

p 693 27, 28, 29, 31, 34, 69, 73

$$\textcircled{27} \quad n\lambda = d \sin \theta$$

$$\begin{aligned} \theta &= \sin^{-1} \left(\frac{n\lambda}{d} \right) \\ &= \sin^{-1} \left(\frac{2(560 \times 10^{-9} \text{ m})}{1.45 \times 10^{-5} \text{ m}} \right) \\ &= \underline{4.4^\circ} \end{aligned}$$

$$\textcircled{28} \quad n\lambda = d \sin \theta \quad d = \frac{1}{3500} = 2.857 \times 10^{-4} \text{ cm}$$

$$\begin{aligned} \lambda &= \frac{d \sin \theta}{n} \\ &= \frac{(2.857 \times 10^{-6} \text{ m}) \sin 28^\circ}{3} = \underline{4.47 \times 10^{-7} \text{ m}} \end{aligned}$$

$$\textcircled{29} \quad n\lambda = d \sin \theta$$
$$d = \frac{n\lambda}{\sin \theta} = \frac{3(630 \times 10^{-9} \text{ m})}{\sin(18^\circ)} = 6.116 \times 10^{-6} \text{ m}$$

$$\frac{1}{6.116 \times 10^{-4} \text{ cm}} = \underline{1635 \text{ lines per cm}}$$

$$\textcircled{31} \quad n\lambda = d \sin \theta$$
$$d = \frac{n\lambda}{\sin \theta} = \frac{589 \times 10^{-9} \text{ m}}{\sin(15.5^\circ)} = \underline{2.20 \times 10^{-6} \text{ m}}$$

$$\theta = \sin^{-1} \left(\frac{n\lambda}{d} \right) = \sin^{-1} \left(\frac{3(589 \times 10^{-9} \text{ m})}{2.20 \times 10^{-6} \text{ m}} \right) = \underline{53.4^\circ}$$

$$(34) \quad n\lambda = d \sin \theta$$

$$d = \frac{1}{6000} = 1.67 \times 10^{-4} \text{ cm}$$

$$n = \frac{d \sin \theta}{\lambda}$$

$$= \frac{1.67 \times 10^{-6} \text{ m}}{633 \times 10^{-9} \text{ m}}$$

= 2.6 but n can only be whole numbers.

∴ 2nd order is the highest that can be seen

$$(69) \quad n\lambda = d \sin \theta$$

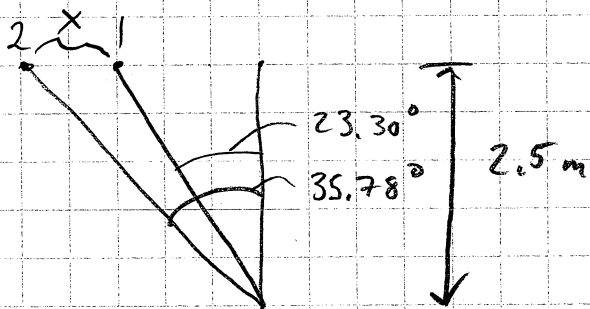
$$d = \frac{n\lambda}{\sin \theta} = \frac{(460 \times 10^{-9} \text{ m})}{\sin(51)} = \underline{5.92 \times 10^{-7} \text{ m}}$$

$$(73) \quad n\lambda = d \sin \theta$$

$$d = \frac{1}{8600} = 1.163 \times 10^{-4} \text{ cm}$$

$$\theta_1 = \sin^{-1} \left(\frac{n\lambda}{d} \right) = \sin^{-1} \left(\frac{4.6 \times 10^{-7} \text{ m}}{1.163 \times 10^{-6} \text{ m}} \right) = 23.30^\circ$$

$$\theta_2 = \sin^{-1} \left(\frac{n\lambda}{d} \right) = \sin^{-1} \left(\frac{6.8 \times 10^{-7} \text{ m}}{1.163 \times 10^{-6} \text{ m}} \right) = 35.78^\circ$$



$$\begin{aligned} x &= 2.5 \tan \theta_2 - 2.5 \tan \theta_1 \\ x &= 2.5 (\tan 35.78^\circ - \tan 23.30^\circ) \\ &= \underline{0.73 \text{ m}} \end{aligned}$$