Waves/Optics

Book Chapter: 13, 14, 23, 24
Book Pages: 390-420, 425-460, 687-692, 702, 715-738
Practice Problems: pp418-420: 2, 38; pp456-459: 4, 20; pp741-744: 8, 30, 52
Terms/ Ideas:
Transverse wave/Longitudinal wave
Wavelength
Frequency
Refraction
Reflection
Diffraction
Convex
Concave
Interference
Standing Wave
Resonance
Doppler Effect
Blue/Red shift
Resonance
Michelson Experiment
Polarization
Photon
Quanta
Snell's Law
Critical Angel
Index of Refraction
Virtual Image
Convergent
Divergent
Equations:

$$v = f\lambda$$

$$f' = f\left(\frac{v + v_o}{v - v_s}\right)$$

$$f' = f\left(\frac{v - v_o}{v + v_s}\right)$$

$$\frac{\sin i}{\sin r} = n_s$$

$$\sin i = \frac{n_2}{n_1}$$

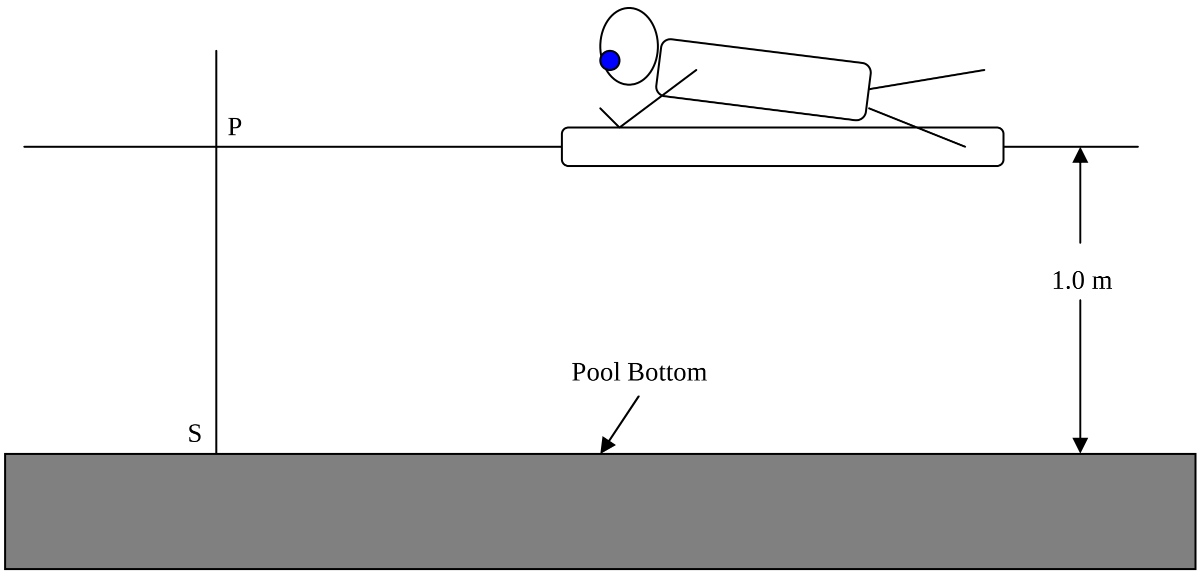
$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$

$$\frac{s_o}{s_i} = \frac{p}{q}$$

$$\beta = 10\log\frac{I}{I_o}$$

Free Response:

A point source S of light is located on the bottom of a swimming pool filled with water to a depth of 1.0 meter, as shown below. The index of refraction of water is 1.33 for this light. Point P is located on the surface of the water directly above the light source. A person floats motionless on a raft so that the surface of the water is undisturbed.



1) Determine the velocity of the source's light in water.

2) On the diagram above, draw the approximate path of a ray of light from the source S to the eye of the person on the raft. It is not necessary to calculate any angles.

3) Determine the critical angle for the air water interface.

Suppose that a converging lens with a focal length 30 cm in water is placed 20 cm above the light source, as shown in the below diagram. An image of the light source is formed by the lens.

4) Calculate the position of the image with respect to the bottom of the pool.