XI PHYSICS TEST ON DIMENSIONAL & ERROR ANALYSIS

**TIME : 1 HOUR** **MAX. MARKS : 25**

**1.** If Energy E is given by $E = \frac{a - bt^2}{x}$ t = time; x = distance. Find dimension of a and b. **2**

**2.** In $p = \left(\frac{a}{b}\right) e^{-\left[\frac{az}{\theta}\right]}$, find dimension of b? where P : Pressure, $\theta$ : Temperature, z : distance **2**

**3.** Find the fractional error in z, if $z = \frac{A^4 B^{1/3}}{CD^{3/2}}$. If % error in A, B, C and D are respectively 1%, 2%, 3%, and 4 %. **2**

**4.** How can we reduce systematic and random errors in measurements? **2**

**5.** Which of these formulae are correct dimensionally : **2**

**a.** $y = a \sin \frac{t}{x}$ ( y = displacement ; a = amplitude ; t = time ; x = position)

**b.** $v = \sqrt{\frac{E}{\rho}}$ ( E = Modulous of Elasticity ; $\rho$ = density ; $v$ = velocity)

**6.** Terminal velocity v depends upon coefficient viscosity ($\eta$), radius 'r', density '$\rho$'. Derive the formula dimensionally if $k = 6\pi$. **3**

**OR**

The value of G is $6.67 \times 10^{-11}$ $Nm^2 kg^{-2}$. Convert in C.G.S. system using dimensional analysis.

**7.** Capillary rise (h) is inversely proportional to (g) and it depends upon surface tension (s), radius (r), density ($\rho$). Derive the basic formula if $k = 2\cos\theta$. **3**

**OR**

Quantity of water flowing Q (volume per second) depends upon pressure gradient ($p / \ell$), radius (r), coefficient of viscosity ($\eta$). Derive the basic formula if $k = \pi / 8$ .

**8.** The time period of oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{1}{g}}$, $\ell$ is about 10 cm and is known 1mm accuracy. The time period of oscillation is about 0.5s. The time of 100 oscillation is measured with a wrist watch of 1s resolution. What is the percentage error in determination of g? **3**

**9.** Write the dimensional formula of the following :

**a.** Surface tension (S) **b.** Universal gravitational constant (G) **c.** Young's modulus of elasticity (Y)

**d.** Coefficient of viscosity ($\eta$) **e.** Planck's constant [h] **f.** Torque ($\tau$) **3**

**10.** Centripetal force measured as $F = \frac{mv^2}{R}$, if m = 20 $\pm$ 0.2 kg, v = 50 $\pm$ 0.5 m/s and R = 100 $\pm$ 2 m, then write F with limit of errors. **3**