Question 1

Light passes through a single slit whose width can be varied.

As the slit width is decreased, what happens.

1. The central maximum narrows.
2. The central maximum widens.
3. The central maximum stays the same width but more dark fringes appear.
4. The central maximum stays the same width but fewer dark fringes appear.
5. Nothing changes except for the brightness of the central maximum.

Question 2

Light with wavelength $500\,\mathrm{nm}$ passes through a single slit with width $1800\,\mathrm{nm}$.

How many dark spots will appear in the diffraction pattern?

1. 3
2. 4
3. 6
4. 7
5. Infinite

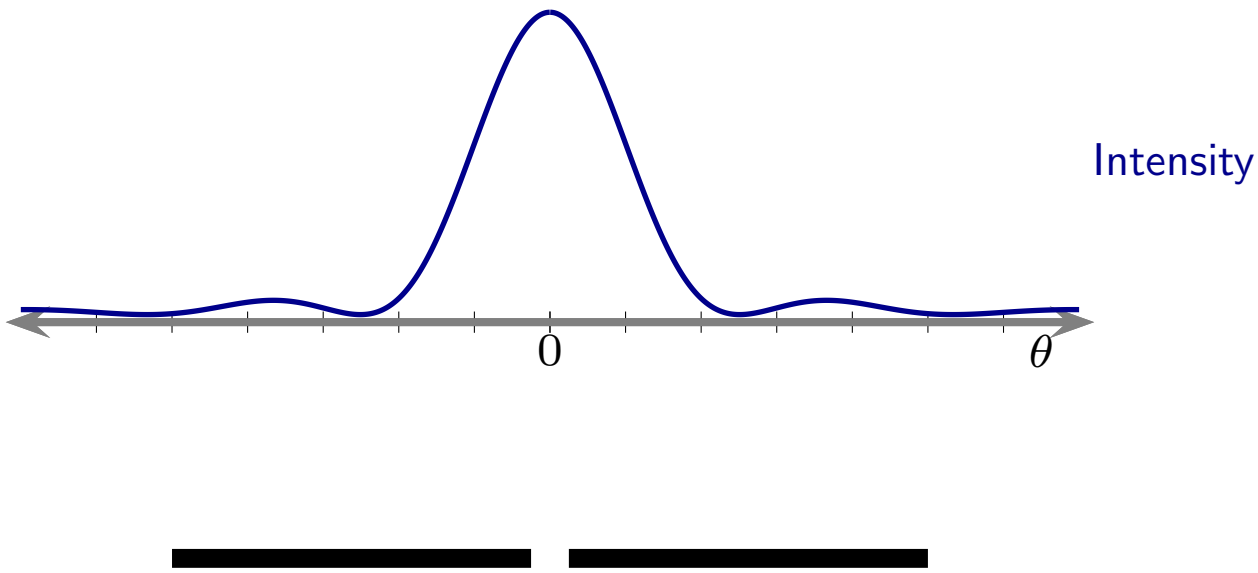
Single Slit Pattern

Single slit interference pattern.

$$I = I_{\max} \left(\frac{\sin \alpha}{\alpha} \right)^2$$

where

$$\alpha = \frac{\pi a}{\lambda} \sin \theta.$$



Double Slit Pattern: Width Included

Double slit interference pattern including width features.

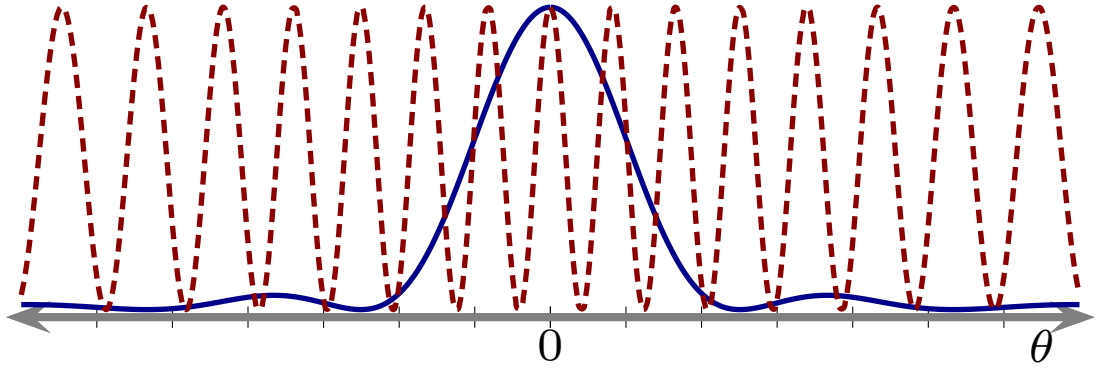
$$I = I_{\max} \left(\frac{\sin \alpha}{\alpha} \right)^2 \cos^2 \beta$$

where

$$\alpha = \frac{\pi a}{\lambda} \sin \theta$$

and

$$\beta = \frac{\pi d}{\lambda} \sin \theta.$$



Double Slit Pattern: Width Included

Double slit interference pattern including width features.

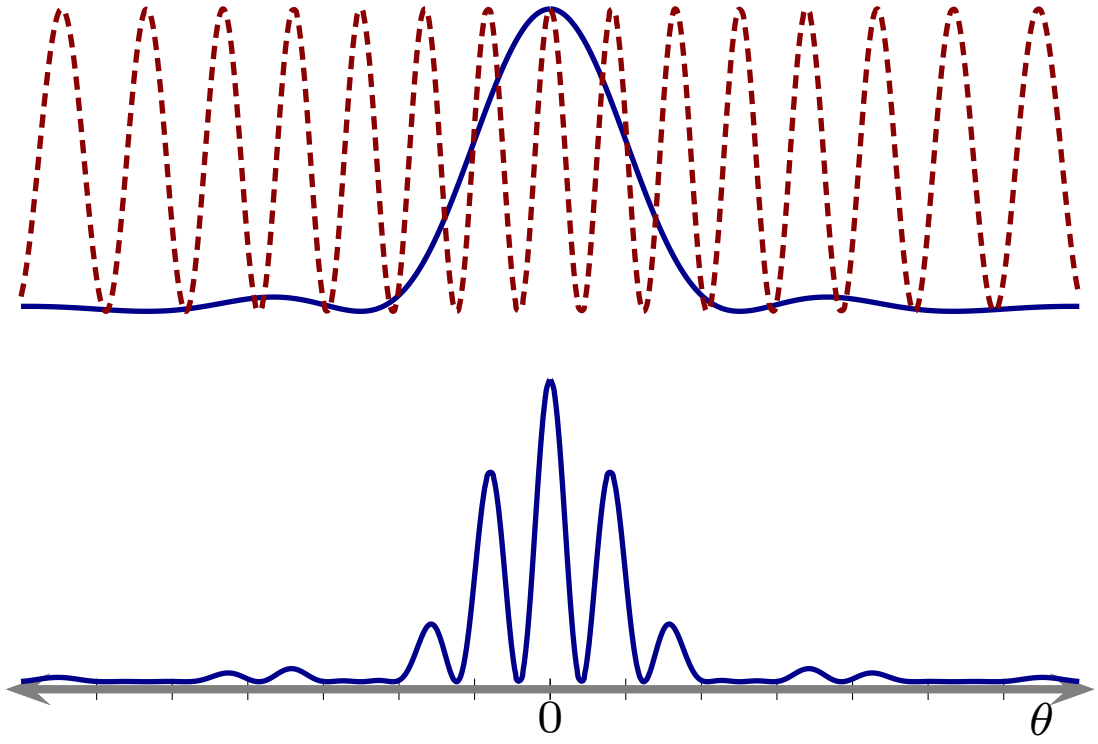
$$I = I^{\max} \left(\frac{\sin \alpha}{\alpha} \right)^2 \cos^2 \beta$$

where

$$\alpha = \frac{\pi a}{\lambda} \sin \theta$$

and

$$\beta = \frac{\pi d}{\lambda} \sin \theta.$$



Double Slit Pattern: Narrower Width

Double slit interference pattern with a narrower width.

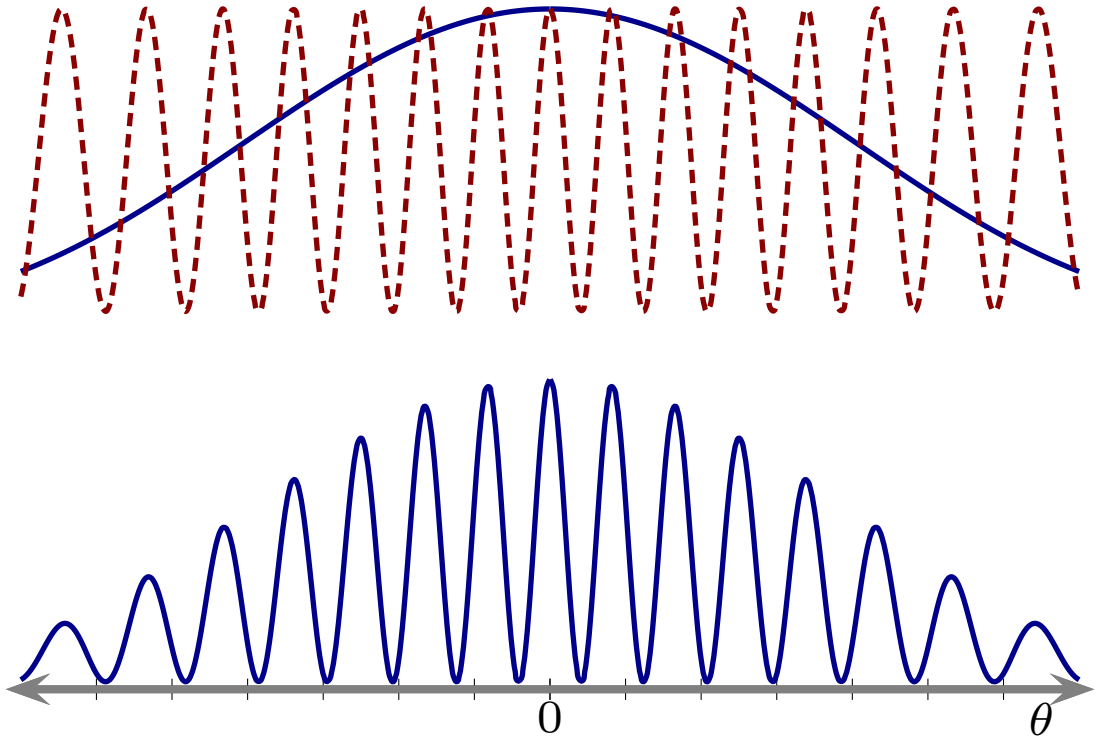
$$I = I^{\max} \left(\frac{\sin \alpha}{\alpha} \right)^2 \cos^2 \beta$$

where

$$\alpha = \frac{\pi a}{\lambda} \sin \theta$$

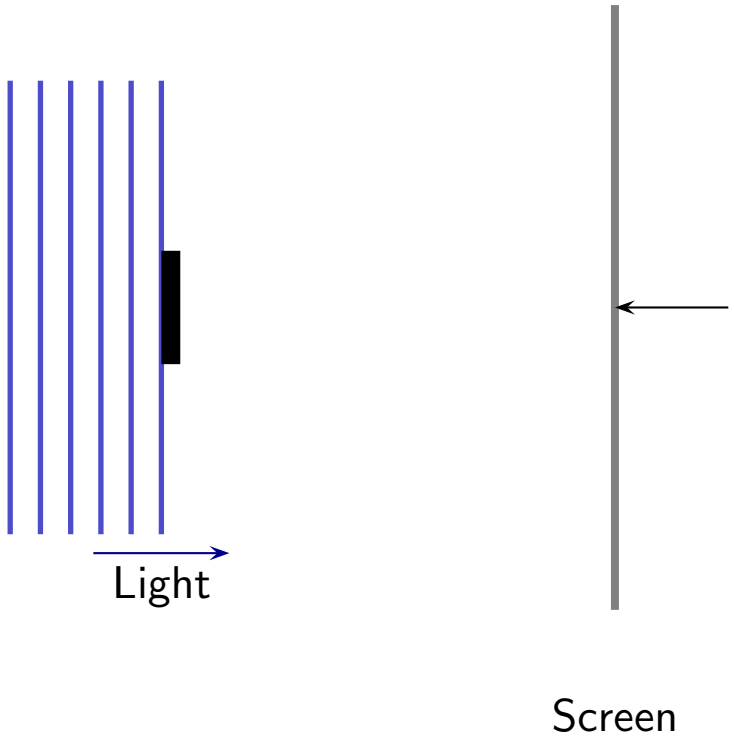
and

$$\beta = \frac{\pi d}{\lambda} \sin \theta.$$



Question 3

Monochromatic light is incident on a small disk-shaped barrier.



The disk will produce a shadow. The center of this area (marked by an arrow) is:

1. a bright spot,
2. darker than the rest of the shadow,
3. slightly lighter than the rest of the shadow,
4. bright or dark depending on the distance between the screen and the disk.

Mach-Zehnder Interferometer