

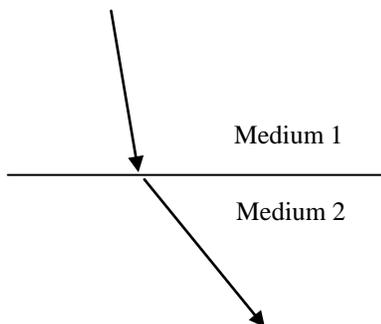
MULTIPLE CHOICE REVIEW: CHAPTERS 22 – 24

1988 – 27. Which of the following is true of a single-slit diffraction pattern?

- a. It has equally spaced fringes of equal intensity.
- b. It has a relatively strong central maximum.
- c. It can be produced only if the slit width is less than one wavelength.
- d. It can be produced only if the slit width is exactly one wavelength.
- e. It can be produced only if the slit width is an integral number of wavelengths.

1998 – 27. When light passes from air into water, the frequency of the light remains the same. What happens to the speed and the wavelength of light as it crosses the boundary in going from air into water?

- | <u>Speed</u> | <u>Wavelength</u> |
|---------------------|-------------------|
| a. Increases | Remains the same |
| b. Remains the same | Decreases |
| c. Remains the same | Remains the same |
| d. Decreases | Increases |
| e. Decreases | Decreases |



1974 – 25. If a light ray crosses a boundary from Medium 1 to Medium 2 as shown in the figure above, it can be concluded that the . . .

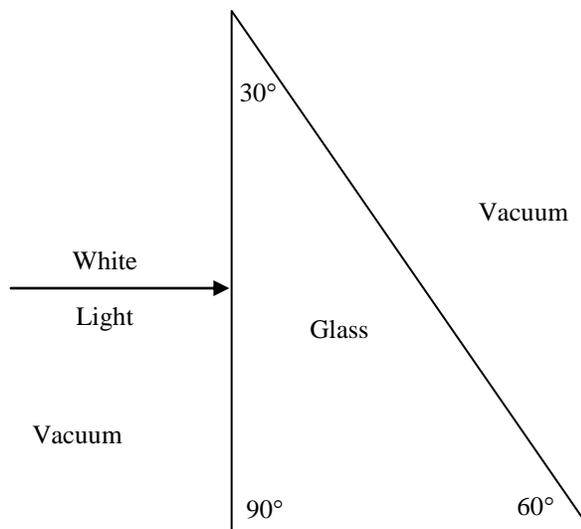
- a. velocity of light in Medium 2 is less than in Medium 1.
- b. velocity of light in Medium 2 is greater than in Medium 1.
- c. light wave is polarized.
- d. index of refraction of Medium 2 is less than one.
- e. index of refraction of Medium 1 is less than one.

1993 – 69. If the object distance for a converging thin lens is greater than twice the focal length of the lens, the image is . . .

- a. virtual and upright.
- b. larger than the object.
- c. located inside the focal point.
- d. located at a distance between f and $2f$ from the lens.
- e. located at a distance more than $2f$ from the lens.

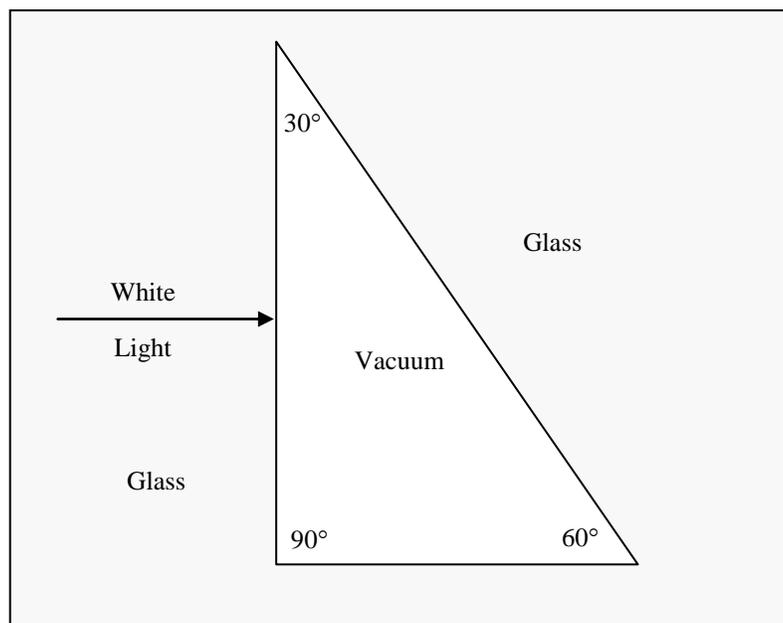
FREE RESPONSE REVIEW: CHAPTERS 22 – 24

	Wavelength in Vacuum	Index of Refraction of Glass
Red Light	700 nm	1.50
Blue Light	480 nm	1.60



1993 – 4. The glass prism shown above has an index of refraction that depends on the wavelength of the light that enters it. The index of refraction is 1.50 for red light of wavelength 700 nm in a vacuum and 1.60 for blue light of wavelength 480 nm in a vacuum. A beam of white light is incident from the left, perpendicular to the first surface, as shown in the figure, and is dispersed by the prism into its spectral components.

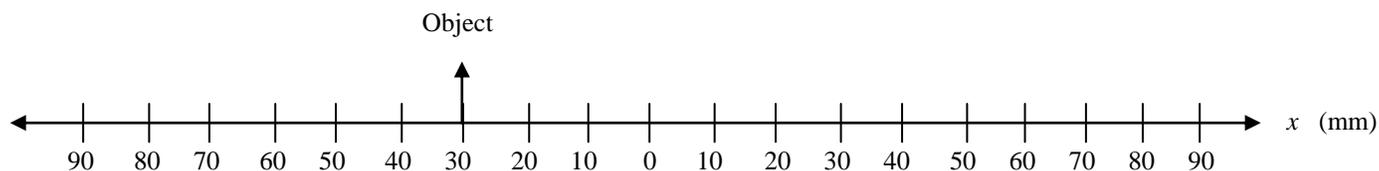
- Determine the speed of the blue light in the glass.
- Determine the wavelength of the red light in the glass.
- Determine the frequency of the red light in the glass.
- On the figure above, sketch the approximate paths of both the red and the blue rays as they pass through the glass and back out into the vacuum. Ignore any reflected light. It is not necessary to calculate any angles, but do clearly show the change in direction of the rays, if any, at each surface, and be sure to distinguish carefully any differences between the paths of the red and the blue beams.
- The figure below represents a wedge-shaped space in a large piece of the type of glass described above. On this figure, sketch the approximate path of the red and the blue rays as they pass through the hollow prism and back into the glass. Again, ignore any reflected light, clearly show changes in direction, if any, where refraction occurs, and carefully distinguish any differences in the two paths.



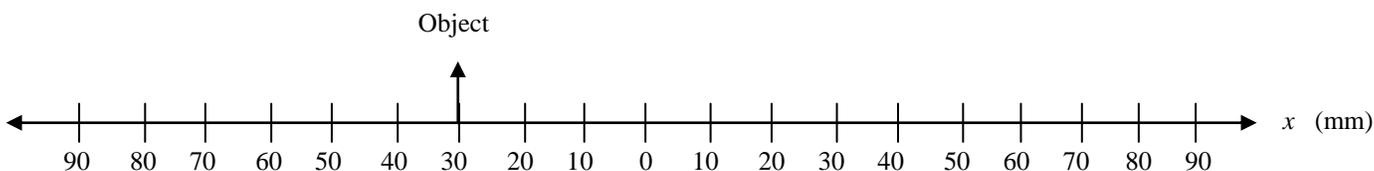
FREE RESPONSE REVIEW: CHAPTERS 22 – 24 (CONT)

1997 – 5. An object is placed 30 mm in front of a lens. An image of the object is located 90 mm behind the lens.

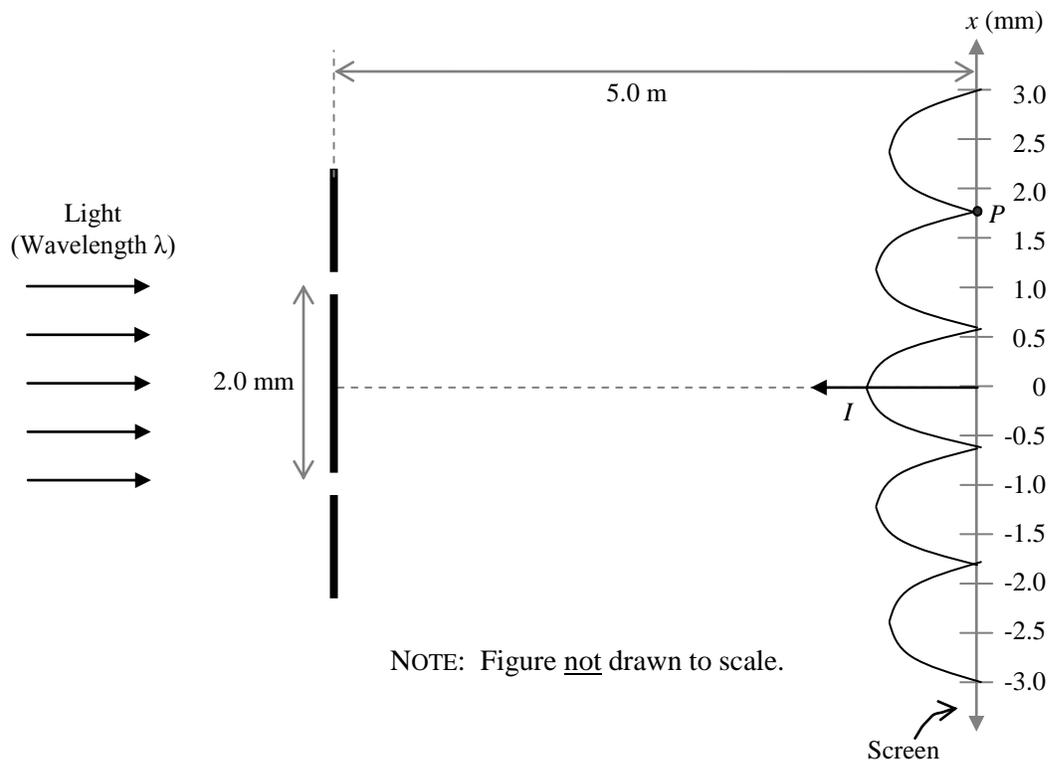
- (a) Is the lens converging or diverging? Explain your reasoning.
(b) What is the focal length of the lens?
(c) On the axis below, draw the lens at position $x = 0$. Draw three rays and locate the image to show the situation described above.



- (d) Based on your diagram in (c), describe the image by answering the following questions.
- Is the image real or virtual?
 - Is the image smaller than, larger than, or the same size as the object?
 - Is the image inverted or upright compared to the object?
- (e) The lens is replaced by a concave mirror with focal length 20 mm. On the axis below, draw the mirror at position $x = 0$ so that a real image is formed. Draw three rays and locate the image to show this situation.



FREE RESPONSE REVIEW: CHAPTERS 22 – 24 (CONT)



1996 – 3. Coherent monochromatic light of wavelength λ in air is incident on two narrow slits, the centers of which are 2.0 mm apart, as shown above. The pattern observed on a screen 5.0 m away is represented in the figure by the graph of light intensity I as a function of position x on the screen.

- What property of light does this experiment demonstrate?
- At point P in the diagram, there is a minimum in the intensity pattern. Determine the path difference between the light arriving at this point from the two slits.
- Determine the wavelength λ of the light.
- Briefly and qualitatively describe how the intensity pattern would change under each of the following separate modifications and explain your reasoning.
 - The experiment is performed in water, which has an index of refraction greater than 1.
 - One of the slits is covered.
 - The slits are moved farther apart.