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## Grade 10 Physics Chapter 3 Revision Problems – Answer Key

### Multiple Choice Questions.

<b>Q1.</b>	A part of a pencil that is placed in a glass of water appears bent in relation to the part of the pencil that extends out of the water. What is this phenomenon called?	
<b>a.</b>	Interference	
<b>b.</b>	Refraction	
<b>c.</b>	Diffraction	
<b>d.</b>	Reflection	

<b>Q2.</b>	The _____ of light can change when light is refracted because the medium changes.
<b>a.</b>	speed
<b>b.</b>	frequency
<b>c.</b>	color
<b>d.</b>	nature

<b>Q3.</b>	Which of the following is true for when light passes at an angle to the normal from one medium into another medium in which its speed is higher?
<b>a.</b>	It is bent toward the normal to the surface.
<b>b.</b>	It always lies along the normal to the surface.
<b>c.</b>	It is unaffected.
<b>d.</b>	It is bent away from the normal to the surface.

<b>Q4.</b>	What type of image does a Concave lens produce?
<b>a.</b>	Real
<b>b.</b>	Virtual
<b>c.</b>	Both real and virtual
<b>d.</b>	It depends on the focal point

<b>Q5.</b>	The focal length for a convex lens is _____.
<b>a.</b>	always positive.
<b>b.</b>	always negative.
<b>c.</b>	dependent on the location of the object.
<b>d.</b>	dependent on the location of the image.

<b>Q6.</b>	Under which conditions does a convex lens produce an enlarged virtual image?
<b>a.</b>	Never
<b>b.</b>	When the object is farther away than the focal point
<b>c.</b>	When the object is farther away than the center point
<b>d.</b>	When the object is between the focal point and the lens

<b>Q7.</b>	A virtual image has a _____ image distance ( $x_i$ ) and is located in _____ of the lens.
<b>a.</b>	positive, front
<b>b.</b>	negative, back
<b>c.</b>	negative, front
<b>d.</b>	positive, back

<b>Q8.</b>	Atmospheric refraction of light rays is responsible for which of the following effects?
<b>a.</b>	Spherical aberration
<b>b.</b>	Mirages
<b>c.</b>	Chromatic aberration
<b>d.</b>	Total internal reflection in a gemstone

<b>Q9.</b>	Which of the following best describes what happens to an incident ray of light on a glass-to-air boundary at an angle greater than the critical angle?
<b>a.</b>	Total internal reflection
<b>b.</b>	Total external transmission
<b>c.</b>	Partial reflection, partial transmission
<b>d.</b>	Partial reflection, total transmission

<b>Q10</b>	An absolute value of magnification $M$ is greater than 1, indicates that _____.
<b>a.</b>	the image is magnified
<b>b.</b>	the image is diminished
<b>c.</b>	an image is not formed
<b>d.</b>	the image has the same size as the object

<b>Q11</b>	An object is positioned in front of a concave lens between points $F$ and $2F$ . Determine the nature of the image produced by the concave lens.
<b>a.</b>	Virtual, upright and magnified
<b>b.</b>	Virtual, upright and diminished
<b>c.</b>	Virtual, inverted and magnified
<b>d.</b>	Virtual, inverted and diminished

<b>Q12</b>	If an image that is produced by a convex lens is smaller than the object, where is the object placed?
<b>a.</b>	At the lens's focal point.
<b>b.</b>	Between the mirror and the focal point.
<b>c.</b>	Between the focal point and center.
<b>d.</b>	Beyond the center of lens.

<b>Q13</b>	Which of the following lenses are used to correct farsightedness?
<b>a.</b>	Normal glass
<b>b.</b>	Convex lenses
<b>c.</b>	Concave lenses
<b>d.</b>	Any transparent lenses

<b>Q14</b>	An object is placed 20.0 cm from a thin convex lens along the axis of the lens. If a real image forms behind the lens at 8.00 cm from the lens, what is the focal length of the lens?
<b>a.</b>	5.71 cm
<b>b.</b>	-13.3 cm
<b>c.</b>	13.3 cm
<b>d.</b>	12.0 cm

<b>Q15</b>	Which of the following factors change as light waves pass from one transparent medium into another?
<b>a.</b>	$f$ and $v$
<b>b.</b>	$v$ and $\lambda$
<b>c.</b>	$f$ and $\lambda$
<b>d.</b>	$f$ , $v$ and $\lambda$

Constructed Response Questions.

Q1

A ray of light passes from air into carbon disulfide ( $n = 1.63$ ) at an angle of  $28.0^\circ$  to the normal. What is the angle of refraction?

Given

$$\theta_i = 28.0^\circ$$

$$n_i = 1.00$$

$$n_r = 1.63$$

Solution

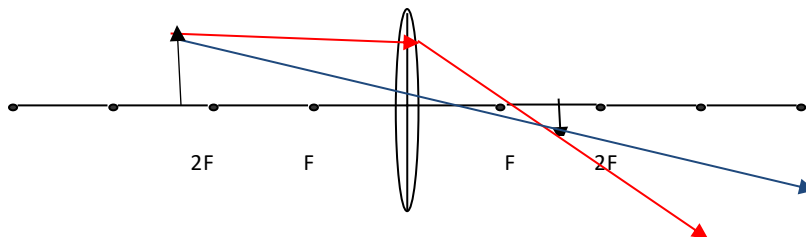
Rearrange Snell's law,  $n_i \sin \theta_i = n_r \sin \theta_r$ ,  
and solve for  $\theta_r$ .

$$\theta_r = \sin^{-1} \left( \frac{n_i}{n_r} (\sin \theta_i) \right) =$$

$$\sin^{-1} \left( \frac{1.00}{1.63} (\sin 28.0^\circ) \right) = 16.7^\circ$$

Q2. An object is placed 25 cm away from a convex lens with a focal length of 10 cm.

a. Complete the ray diagram below and locate the image.



**The image is located behind the lens between the focal point and the center (2f)**

b. Use the thin lens equation to calculate the image distance  $x_i$

$$\frac{1}{f} = \frac{1}{x_i} + \frac{1}{x_o}$$

$$\frac{1}{10} = \frac{1}{x_i} + \frac{1}{25}$$

$$0.1 = \frac{1}{x_i} + 0.04$$

$$10.06 = \frac{1}{x_i}$$

$$x_i = 16.7 \text{ cm}$$

c. Calculate the magnification M of the lens then describe the image.

$$M = -\frac{x_i}{x_o} = -\frac{16.7}{25} = -0.67$$

**The image is real, inverted and diminished**