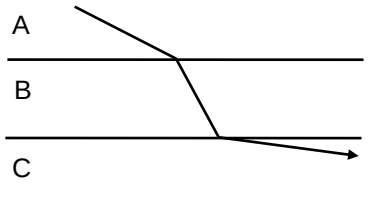
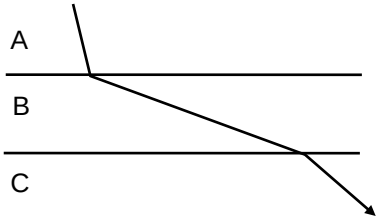
Name _____ Date _____ Period_____

Wave Optics: Refraction WS 1

Air:	1.00	Crown glass	1.52	speed of light in a vacuum: 3.0×10^8 m/s
Water	1.33	Flint glass	1.61	
Alcohol	1.36	Diamond	2.42	

1. Below is monochromatic light traveling through three substances A, B, and C.





a. Rank the speed of light in each of the materials from fastest to slowest.

1st _____ 2nd _____ 3rd _____ 1st _____ 2nd _____ 3rd `_____

b. Rank the index of refraction of each of the materials from highest to lowest.

1st _____ 2nd _____ 3rd _____ 1st _____ 2nd _____ 3rd `_____

c. Rank the wavelength of the light in each of the materials from longest to shortest.

1st _____ 2nd _____ 3rd _____ 1st _____ 2nd _____ 3rd `_____

d. Rank the frequency of the light in each of the materials from highest to lowest.

1st _____ 2nd _____ 3rd _____ 1st _____ 2nd _____ 3rd `_____

2. What is the speed of light in diamond?

3. Dinah Might wants to hide a piece of crown glass, and finds a chemical in which the speed of light is 1.97×10^8 m/s. Will this chemical work?

4. The wavelength of red light in air is 6.0×10^{-7}m and in an unknown chemical it is 3.76×10^{-7}m.

   a. What is the index of refraction of the chemical?

   b. What is the frequency of the light in the air and in the chemical?

5. What is the index of refraction of a material for which the wavelength of light is 0.671 times its value in a vacuum? Identify the likely substance.

6. What is the ratio of thicknesses of crown glass and water that would contain the same number of wavelengths of light?

7. The length of the most effective transmitting antenna is equal to one–fourth the wavelength of the broadcast wave. If a radio station has an antenna 4.5 meters long then what is the broadcast frequency of the radio station?

8. A radio signal with a wavelength of 1.2×10^{-4} m is sent to a distance asteroid, is reflected, and returns to Earth 72 hours and 48 minutes later. How far from Earth is the asteroid?

Radio waves	Infrared radiation	Visible light	Ultraviolet radiation	Gamma radiation

9. For the five types of electromagnetic radiation listed above, which of the following correctly describes the way in which wavelength, frequency and speed, change as one goes from the left to right on the list?

	Wavelength	Frequency	Speed
(A)	Decreases	Decreases	Decreases
(B)	Decreases	Increases	Remains the same
(C)	Increases	Decreases	Remains the same
(D)	Increases	Decreases	Increases
(E)	Increases	Increases	Increases