Refraction and Total internal reflection calculations.

3.18 know and use the relationship between refractive index, angle of incidence and angle of refraction:

$$n = \frac{\sin i}{\sin r}$$

3.22 know and use the relationship between critical angle and refractive index:

$$\sin c = \frac{1}{n}$$

1) In an experiment to measure the refractive index of glass, when the angle of incidence was 35^0 the angle of refraction was found to be $22^{0.}$

a) Calculate the refractive index of the block of glass. What are the units of refractive index?

b) If the angle of incidence were 15^0 what would the angle of refraction be?

c) If the angle of refraction was 28^0 what was the angle of incidence?

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

2) A beam of laser light is directed towards a tank of water. The angle of incidence is 45^0 and the angle of refraction is measure to be 33^0.

a) Calculate the refractive index of water.

b) Does light travel faster in water or air?

c) Diamond has a high refractive index at 2.4. Does light travel faster in diamond or water?

d) For the same laser beam with the same angle of incidence as above what would the angle of refraction be for diamond?

e) What is the critical angle for diamond?

1) a) n = 1.53 b) $r = 9.8^0$ c) $i = 45.9^0$ d) $c = 40.8^0$
2) a) n = 1.30 b) faster in air c) faster in water d) $r = 17.1^0$ e) $c = 24.6^0$