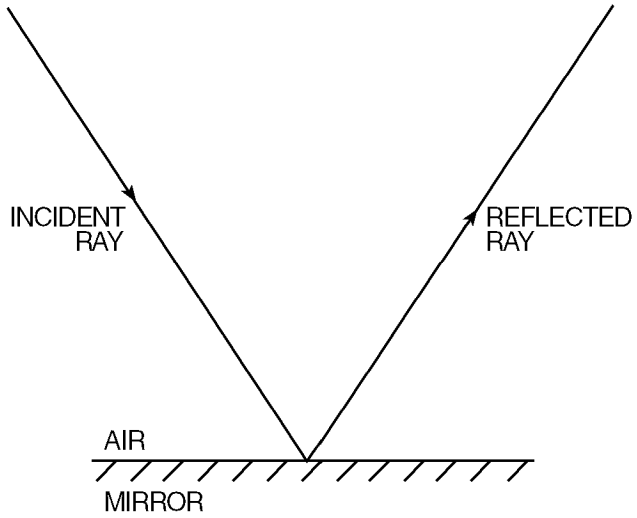
Name: _____
Waves Unit EMS and Reflection Problems

Questions 1 through 3 refer to the following:

A ray of monochromatic light of frequency 5.00×10^{14} hertz is incident on a mirror and reflected, as shown.



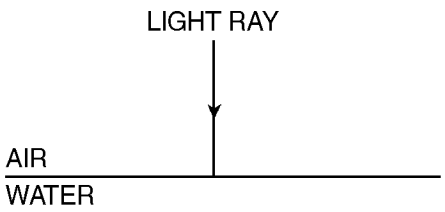
1) (a) Using a protractor and ruler, construct and label the normal to the mirror at the point of incidence on the given diagram.

(b) Using a protractor, measure the angle of incidence to the *nearest* degree.

2) Determine the wavelength of the ray of light shown in the diagram. [*Show all calculations, including the equation and substitution with units.*]

3) What is the color of the ray of light in the diagram shown?

4) A ray of light traveling in air is incident on an air-water boundary as shown below.



On the diagram above, draw the path of the ray in the water.

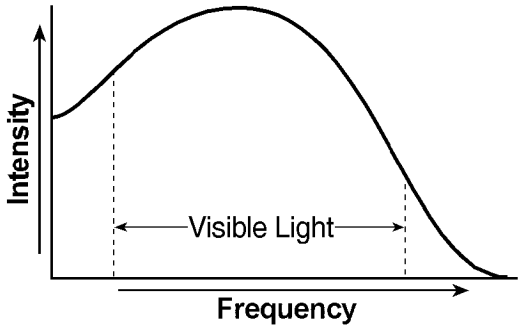
5) Determine the color of a ray of light with a wavelength of 6.21×10^{-7} meter.

6) What is the frequency of a light wave with a wavelength of 6.0×10^{-7} meter traveling through space?

7) Exposure to ultraviolet radiation can damage skin. Exposure to visible light does not damage skin. State *one* possible reason for this difference.

Questions 8 and 9 refer to the following:

Sunlight is composed of various intensities of all frequencies of visible light. The graph represents the relationship between light intensity and frequency.



8) Based on the graph shown, which color of visible light has the *lowest* intensity?

9) It has been suggested that fire trucks be painted yellow-green instead of red. Using information from the graph shown, explain the advantage of using yellow-green paint.

10) Radio waves are propagated through the interaction of

A) electric and magnetic fields
B) gravitational and electric fields
C) gravitational and magnetic fields
D) nuclear and electric fields

11) In a vacuum, light with a frequency of 5.0×10^{14} hertz has a wavelength of

12) Compared to the speed of microwaves in a vacuum, the speed of x-rays in a vacuum is

A) greater
B) the same
C) less

13) Radio waves and gamma rays traveling in space have the same

A) wavelength
B) frequency
C) speed
D) period

14) Which pair of terms *best* describes light waves traveling from the Sun to Earth?

A) mechanical and transverse
B) mechanical and longitudinal
C) electromagnetic and transverse
D) electromagnetic and longitudinal

15) Electromagnetic radiation having a wavelength of 1.3×10^{-7} meter would be classified as

A) ultraviolet
B) infrared
C) blue
D) orange

16) A beam of green light may have a frequency of

A) 6.0×10^{14} Hz
B) 5.0×10^{-7} Hz
C) 1.5×10^{2} Hz
D) 3.0×10^{8} Hz

17) Electrons oscillating with a frequency of 2.0×10^{10} hertz produce electromagnetic waves. These waves would be classified as

A) x-ray
B) visible
C) microwave
D) infrared