

EXERCISE – II**PROBLEMS**

1. (A) 3, (B) 3, (C) 4, (D) 4, (E) 3, (F) 5, (G) 2, (H) 4

Notes

2. A

$$703.00$$

$$+ 7.00$$

$$+ 0.66$$

$$\hline 710.66$$

$$\approx 711$$

(B)

$$2.21 \times 0.3$$

$$= 0.663 = 0.7$$

$$(C) 12.4 \times 84 = 1041.6 = 1.0 \times 10^3$$

$$(D) 14.28 / 0.714 = 20 = 20.0$$

$$6.50$$

$$3. (i) \frac{-6.32}{0.18}$$

$$\approx 0.2$$

$$\sqrt{0.2} = 0.4$$

$$(ii) \frac{2.91 \times 0.3842}{0.080}$$

$$= 13.975 = 14$$

$$4. L.C. = M.S.D. - V.S.D.$$

$$= 1\text{mm} - \frac{9}{10}\text{mm} = 0.1\text{mm}$$

ZERO ERROR

$$Z.E. = 0.7\text{mm}$$

Reading $\rightarrow$

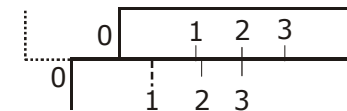
$$(M.S.R. + n \times L.C.) - Z.E.$$

$$= (31\text{mm} + 4 \times 0.1) - 0.7$$

$$= 31.4 - 0.7 = 30.7$$

5. (i)

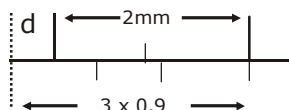
-1



$$M.S.R. + V.S.R. \times L.C.$$

$$-1 + 3 \times 0.1 = -0.7$$

OR



$$= 2.7\text{mm}$$

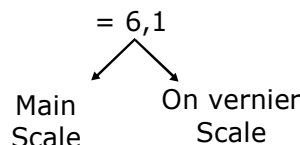
$$= 0.7\text{mm}$$

(ii)

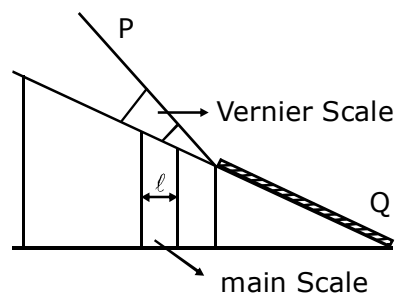
ACTUAL READING

$$= \text{READING} - Z.E.$$

$$= 5.4 - (-0.7)$$



6.



$$I.M.S.D. = \frac{\ell}{\cos \theta}$$

$$I.V.S.D. = \ell$$

$$L.C. = -\ell + \frac{\ell}{\cos \theta}$$

$$= \ell \frac{(-\cos \theta + 1)}{\cos \theta}$$

7.

$$L.C. = \frac{0.5\text{mm}}{50\text{ division}}$$

$$= 0.01\text{mm}$$

Reading = L.S.R.

$$+ L.C. \times V.S.R.$$

$$= 5 \times 0.5 + 34 \times 0.01$$

$$= 2.5 + 0.34$$

$$= 2.84\text{mm}$$

8.

$$L.C. = \frac{1\text{mm}}{50\text{div}} = 0.02\text{mm}$$

$$Z.E. = L.S.R. + L.C. \times VSR$$

$$= -1 + 0.02 \times 44$$

$$= -1 + 0.88$$

$$= -0.12$$

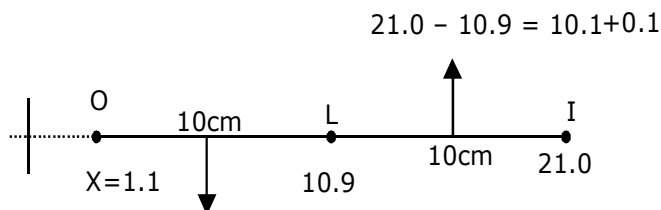
Now Reading

$$= L.S.R. + L.C. \times V.S.R. - Z.E.$$

$$= 3 + 0.02 \times 26 + 0.12$$

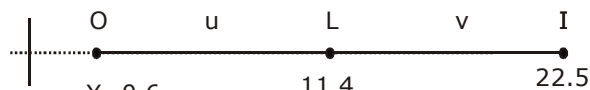
$$= 3.64\text{mm}$$

9. Ist data



$$10.9 - 1.1 = 9.8$$

$$\text{error} = -0.2$$



$$U = (11.4 - 0.6) + 0.2 = 11 \text{ cm}$$

$$V = 22.5 - 11.4 - 0.1 = 11 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow f = 5.5 \text{ cm}$$

$$\Delta f = f^2 \left(\frac{\Delta V}{V^2} + \frac{\Delta V}{V^2} \right)$$

$$= 5.5 \times 5.5 \left(\frac{0.1}{11^2} + \frac{0.1}{11^2} \right) = 0.05 \text{ cm}$$

10. CD, AB, EF

$$11. \quad \text{av. } V = \frac{13.8}{4.0} = 3.45 = 3.4 \text{ m/s}$$

$$\frac{\Delta V}{V} = \frac{\Delta S}{S} + \frac{\Delta t}{t}$$

$$\Rightarrow \frac{\Delta V}{3.4} = \frac{0.2}{13.8} + \frac{0.3}{4.0} \Rightarrow \Delta V = 0.3$$

$$\text{So } V = 3.4 \pm 0.3$$

$$12. \quad S = (1.20 \pm 0.18) \text{ cm}$$

13. (i) series

$$\text{av. } R = 5 + 10 = 15 \Omega$$

$$\Delta R = \Delta R_1 + \Delta R_2 = 0.3 \Omega$$

So

$$R = 15 \pm 0.3$$

$$\text{OR } \frac{0.3}{15} \times 100 = 2\% \Rightarrow R = 15 \pm 2\%$$

$$(ii) \text{ av. } R = \frac{R_1 R_2}{R_1 + R_2}$$

$$\text{So } R = \frac{10}{3} = 3.3$$

$$\text{Now } \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} \Rightarrow \frac{\Delta R}{R^2} = \frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}$$

$$\text{So } \Delta R = 0.1$$

$$\text{In \% age } \frac{\Delta R}{R} \times 100 = \frac{10}{3.3} = 3\%$$

$$14. \quad \rho = \frac{m}{v} = \frac{5.74}{1.2} = 4.78 = 4.8 \text{ (Rounding)}$$

$$15. \quad T = 2\pi\sqrt{l/g}$$

$$g = \frac{4\pi^2 l}{T^2}$$

$$100 \frac{\Delta g}{g} = 100 \frac{\Delta l}{l} + 200 \frac{\Delta T}{T}$$

$$100 \times \frac{0.1}{10} + 200 \times \frac{0.02}{0.5}$$

$$1 + 8 = 9\%$$

16.

$$P = \frac{4\pi^2 A^3 B^2}{\sqrt{C} \times D}$$

$$100 \frac{\Delta P}{P} = \left(3 \frac{\Delta A}{A} \right) \times 100 + \left(\frac{2\Delta B}{B} \right) \times 100 + \frac{1}{2} \frac{\Delta C}{C} \times 100 + 100 \frac{\Delta D}{D}$$

$$= 3 \times 1\% + 2 \times 3\% + \frac{1}{2} \times 2\% + 4\%$$

$$= 3 + 6 + 1 + 4 = 14\%$$

$$\Delta P = \frac{14P}{100} = \frac{14 \times 3.73}{100}$$

$$= 0.52$$

17.

$$\mu = \frac{\sin\left(\frac{A+S_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}, \quad \mu = \frac{\sin 45}{\sin 30} = \sqrt{2}$$

$$\ln \mu = \ln \sin\left(\frac{A+\delta m}{2}\right) - \ln \sin\left(\frac{A}{2}\right)$$

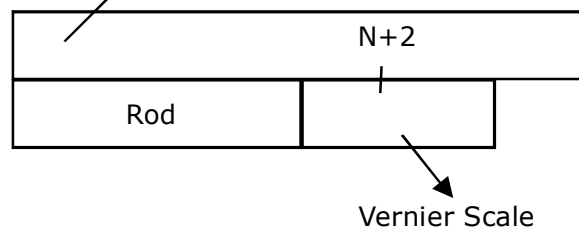
$$\frac{\Delta \mu}{\mu} = \frac{\cos\left(\frac{A+\delta m}{2}\right)}{\sin\left(\frac{A+\delta m}{2}\right)} \times \Delta\left(\frac{A+\delta m}{2}\right)$$

$$= \tan\left(\frac{A+\delta m}{2}\right) \times \frac{1}{2} \Delta(\delta m)$$

$$= \tan 45^\circ \times \frac{1}{2} \times \frac{\pi}{180} \text{ rad} \times 100\% = \frac{5\pi}{18} \%$$

18.

Let M.S.D. = 1 mm $\frac{\text{Å}}{\text{Main Scale}}$



$$\text{Now } (N+2) \times 1 \text{ mm} = l(\text{Rod}) + 2 \times 0.9$$

$$\Rightarrow N+2 = l + 1.8$$

Now change for (N+2) mm on M.S. is equal to change of

$$1.8 \text{ mm on V.S.} \Rightarrow \alpha_1 (N+2) \Delta T \Rightarrow \alpha_2 (1.8) \Delta T$$

$$\Rightarrow \frac{\alpha_1}{\alpha_2} = \frac{1.8}{N+2}$$