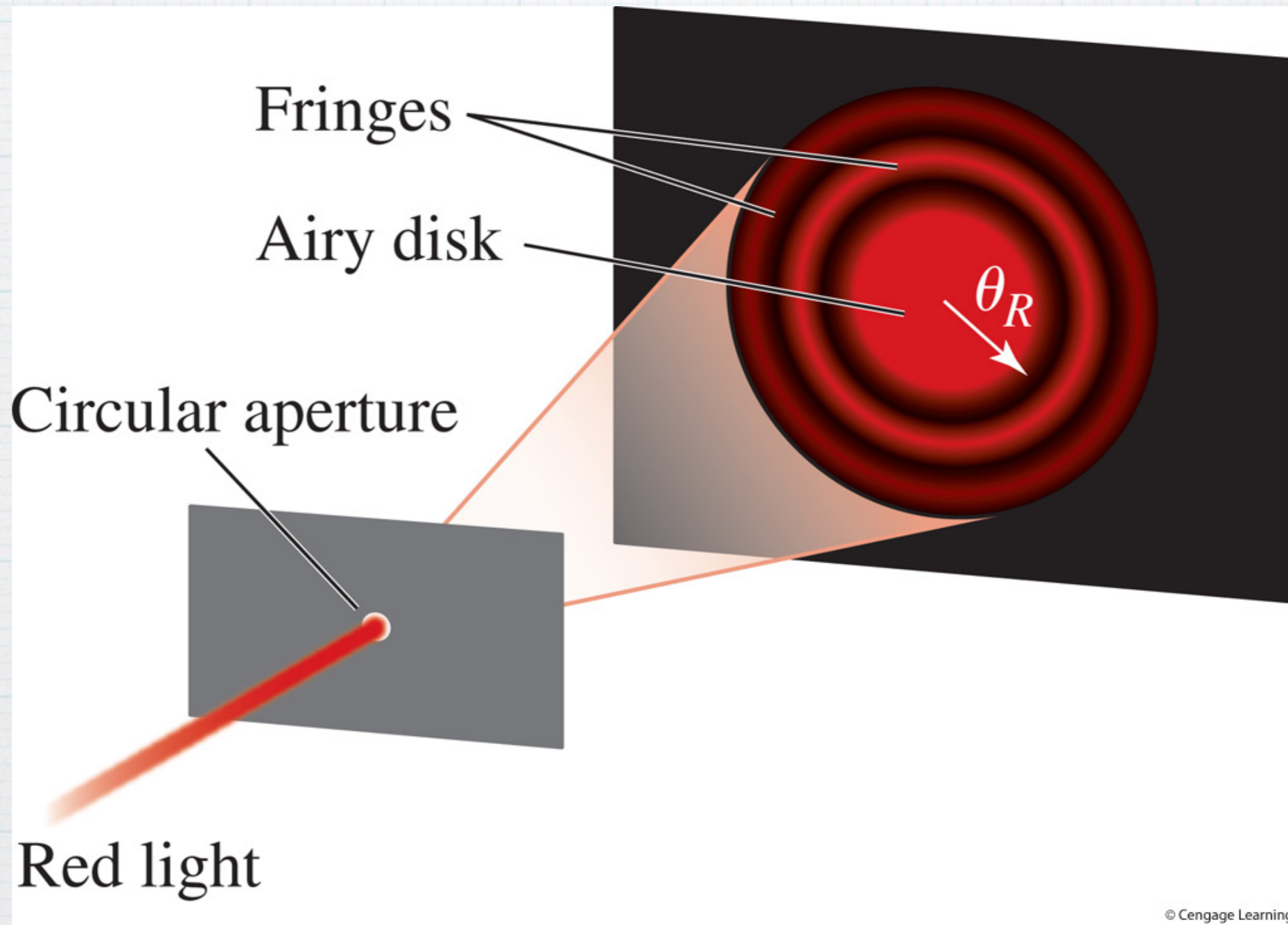


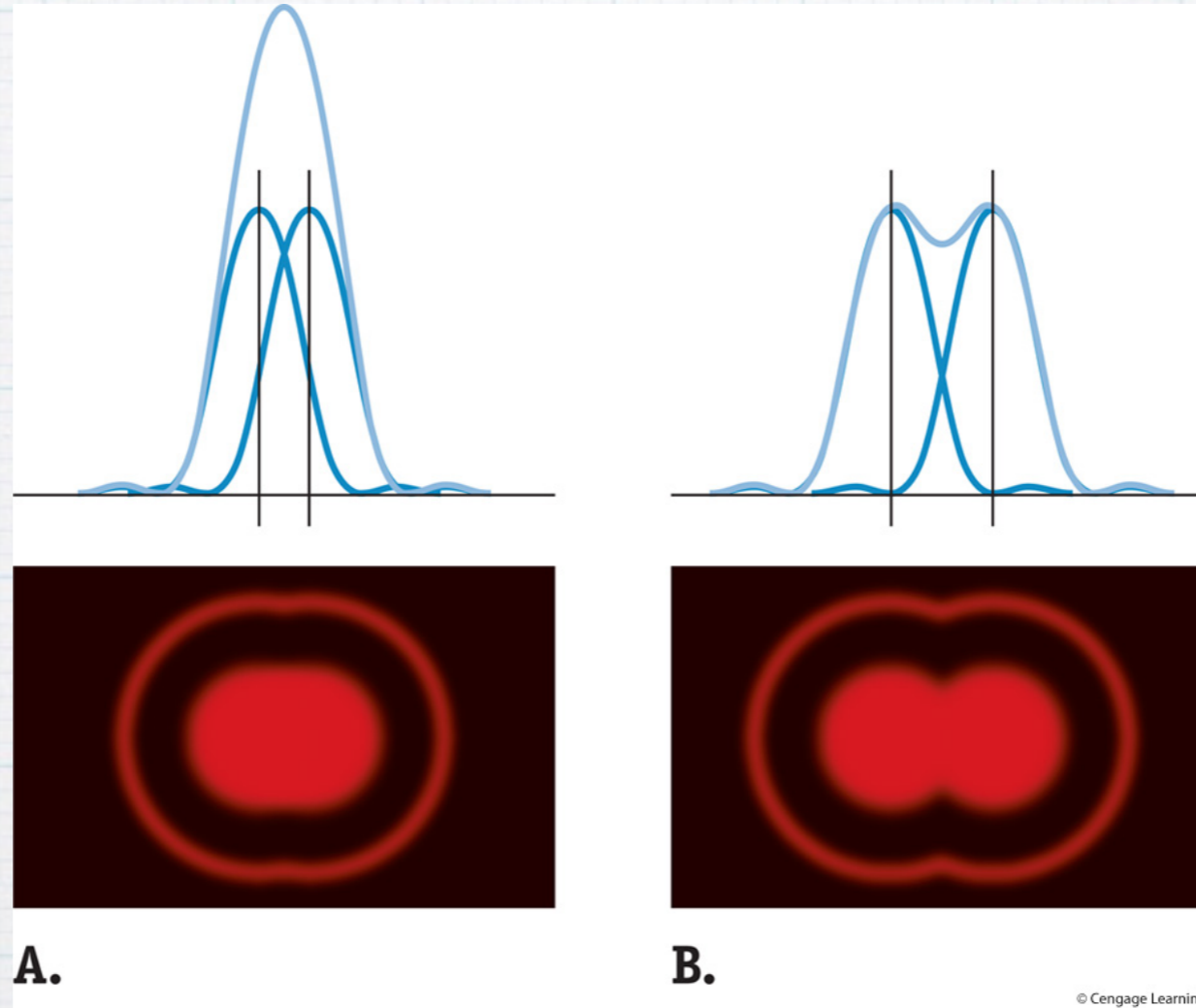
Applications of the Wave Model



Circular Aperture Diffraction



Resolved vs Unresolved



$$\theta_{min} \approx 1.22 \frac{\lambda}{d} = 251643 \frac{\lambda}{d} \text{arcsec}$$

The Moon



Hubble



1/10th arc second resolution

$$s = r\theta$$

Examples

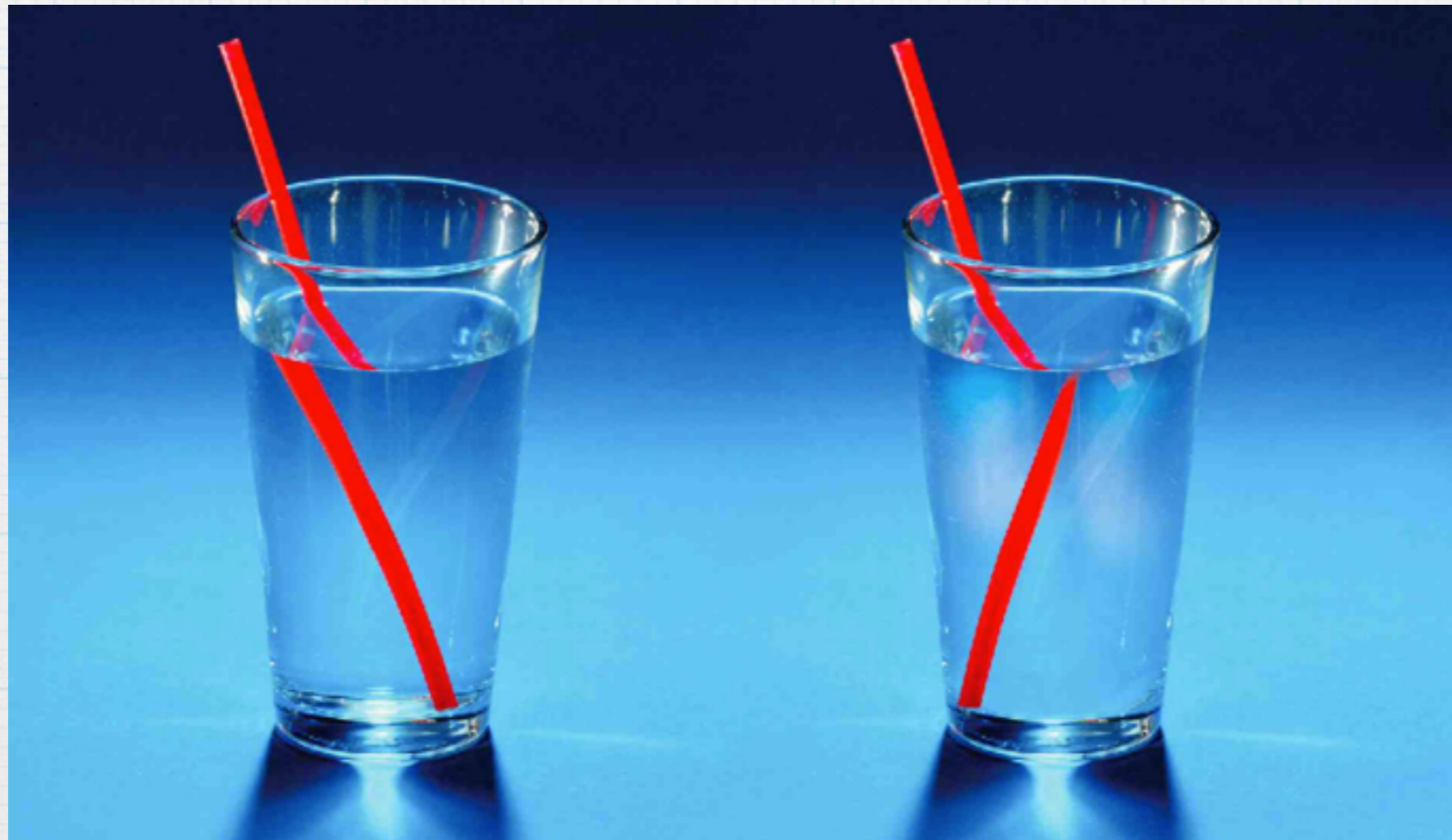
Hubble

30 meter telescope

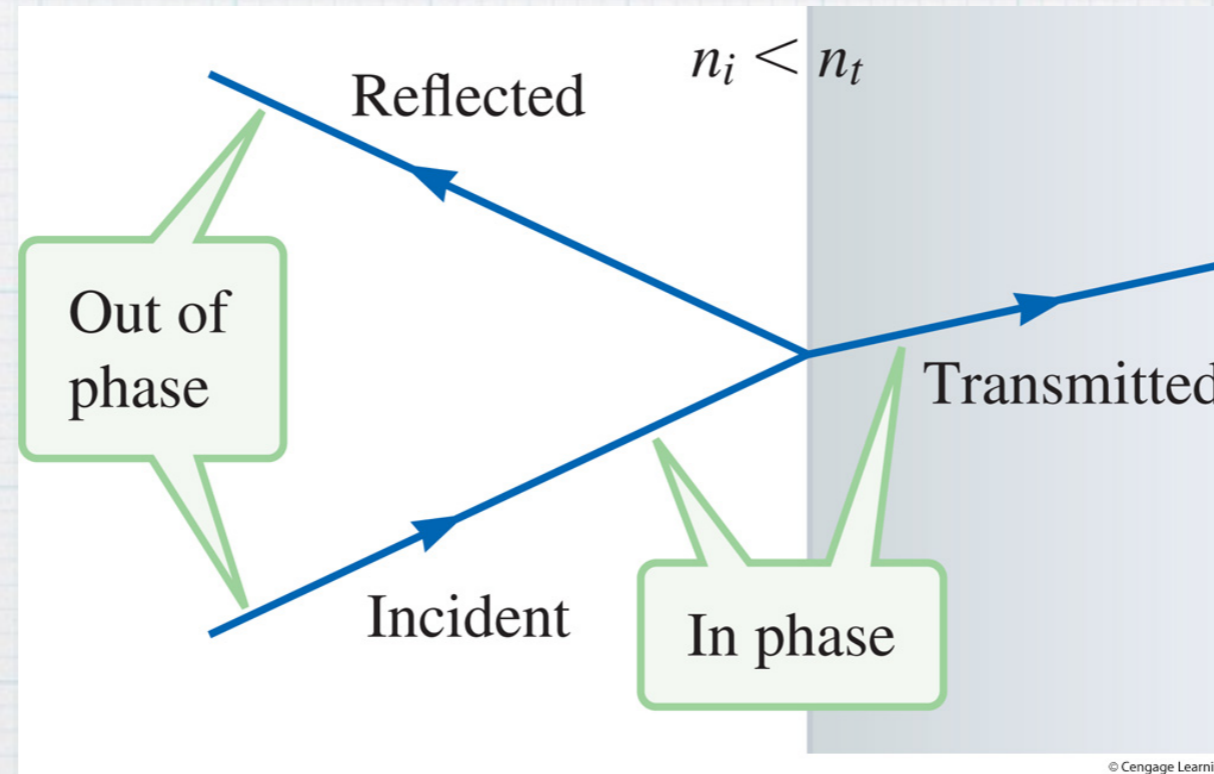
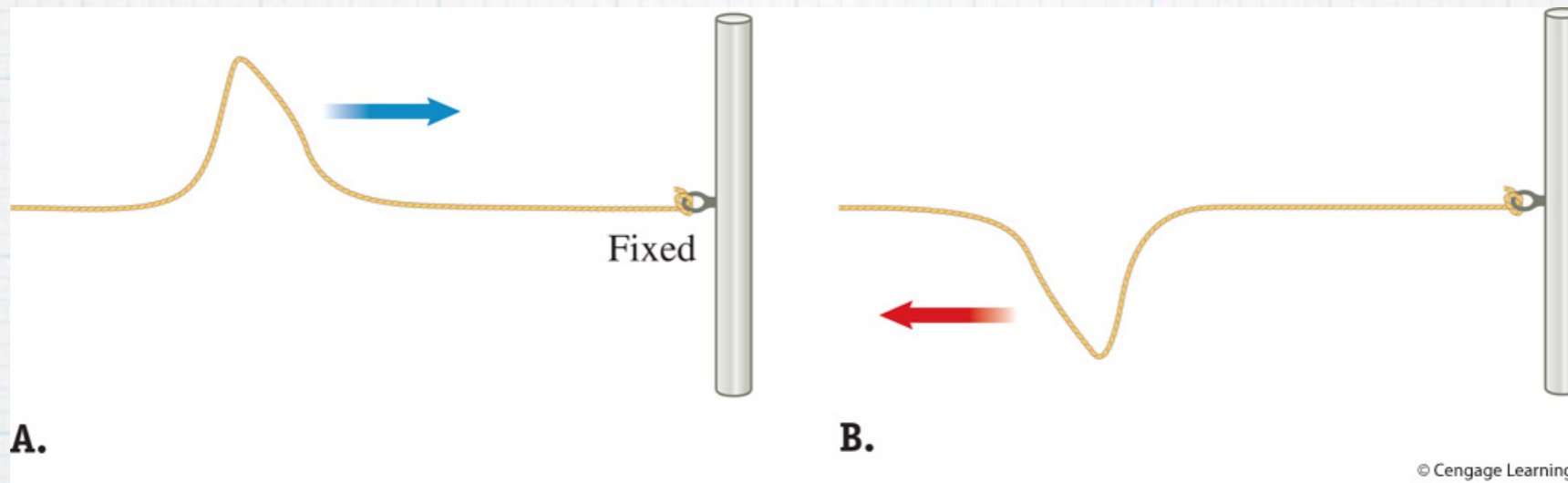
Index of Refraction

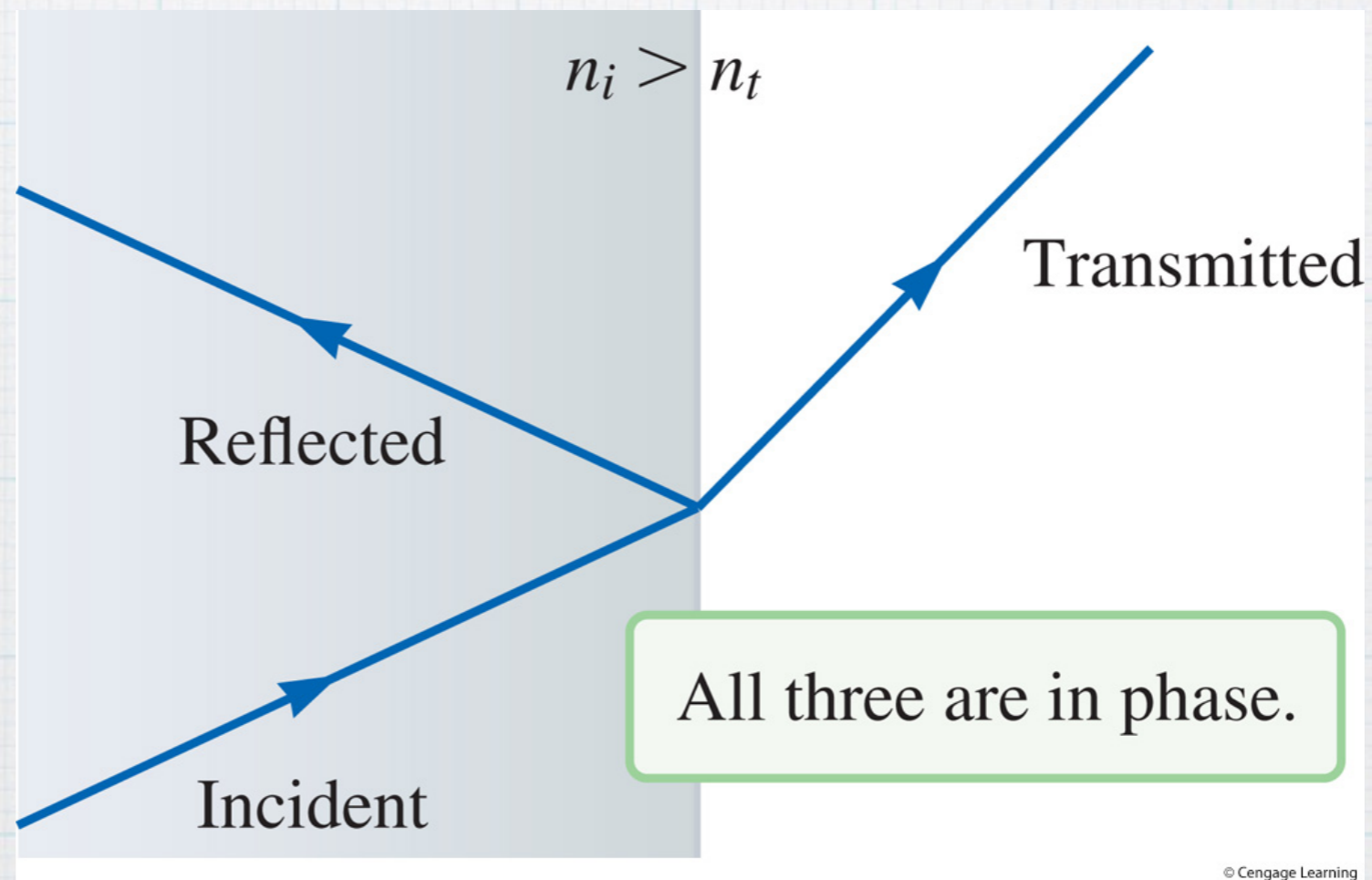
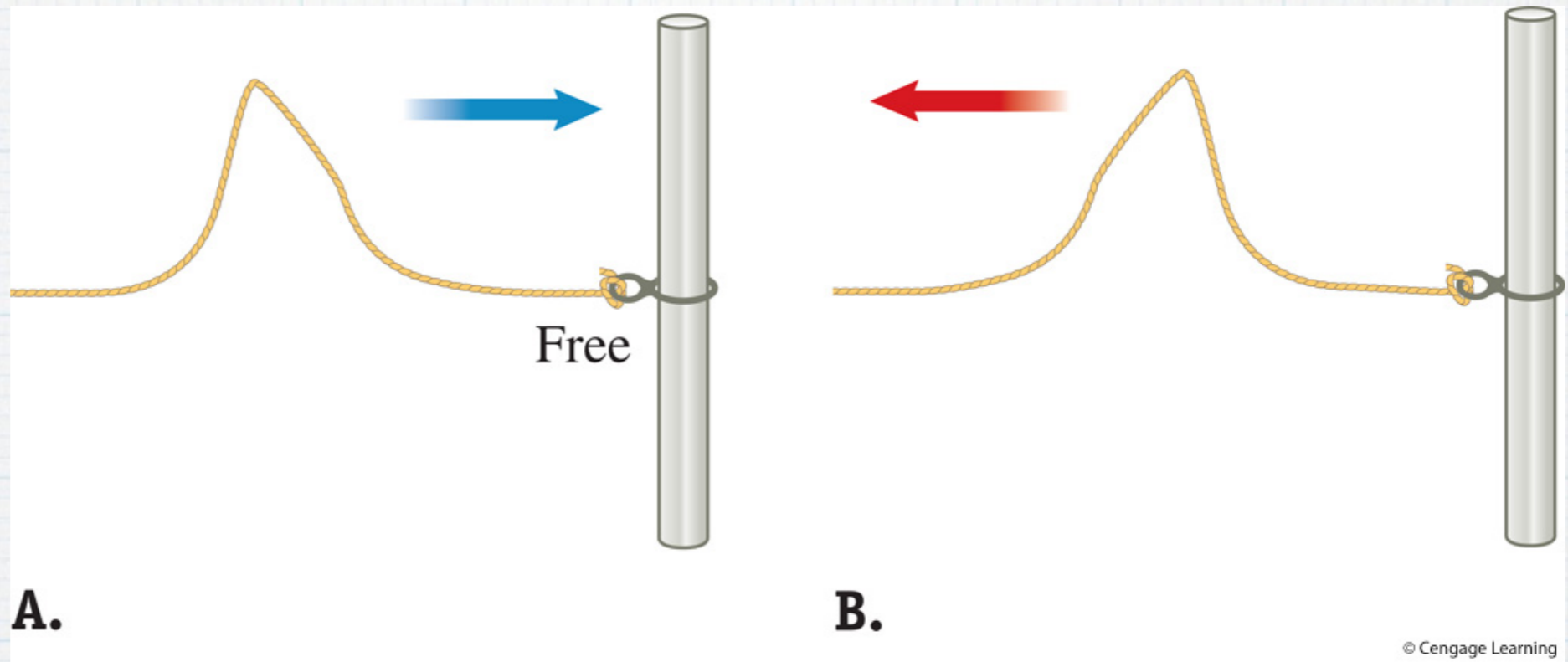
$$n = \frac{c}{v}$$

$$n_1 \lambda_1 = n_2 \lambda_2$$



Thin Film Interference and Phase Changes





Thin Films - 1 phase change

$$\Delta d = \left(m + \frac{1}{2}\right) \frac{\lambda_0}{n_f}$$

Constructive

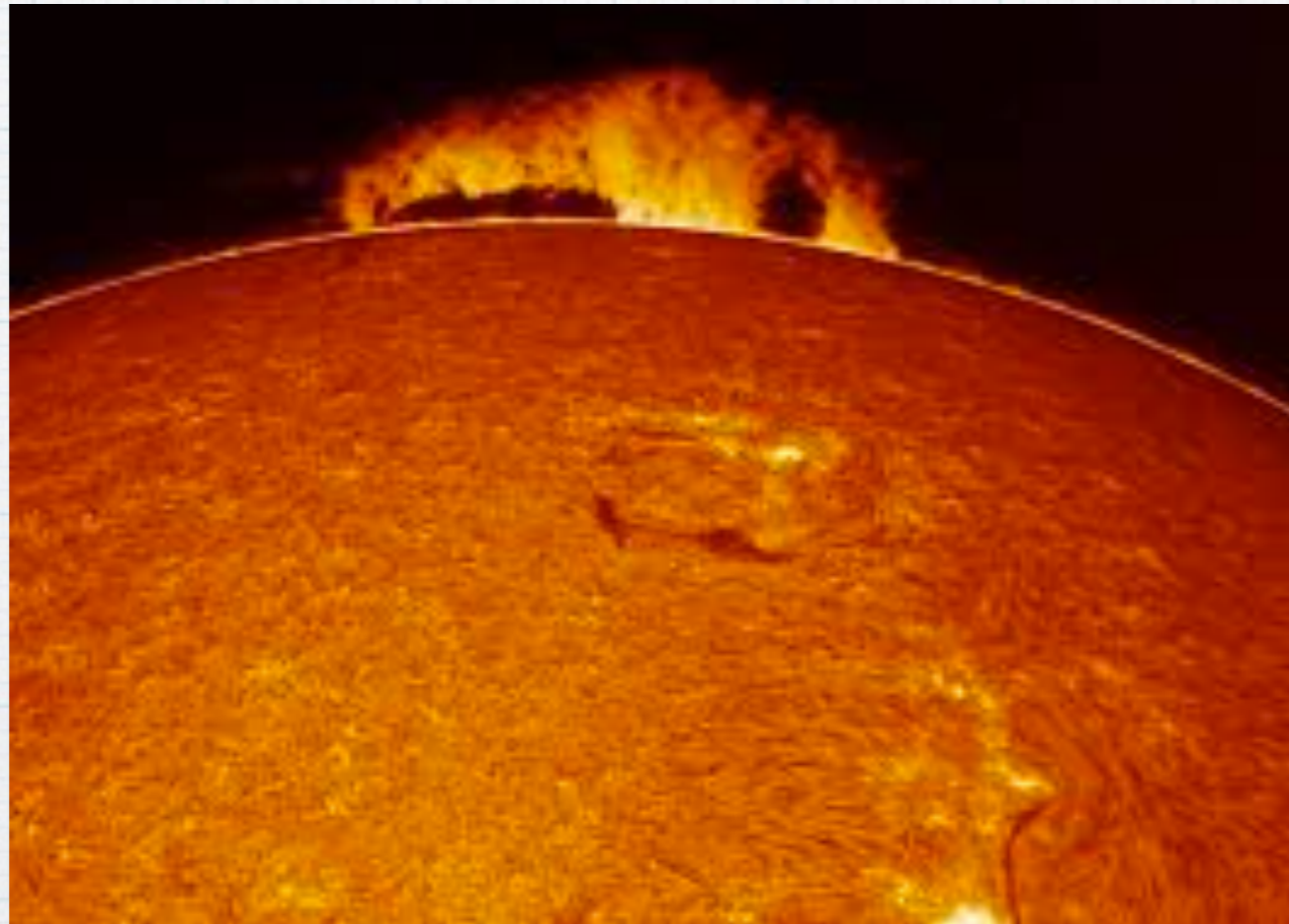
$$\Delta d = m \frac{\lambda_0}{n_f}$$

Destructive

What does this mean?

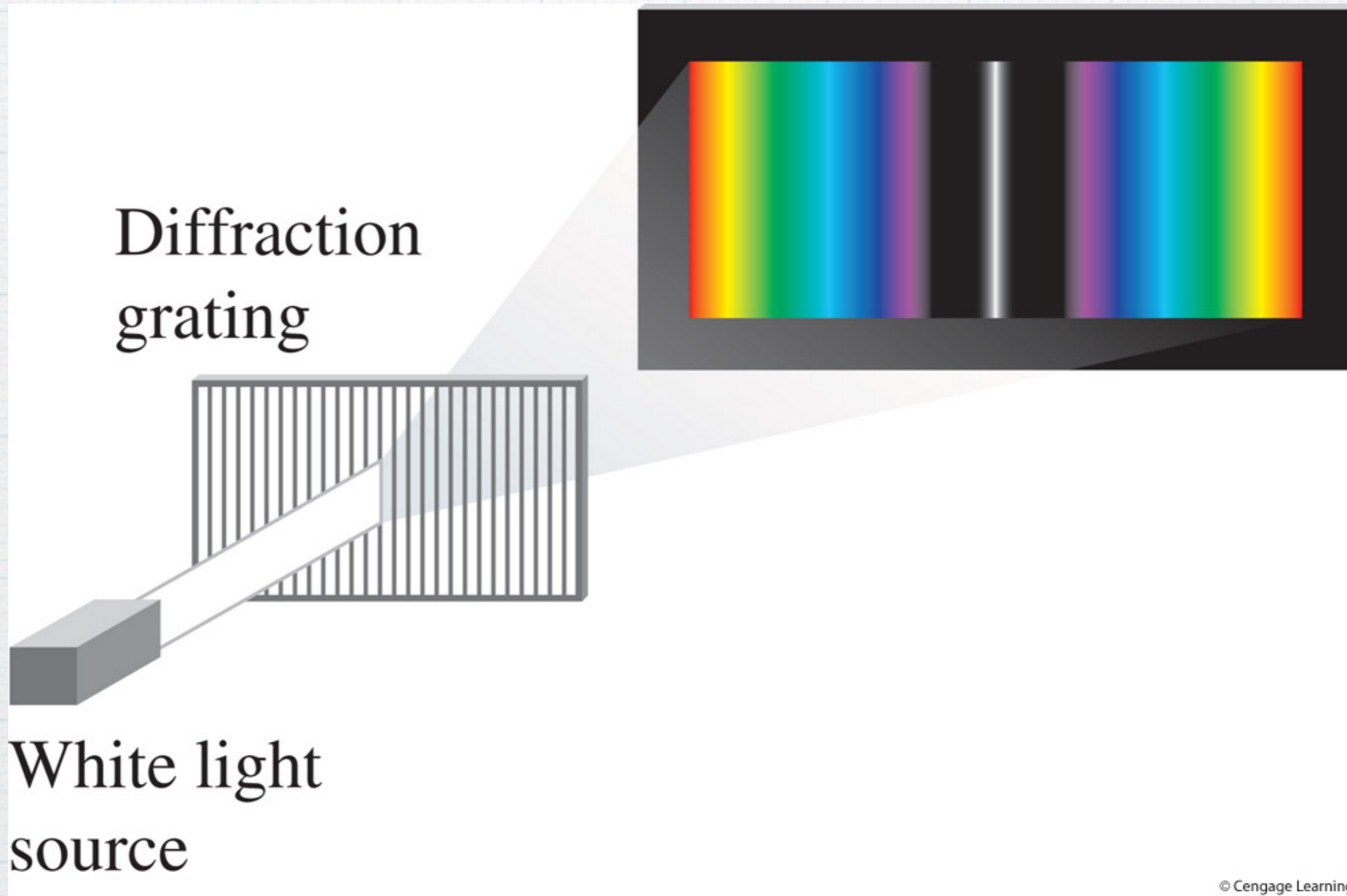
Example

Hydrogen Alpha Filter





2 Phase changes?

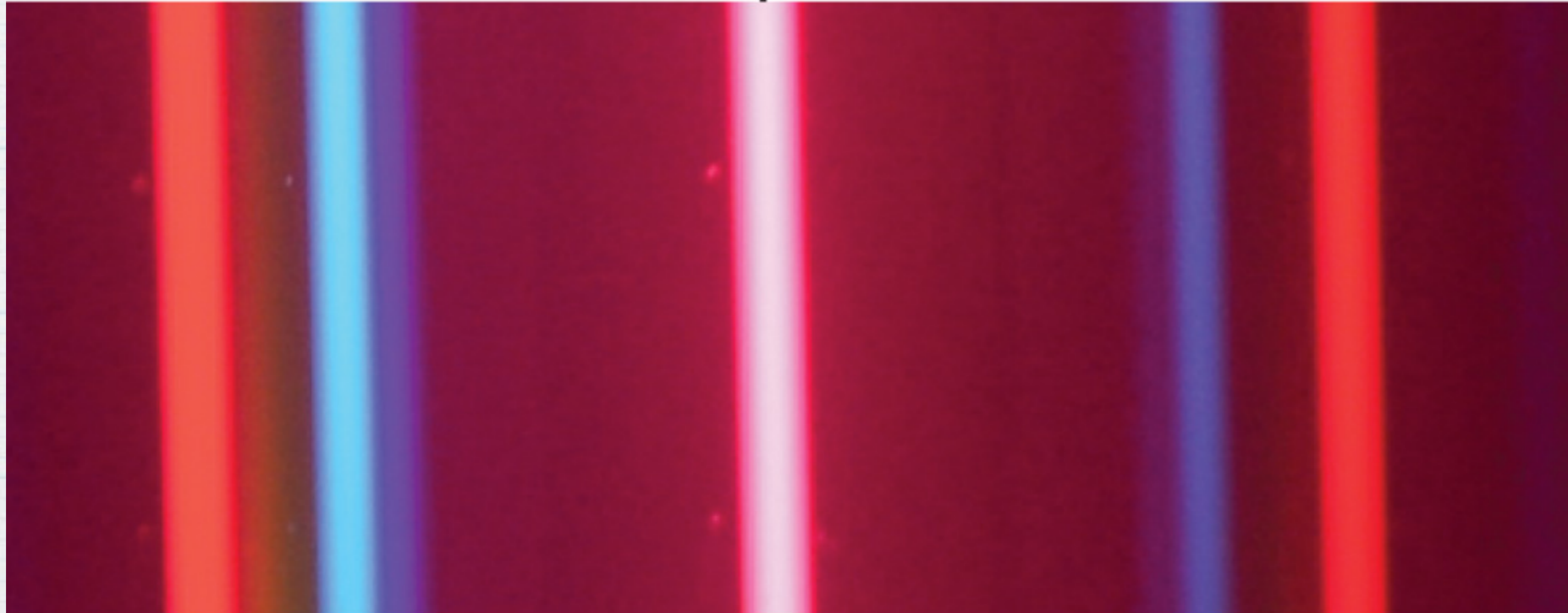
Diffraction Grating

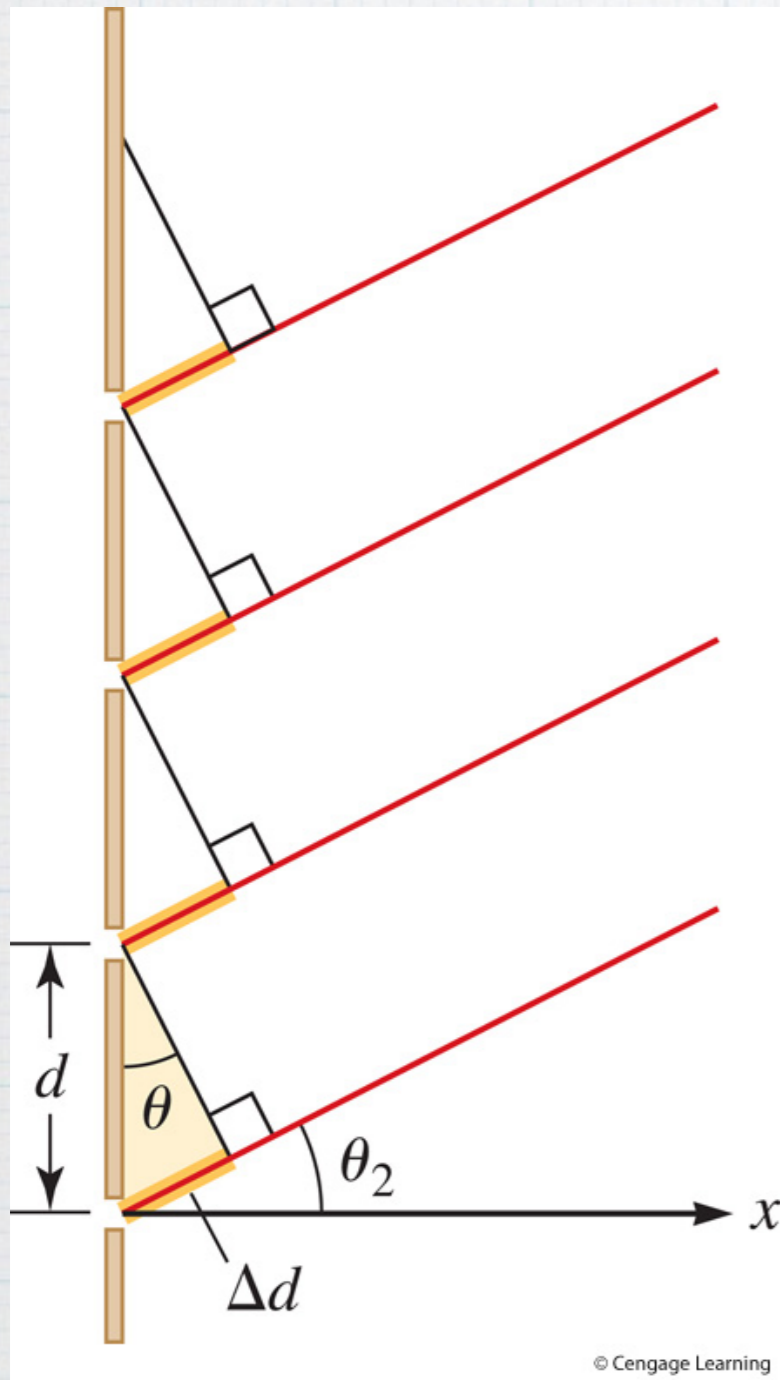


$$m = -1$$

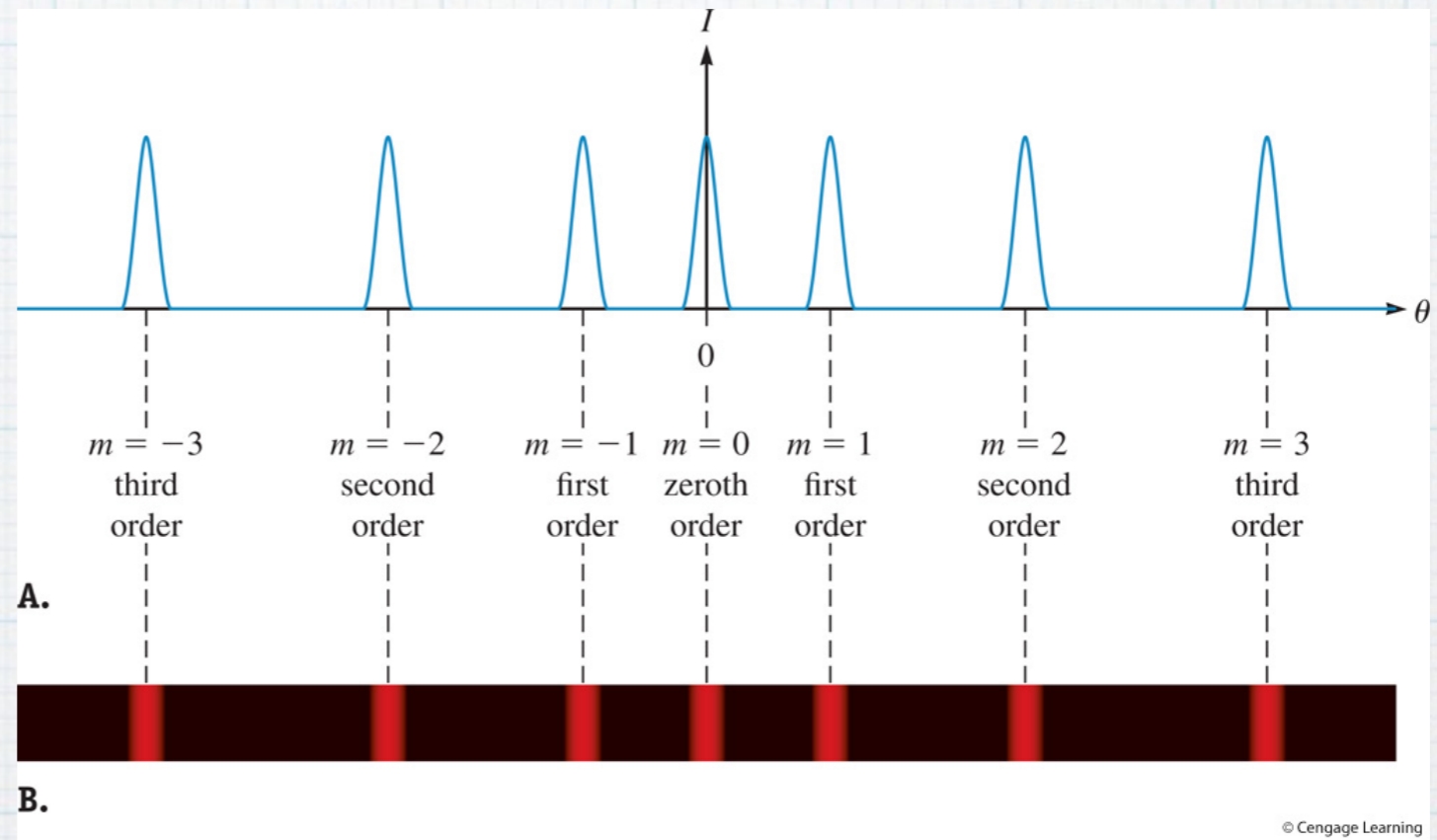

$$m = 0$$


$$m = 1$$




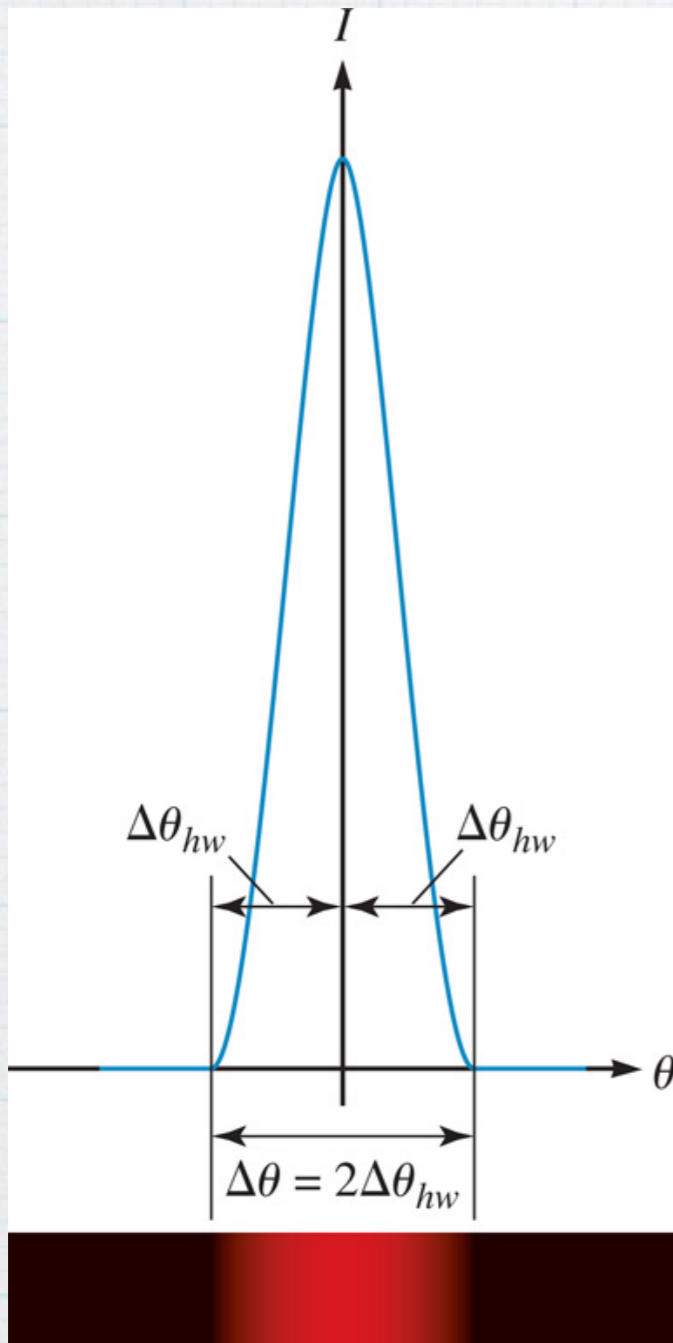


© Cengage Learning



© Cengage Learning

$$\Delta d = d \sin(\theta) = m\lambda$$



© Cengage Learning

$$\Delta\theta_{hw} = \frac{\lambda}{Nd\cos(\theta)}$$

$$d = \frac{l}{N}$$

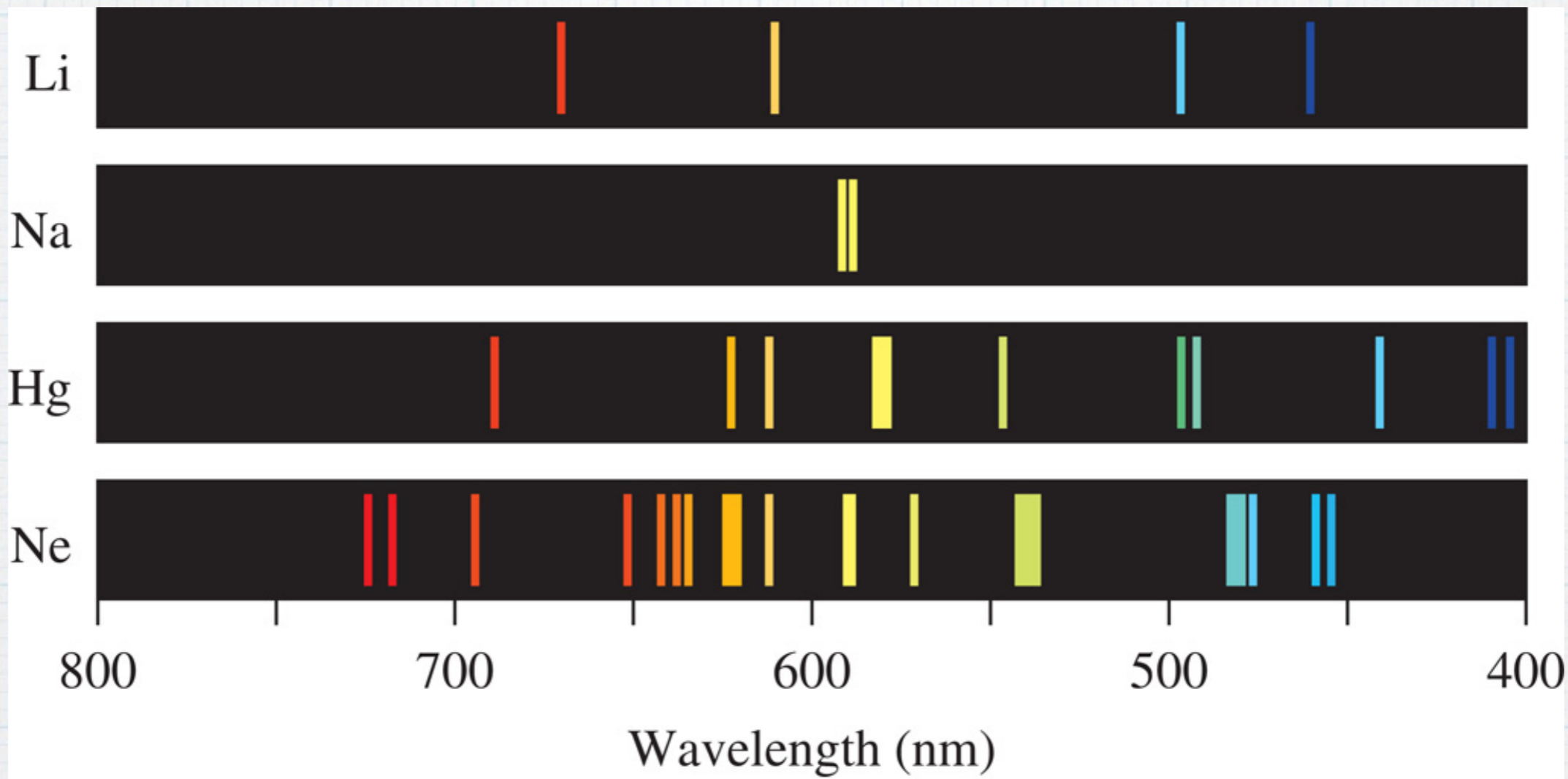
Examples

Dispersion and Resolving Power

$$D = \frac{\Delta\theta}{\Delta\lambda} = \frac{m}{d\cos(\theta)}$$

$$R = \frac{\lambda_{avg}}{\Delta\lambda} = Nm$$

Examples



© Cengage Learning



© Cengage Learning