Name: _____

Diffraction and Refraction Practice problems

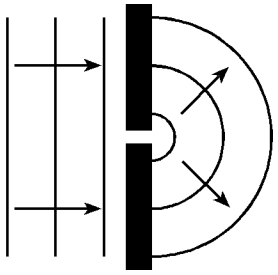
1) Parallel wave fronts incident on an opening in a barrier are diffracted. For which combination of wavelength and size of opening will diffraction effects be *greatest*?

A) long wavelength and narrow opening
B) short wavelength and narrow opening
C) long wavelength and wide opening
D) short wavelength and wide opening

2) Waves pass through a 10.-centimeter opening in a barrier without being diffracted. This observation provides evidence that the wavelength of the waves is

A) much shorter than 10. cm
B) longer than 20. cm
C) longer than 10. cm, but shorter than 20. cm
D) equal to 10. cm

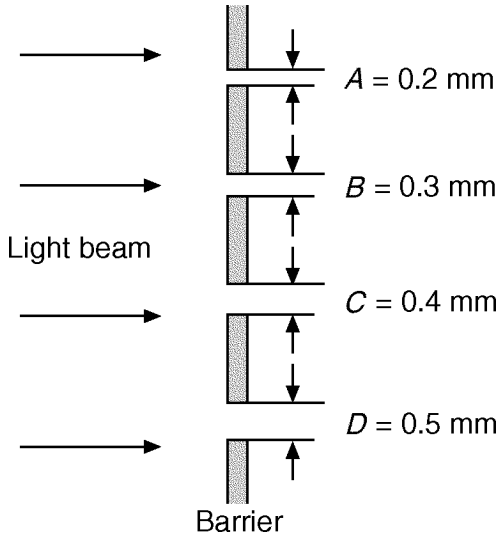
3) The diagram below shows straight wave fronts passing through an opening in a barrier.



What is this wave phenomenon called?

A) reflection
B) refraction
C) diffraction
D) polarization

4) A beam of monochromatic light approaches a barrier having four openings, *A*, *B*, *C*, and *D*, of different sizes as shown below.

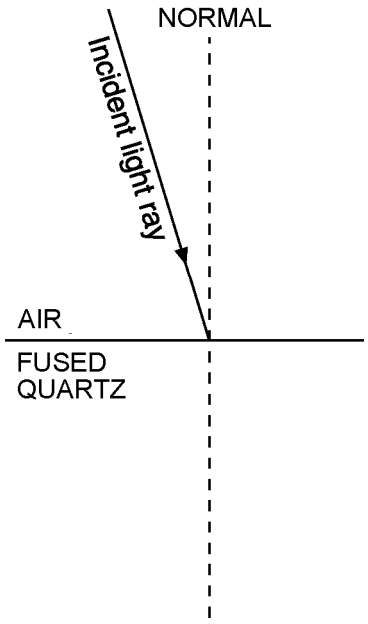


Which opening will cause the *greatest* diffraction?

A) *A*
B) *B*
C) *C*
D) *D*

Questions 5 through 8 refer to the following:

The diagram below shows a light ray ($f = 5.09 \times 10^{14}$ Hz) in air, incident on a boundary with fused quartz. At the boundary, part of the light is refracted and part of the light is reflected.



5) Using a protractor, measure the angle of incidence of the light ray in the diagram provided at the air-fused quartz boundary.

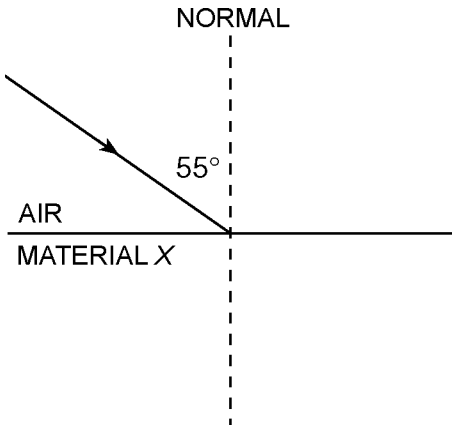
6) Calculate the angle of refraction of the incident light ray in the diagram. [*Show all work, including the equation and substitution with units.*]

7) Using a protractor and straightedge, construct the refracted light ray in the fused quartz on the diagram provided.

8) Using a protractor and straightedge, construct the reflected light ray on the diagram provided.

Questions 9 through 11 refer to the following:

A ray of light ($f = 5.09 \times 10^{14}$ Hz) is incident on the boundary between air and an unknown material *X* at an angle of incidence of 55°, as shown below. The absolute index of refraction of material *X* is 1.66.



9) Using the given information, identify a substance of which material *X* may be composed.

10) Using the given information, determine the speed of this ray of light in material *X*.

11) Using the given information, calculate the angle of refraction of the ray of light in material *X*. [*Show all work, including the equation and substitution with units.*]