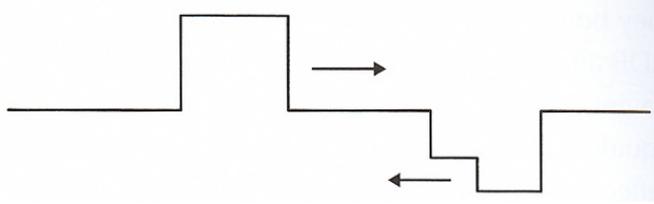# Wave Characteristics

1. Two pulses of equal width and height are traveling in opposite directions on the same string as shown.

   When the pulses completely overlap, what is the shape of the string?

2. Red light of wavelength 6.8×10^{-7} m enters glass with an index of refraction of 1.583 from air, with an angle of incidence of 38°. Calculate:
   a. The angle of refraction
   b. The speed of light in the glass
   c. The wavelength of the light in the glass

3. A ray of light is incident on a rectangular block of glass of index of refraction 1.450 at an angle of 40°, as shown.
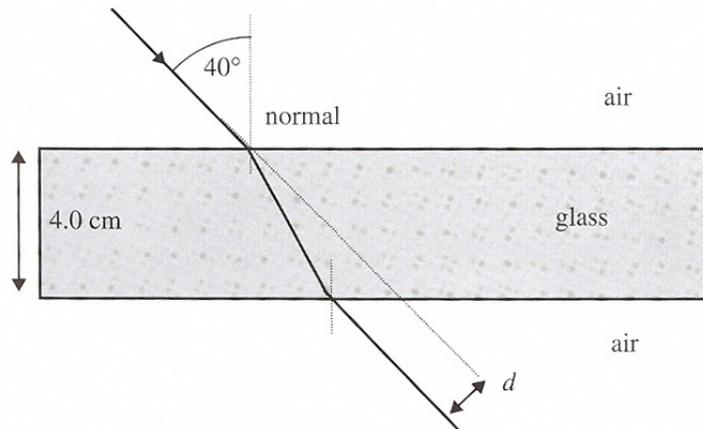

   If the thickness of the block is 4.00 cm, calculate the amount d by which the ray is deviated.

4. A radio station, R, emits radio waves of wavelength 1600 m which reach a house, H, directly and after reflection from a mountain, M, behind the house as shown.

   If the reception at the house is very poor, what is the shortest possible distance between the house and mountain?

5. A car moves along a road that joins the twin antennas of a radio station that is broadcasting at a frequency of 90.0 MHz as shown.
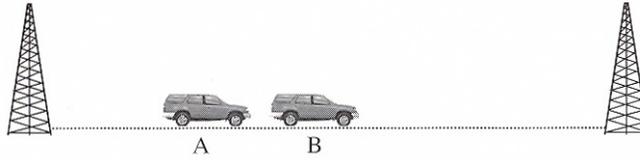
When in position A, the reception is good but it drops to almost zero at position B. What is the minimum distance AB?

6. Light is incident on an analyzer. The transmitted intensity is measured as the orientation of the analyzer is changed. In each of the following three outcomes, determine whether the incident light is polarized, partially polarized or completely unpolarized, explaining your answers.
   a. The intensity of the transmitted light is the same no matter what the orientation of the analyzer.
   b. The intensity of the transmitted light varies depending on the orientation of the analyzer. At a particular orientation, the transmitted intensity is completely zero.
   c. The transmitted intensity varies as the orientation varies, but it never becomes zero.

7. State Malus's Law.

8. Polarized light is incident on a polarizer whose transmission axis makes an angle of 25° with the direction of the electric field of the incident light. Calculate the fraction of the incident light intensity that gets transmitted through the polarizer.

9. Unpolarized light of intensity I_o is incident on a polarizer. Calculate, in terms of I_o, the intensity of light transmitted through the polarizer.

10. A fisherman is fishing in a lake. Explain why it would be easier for him to see the fish in the lake if he was wearing polarizing sunglasses.