

**Answers to Coursebook questions – Chapter 4.7**

- 1 Using  $\theta_D = \frac{\lambda}{b}$  we find  $\theta_D = \frac{500.0 \times 10^{-9}}{1.50 \times 10^{-6}} = 0.33$  rad.  
The angular width is double this angle and so 0.66 rad or approximately  $38^\circ$ .
- 2 The angle at the first minimum is  $\tan^{-1} \frac{0.67}{1.0} = 0.59$  rad and so from  $\theta_D = \frac{\lambda}{b}$  we get  
 $b = \frac{\lambda}{\theta_D} = \frac{2.80}{0.59} = 4.7$  cm.
- 3 The first minimum is at  $40^\circ$  or 0.698 rad. Then  $b = \frac{\lambda}{0.698} \Rightarrow b = 0.698\lambda \approx 0.70\lambda$ .
- 4 The angle at the first minimum is  $\tan^{-1} \frac{0.70}{0.60} = 0.862$  rad and so from  $\theta_D = \frac{\lambda}{b}$  we get  
 $b = \frac{\lambda}{\theta_D} \Rightarrow \lambda = 2.30 \times 0.862 = 1.98 \approx 2.0$  cm.