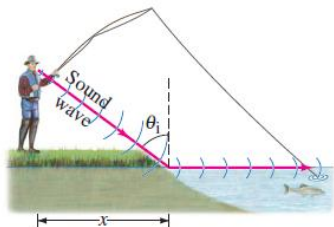


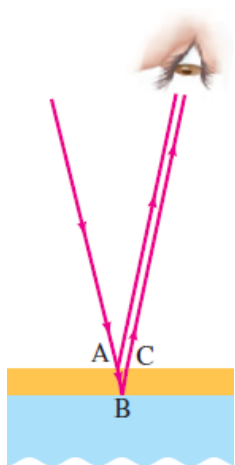
Q) Not Bonus: Total Internal Reflection

a) What is total internal reflection? What is the condition for it to happen? Use Snell's Law to derive the equation for the critical angle. Sketch 3 pictures from small to big angle of incidence showing light going from water to air, in which the light is: refracted, at the critical angle, and totally internally reflected.



b) A fisherman emits a sound from 1.8 m above the ground. The speed of sound is 1440 m/s in water and 343 m/s in air. How far from the bank should the fisherman stand so that the fish will not be scared away by his voice?

(Giancoli 11.87)

1) Thin film interference summary.

A red laser light of wavelength λ is incident on the thin film. For each of the 3 cases, sketch a ray diagram that indicates if the reflection is 0° or 180° with respect to the incident ray's phase, and write the equation relating path difference and wavelength that gives the condition for constructive interference.

$$t \frac{\text{air}}{n} \frac{N}{N}$$

$$t \frac{\text{air}}{N} \frac{n}{n}$$

$$t \frac{n}{\text{air}} \frac{N}{N}$$

2) Thin layer of oil on wet pavement.

The colors seen from outside in: white, brown, blue to red, blue to red...

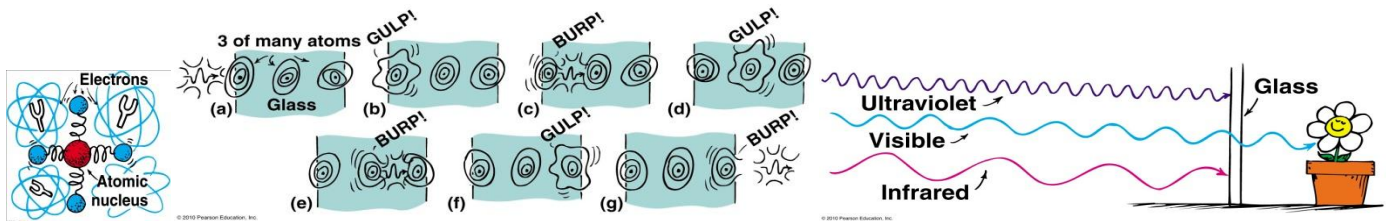
a) The drop of oil looks bright at the edge, where the thickness is much less than the wavelengths of visible light. Compare the index of refraction of the oil compared to the water's. Draw a diagram of the thin film to explain.

b) Why does it make sense for blue to appear on the outside of the ring and then for the bands to go to red?

c) Why does the blue to red repeat going toward the center of the circle?

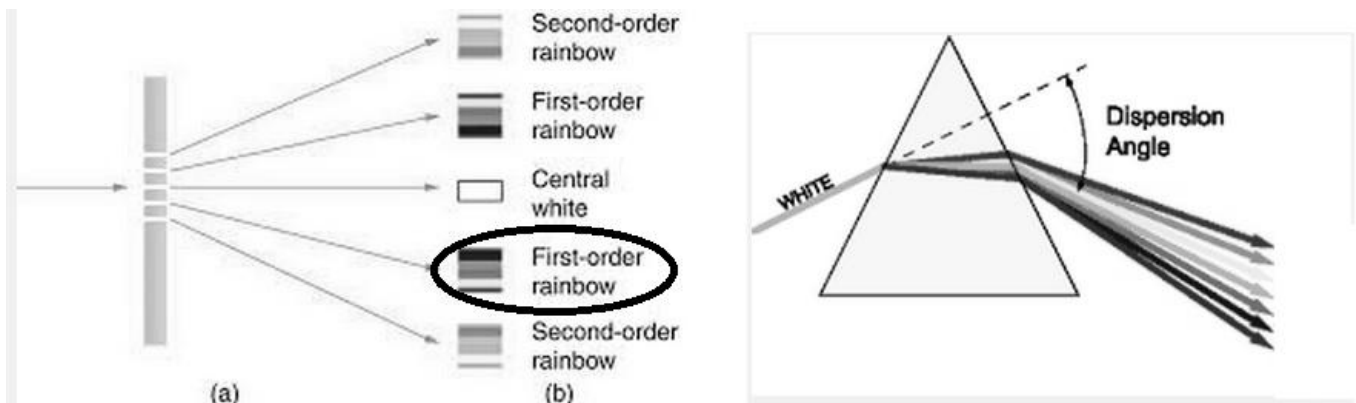
3) In each of these, give a brief conceptual reason as well as the answer.

- Compare the fringe patterns you would see if you did Young's double slit experiment in air vs. in water.
- Compare the fringe patterns you would see if you did Young's double slit experiment with a red laser vs. with a green laser.
- What would happen to the single-slit diffraction pattern if you replace the current slit with a wider slit?
- Compare the interference patterns that would form by two slits vs. by 80 slits, assuming the slit widths and spacing between slits are the same.
- Why is the sky blue?
- Why is glass opaque to ultraviolet and infrared?



(CISE)

g) White light goes through a prism and a diffraction grating. A rainbow appears on the wall below the horizontal from the incident beam in each case. What is the color at the top of the rainbows? Hint: violet slow down most in glass.



(Giancoli Ch. 24)