

Physics 200 (Stapleton)
Optics Practice Quiz

Name: _____

1. Substance A ($n = 1.3$) is separated from substance B ($n = 2.5$) by a flat plane. A ray of light travels from substance A to substance B, meeting the planar boundary between the substances at a 22° angle of incidence.

$$n_1 \sin \theta_1 = n_2 \sin \theta_2 \quad \theta_c = \sin^{-1}\left(\frac{n_2}{n_1}\right)$$

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \quad M = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

- Sketch a simple diagram showing the ray refracting as it travels from substance A to substance B.
- On your sketch, label the normal, the angle of incidence, and the angle of refraction. Calculate the angle of refraction and add that number to your diagram.
- On another part of your diagram (or in a new diagram) show a ray of light with an angle of incidence equal to its critical angle. Calculate and label the critical angle, θ_c . Draw what happens to the ray when it hits the boundary between the two substances.

2. A thin convex lens has a focal length of 5cm. An object 1cm tall is placed on the lens' principal axis, at a distance of 2cm from the center of the lens.
- Is the object's image real or virtual?
 - Is the image upright or inverted?
 - What is the distance of the image from the lens?
 - What is the height of the image?
 - What is the magnification (M) of the object in this situation?
 - Optional -- Sketch or draw a ray diagram to confirm your answers.

3. The same object (1cm tall) is placed on the principal axis of a convex lens with $f = 3\text{cm}$, at a distance of 9 cm from the center of the lens.
- Is the object's image real or virtual?
 - Is the image upright or inverted?
 - What is the distance of the image from the lens?
 - What is the height of the image?
 - What is the magnification (M) of the object in this situation?
 - Optional – Sketch or draw a ray diagram to confirm your answers.