Light Worksheet 2

1. What is the speed of light in each of the following:
    a. Water (n = 1.33)
    b. Polyethylene (n = 1.50)
    c. Diamond (n=2.42)

2. A ray of light passes from air into water (n = 1.33) at an angle of incidence of 50°. What is the angle of refraction?

3. Light travels from air into water. If the angle of refraction is 30°, what is the angle of incidence?

4. A ray of light in air strikes a block of quartz at an angle of incidence of 30°. If the angle of refraction is 20°, what is the index of refraction for the quartz?

5. A beam of light is directed on the flat surface of a block of fused quartz (n = 1.46). Part of the beam is refracted with an angle of refraction of 30°. What is the angle of reflection?

6. The wavelengths of the visible spectrum range from 400 nm to 750 nm. What is the frequency range of visible light?

7. A student doing Young's double slit experiment measures a distance of 6.0 cm between the first and seventh nodal points on a screen located 3.0 m away from the slit plate. If the slit separation is 220 μm, what is the wavelength of the light being used?

8. With two slits 0.12 mm apart, and a screen at a distance of 80 cm, the third bright line to one side of center in an interference pattern is found to be displaced 9.0 mm from the central line. What was the wavelength of the light used?

9. Red light, of wavelength 600 nm, passes through two parallel slits. Nodal lines are produced on a screen 3.0 m away. The distance between the 1st and the 10th nodal lines is 5.0 cm. What is the separation of the two slits?

10. In an interference experiment, red light with a wavelength of 6.0×10^{-7} m passes through a double slit. On a screen 1.5 m away, the distance between the 1st and the 11th dark bands is 2.0 cm. What was the separation of the slits?

Answers:
1. (a) 2.3×10^8 m/s, (b) 2.0×10^8 m/s, (c) 1.2×10^8 m/s
2. 35°
3. 42°
4. 1.46
5. 47°
6. 7.50×10^{14} Hz to 4.00×10^{14} Hz
7. 7.3×10^{-7} m
8. 4.5×10^{-7} m
9. 3.2×10^{-4} m
10. 4.5×10^{-4} m

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