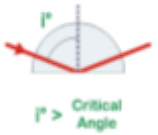
Particles and Waves

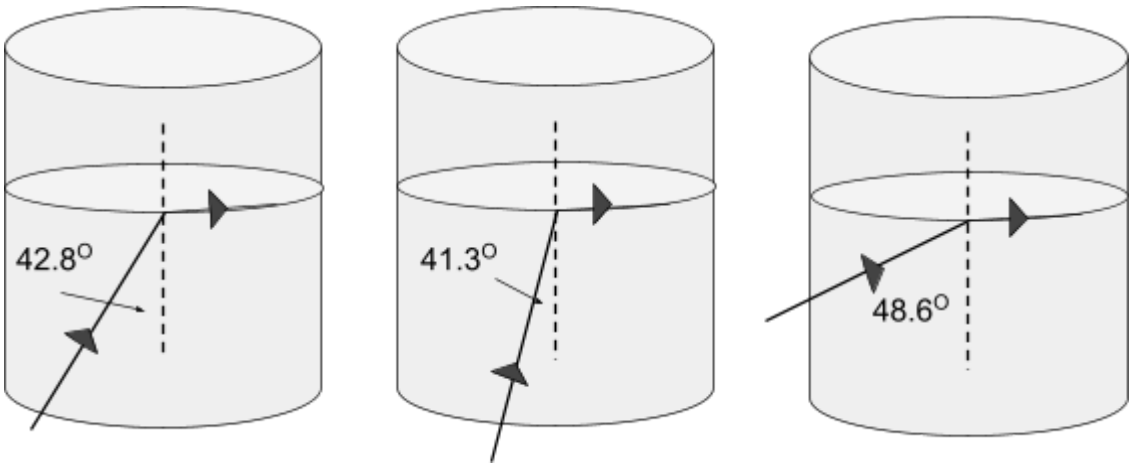
Total Internal Reflection and Critical Angle



1) The refractive index of some materials are given below. For each material determine the critical angle.

    a) Plexiglass n = 1.488
    b) Flint glass n = 1.569
    c) Methyl alcohol n = 1.328

2) A ray of monochromatic light is shone from the bottom of a very thin glass beaker through three different liquids.
The critical angle for each liquid is shown below. Determine the refractive index of each liquid.



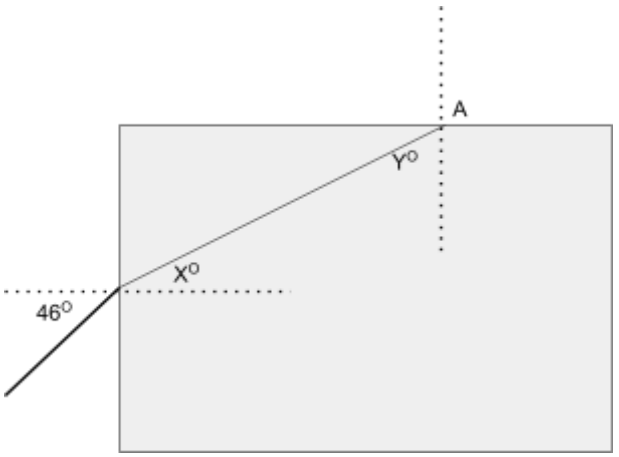
3) A monochromatic ray of light of wavelength of 650 nm is shone through a piece of glass of refractive index 1.39.

    a) Determine the angles X^{O} and Y^{O}

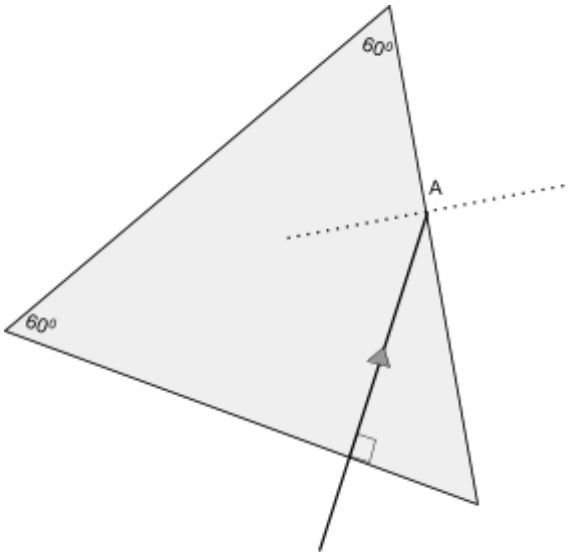
    b) Calculate the critical angle for this block of glass.

    c) Explain if the monochromatic ray will leave the glass and enter into the air at position A.

    d) Determine the wavelength of the light in the glass.



4) A monochromatic light beam of wavelength of 700 nm enters a small prism of amber of refractive index 1.546.

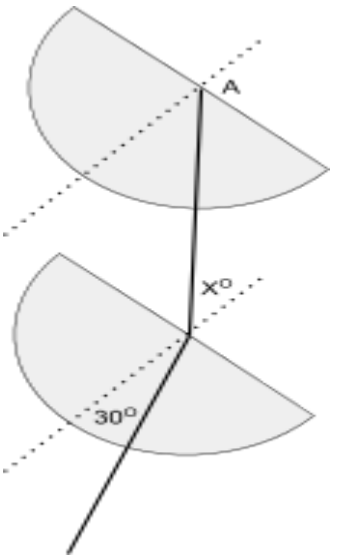


a) Determine the wavelength of the light inside the amber.

b) If the monochromatic beam has a speed of 3×10^8 m s^{-1} in the air then determine the speed of the beam in the amber.

c) Using your knowledge of the critical angle determine the path of the light beam after it reaches position A showing its full path along with the appropriate angles.

5) A monochromatic ray of light is shone through two semi circular prisms arranged as shown. Each semi circular prism has a refractive index of 1.515.



a) Determine angle X^O

b) Find the critical angle of the prisms.

c) Show that when the ray reaches position A it is totally internally reflected.