Solutions

Each answer shows the steps, then the **result**.

2.1

- the spreading of waves around obstacles and through gaps

2.2

- when the gap is about the same size as the wavelength

2.3

- that light behaves as a wave

2.4

- $a \sin\theta = \lambda$

3.1 B

- spreading.

3.2 B

- about equal to the wavelength.

3.3

(a)

- they spread out into the region beyond the gap

(b)

- make the gap narrower (closer to the wavelength)

3.4

(a)

- wavefronts from different points across the slit travel different path lengths to the screen
- where the path difference makes them arrive out of phase they interfere destructively, giving a dark band

(b)

- small angles: $y = \dfrac{\lambda L}{a} = \dfrac{(600 \times 10^{-9})(2.0)}{0.12 \times 10^{-3}}$
- $y = \mathbf{0.010}$ m (10 mm)

(c)

- twice the distance to the first dark band: $\mathbf{0.020}$ m (20 mm)

(d)

- it becomes wider, because $y \propto 1/a$

3.5 A

- the pattern takes the shape of the opening: a circular hole gives a central disc with rings