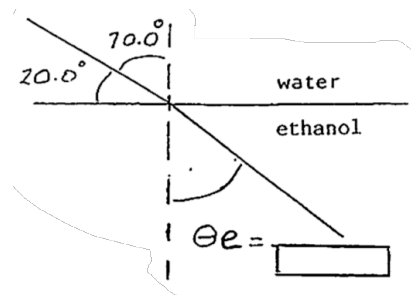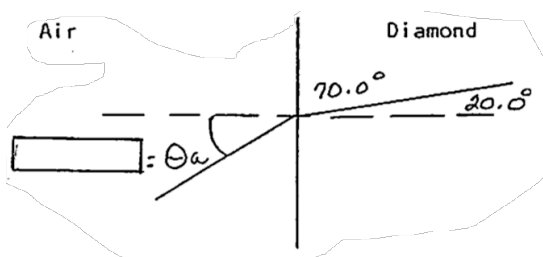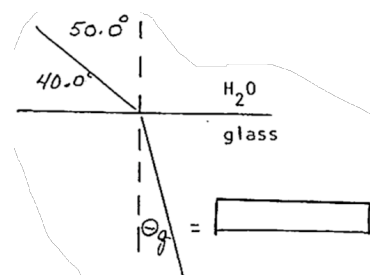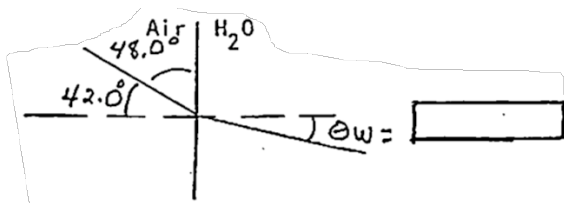Show work on all problems. Basic equations, numbers with units, answers to correct (3) sig. figs in boxes provided.

#1) Determine the angle the light path takes in the material as shown. *Note: Indices are in the text. Also, not all interfaces are horizontal. The dotted lines are the normal lines.*

#2) Calculate the critical angle for the light passing between glass and water. On the drawing, sketch a ray of light moving at the critical angle of incidence _in the proper direction_ and show clearly where that light goes after hitting the interface.

Glass/water

sketch:

Work:

glass

water

Normal

Refraction and Total Internal Reflection
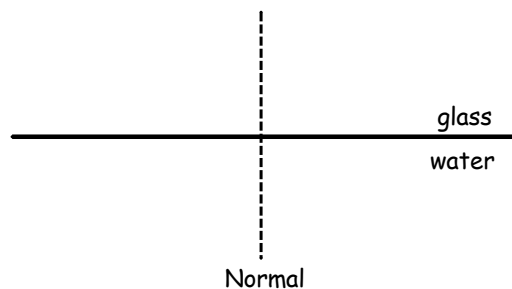
1) Calculate the angles and draw the rays for each of the following situations:

air
n = 1.00

a. A ray leaves the source, striking the surface at an angle of 10.0°. Calculate the angle of refraction. Draw the refracted ray.

b. A ray leaves the source, striking the surface at an angle of 30.0°. Calculate the angle of refraction. Draw the refracted ray.

b

c

a

glycerine
n = 1.47

source

c. A ray leaves the source, striking the surface at an angle of 50.0°. Calculate the angle of refraction. Draw what happens.

d. Calculate the critical angle for this situation. Draw it on the diagram above.
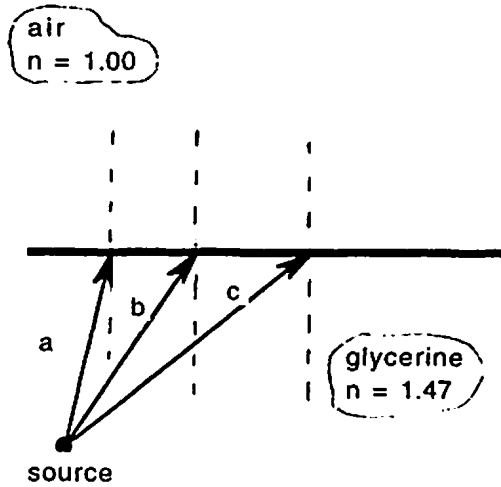
2) Calculate and draw, (using a straight edge) the path of the light ray below, continuing it until it emerges from the glass.

a. going into the glass

b. going through the glass. (*hint: draw the normal line where the ray touches the interface*)

c. coming out of the glass; calculate the angle of the emergent ray and put that number on your diagram below.

air
n=1.00

60.0°

glass
n=1.50

30.0°