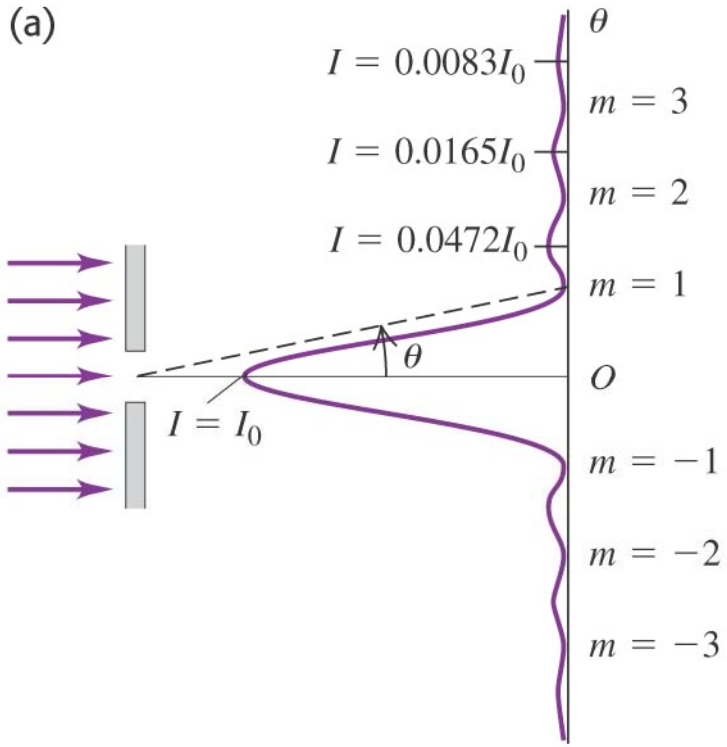
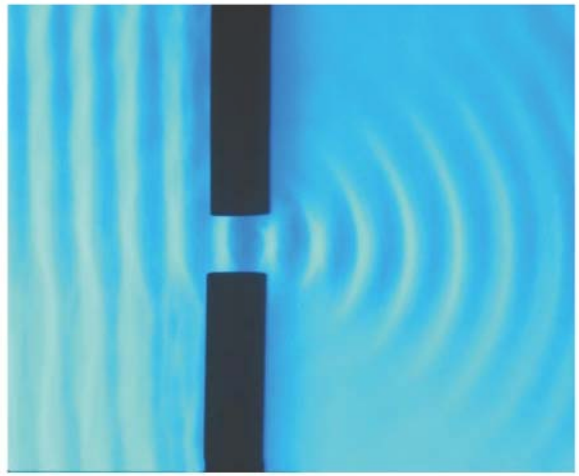
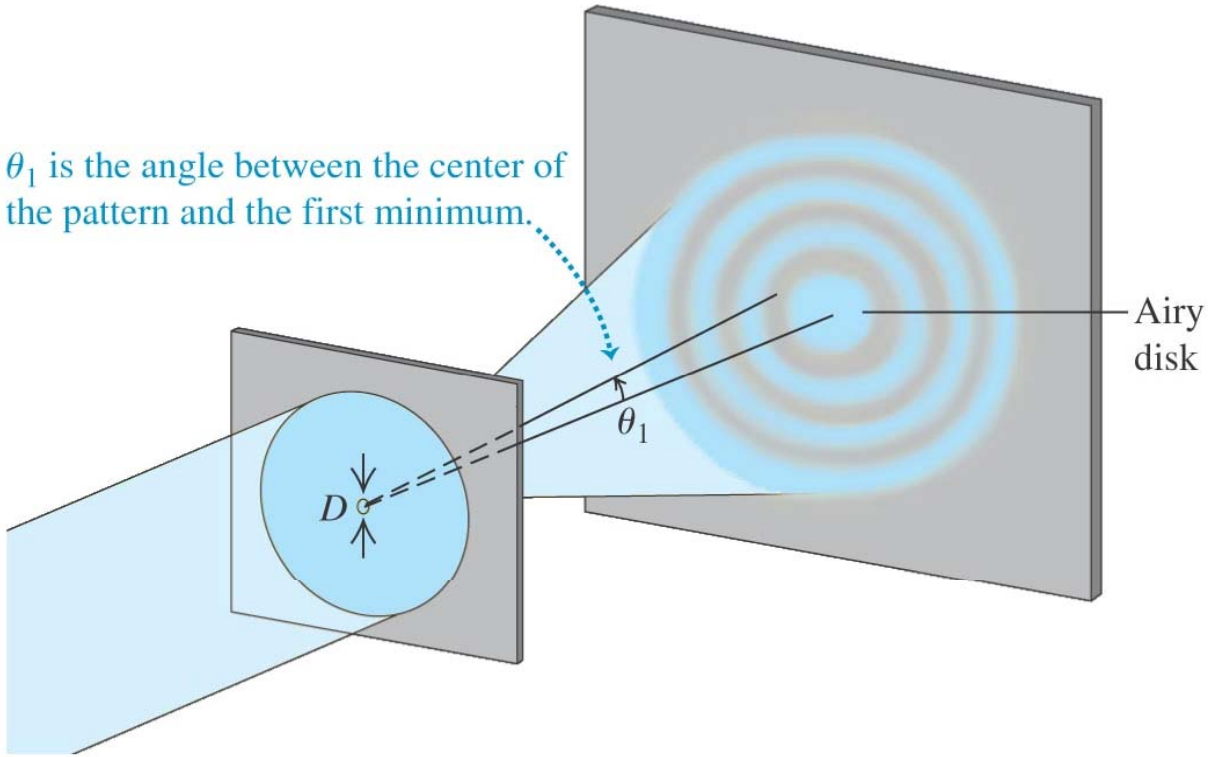
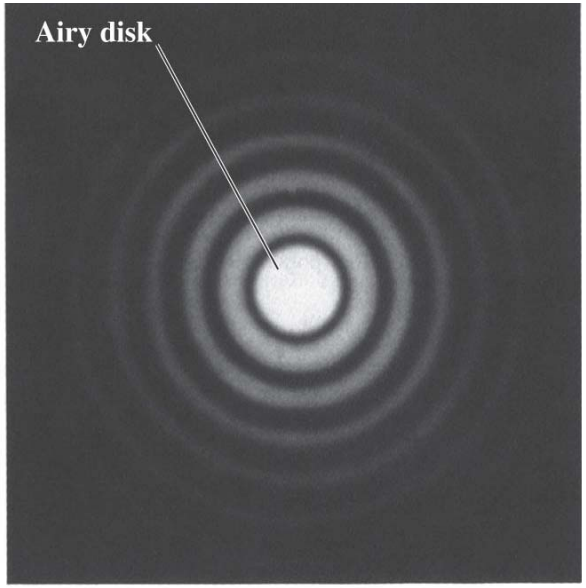
(a)



(b)



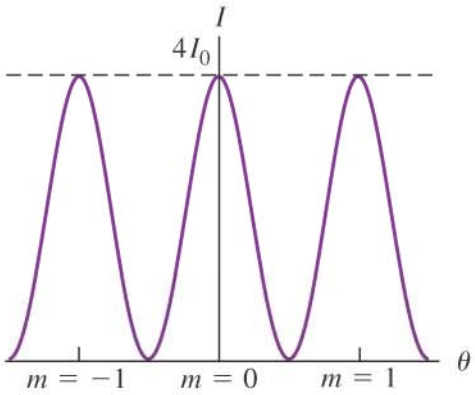




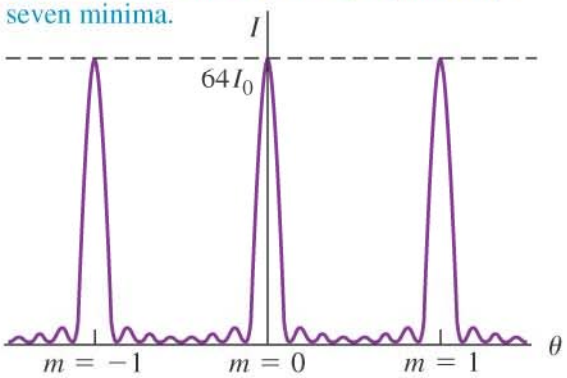
Angular position of first minimum:

$\sin \theta = 1.22 \lambda/d$

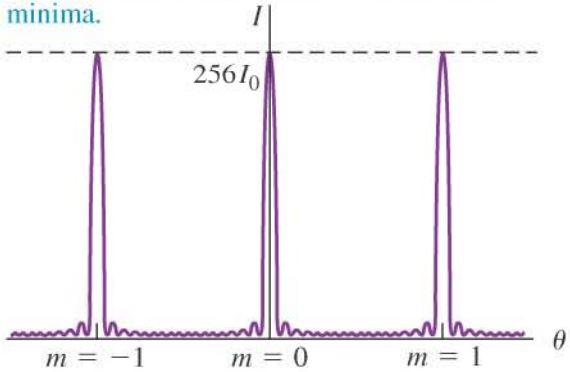
(a) $N = 2$: two slits produce one minimum between adjacent maxima.



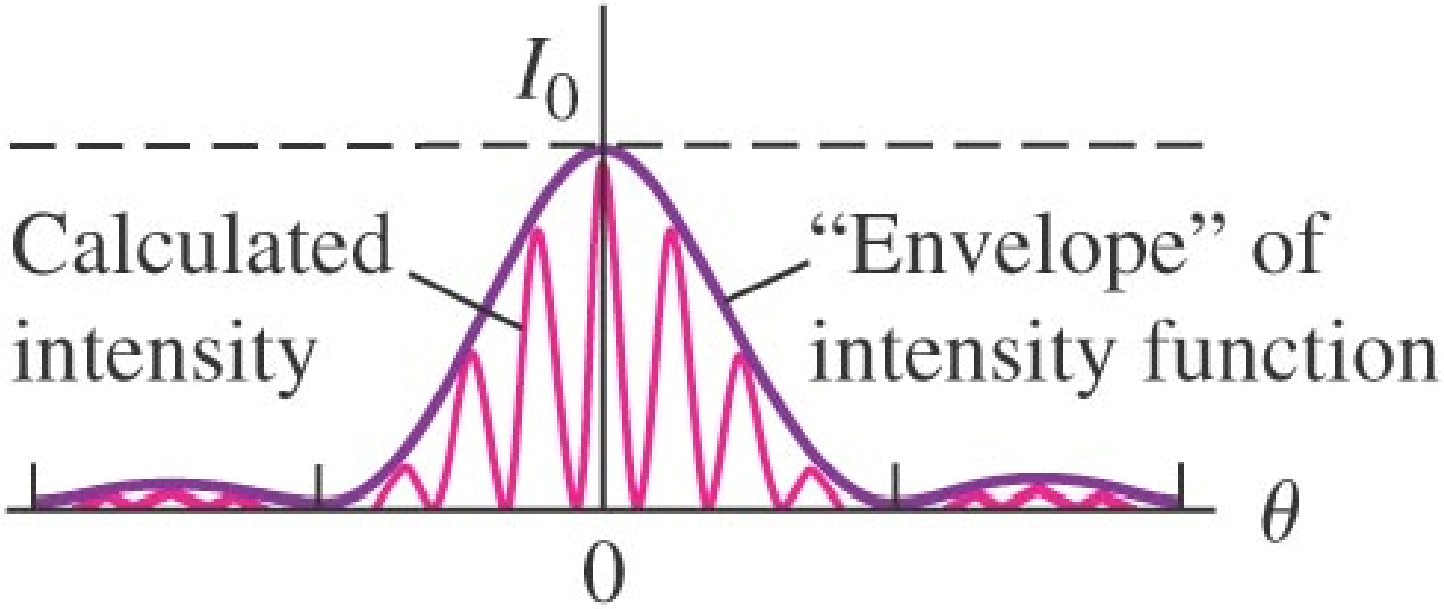
(b) $N = 8$: eight slits produce taller, narrower maxima in the same locations, separated by seven minima.



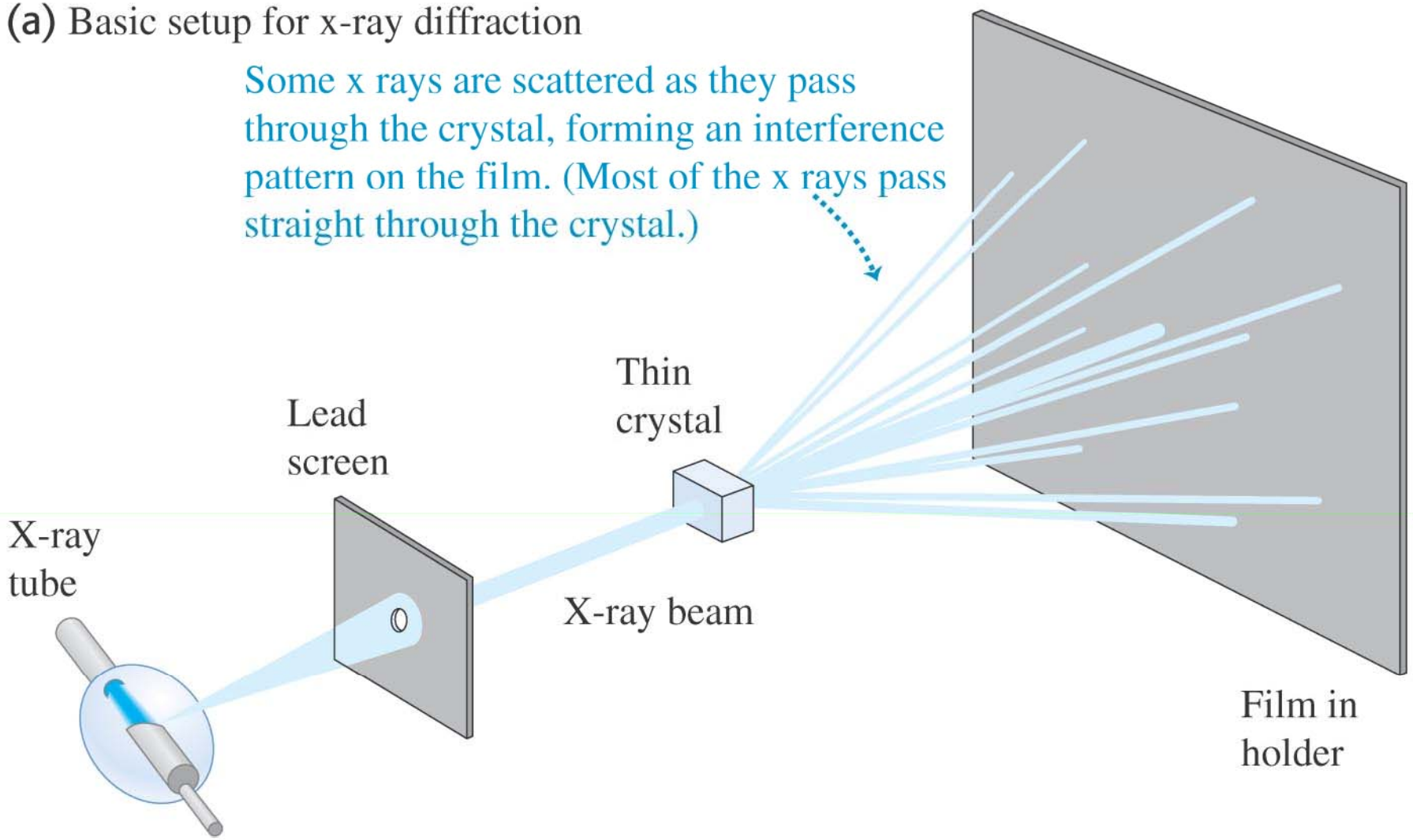
(c) $N = 16$: with 16 slits, the maxima are even taller and narrower, with more intervening minima.



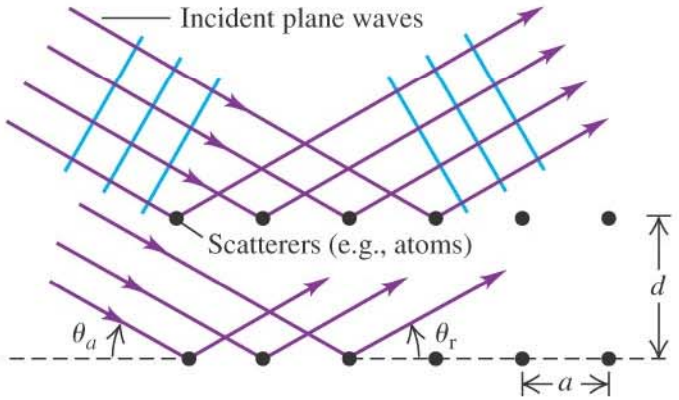
(c) Calculated intensity pattern for two slits of width a and separation $d = 4a$, including both interference and diffraction effects



(a) Basic setup for x-ray diffraction

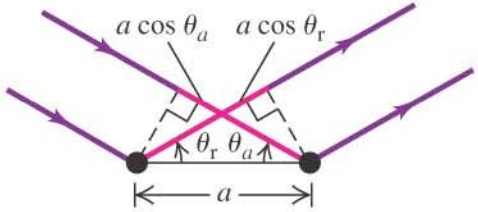


(a) Scattering of waves from a rectangular array



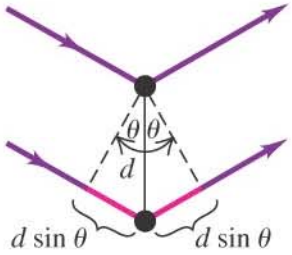
(b) Scattering from adjacent atoms in a row

Interference from adjacent atoms in a row is constructive when the path lengths $a \cos \theta_a$ and $a \cos \theta_r$ are equal, so that the angle of incidence θ_a equals the angle of reflection (scattering) θ_r.



(c) Scattering from atoms in adjacent rows

Interference from atoms in adjacent rows is constructive when the path difference $2d \sin \theta$ is an integral number of wavelengths, as in Eq. (36.16).



For the same diffraction grating, you change the laser from green light to red light. What happens to the spacing?

A. Increases.

B. Decreases.

C. Stays the same, but the width of the peaks changes.

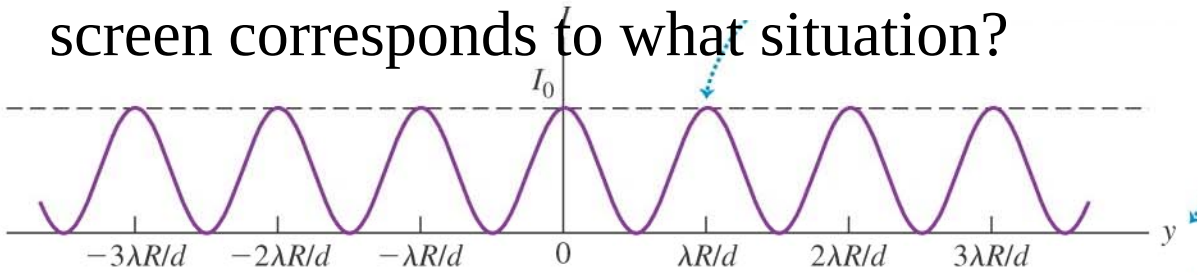
For the green laser, you change the grating to one with a higher density of lines. What happens to the spacing?

A. Increases.

B. Decreases.

C. Stays the same, but the width of the peaks changes.

This pattern of intensity viewed on a distant screen corresponds to what situation?



A. Double slit interference, where the slit width is much less than λ.

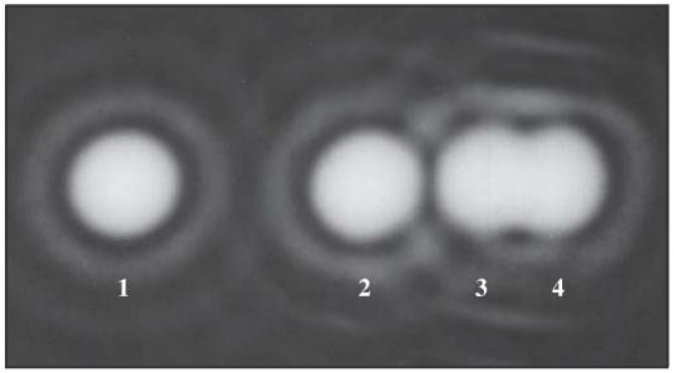
B. Double slit interference, where the slit width is about the same as λ.

C. Single slit diffraction, where the slit width is much less than λ.

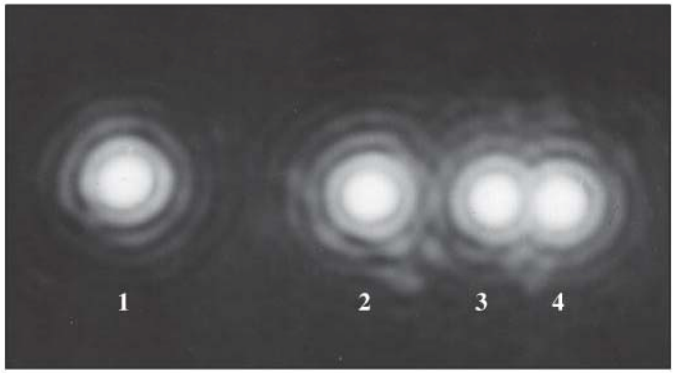
D. Single slit diffraction, where the slit width is about the same as λ.

E. Interference from multiple, equally spaced, slits.

(a) Small aperture



(b) Medium aperture



(c) Large aperture