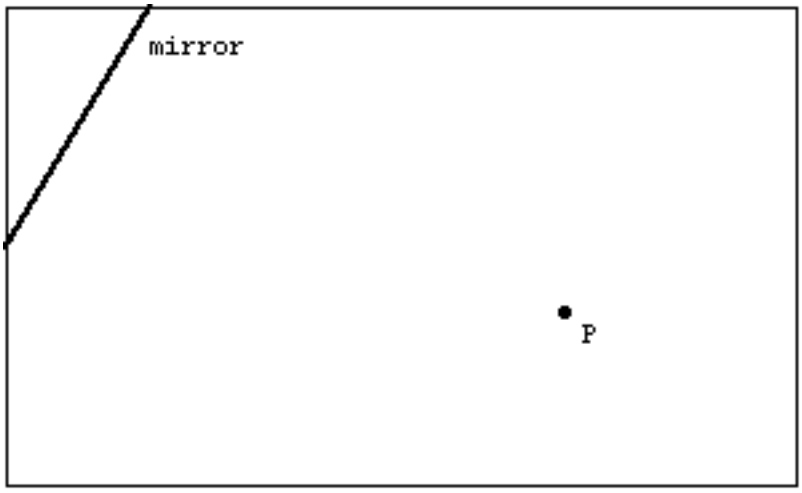
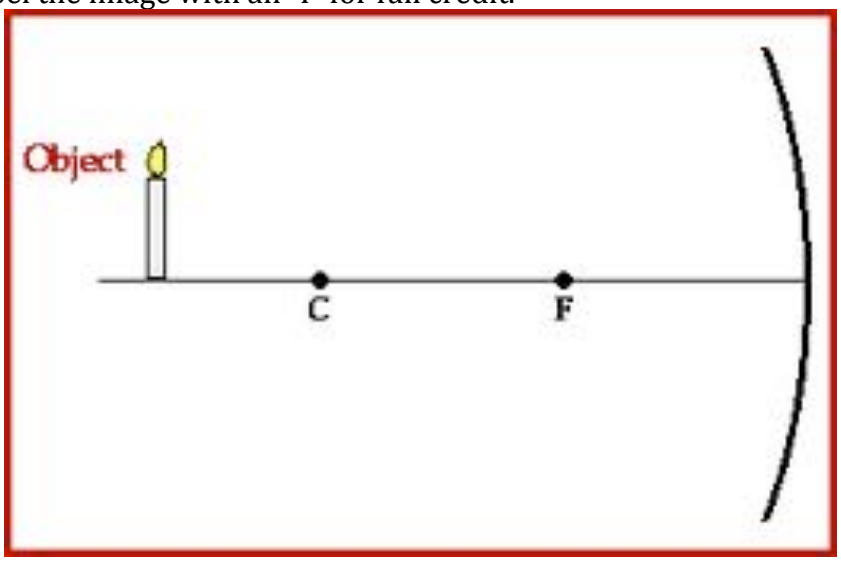
31. Draw in rays of light to show how much of the room a person can see from point P by looking only in the mirror. Shade in what portion of the room the person at point P can see when looking in only the mirror.

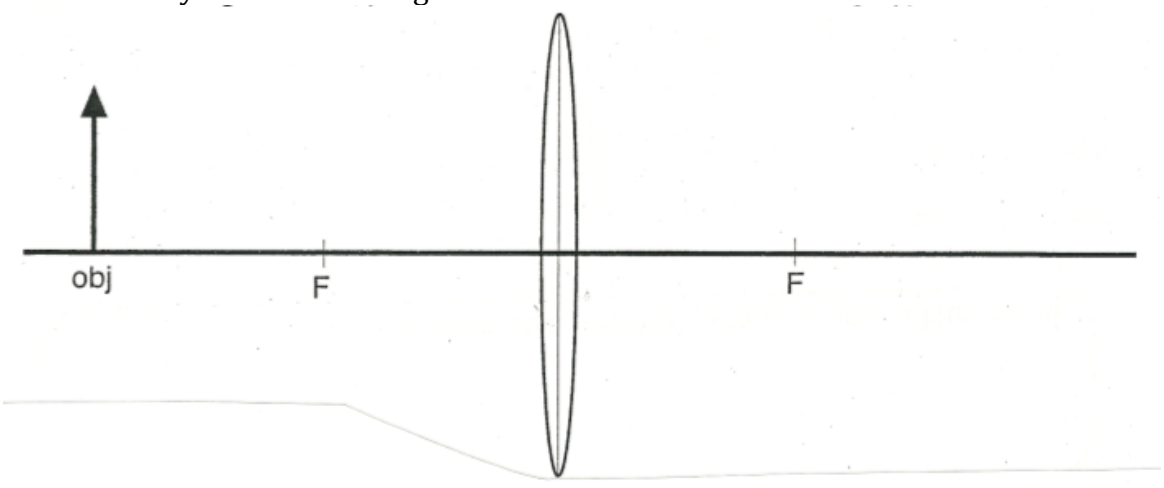
Room viewed from above:



32. Draw in a complete ray diagram to locate the image of the object (the candle) in the mirror below. Make sure you label the image with an "I" for full credit.



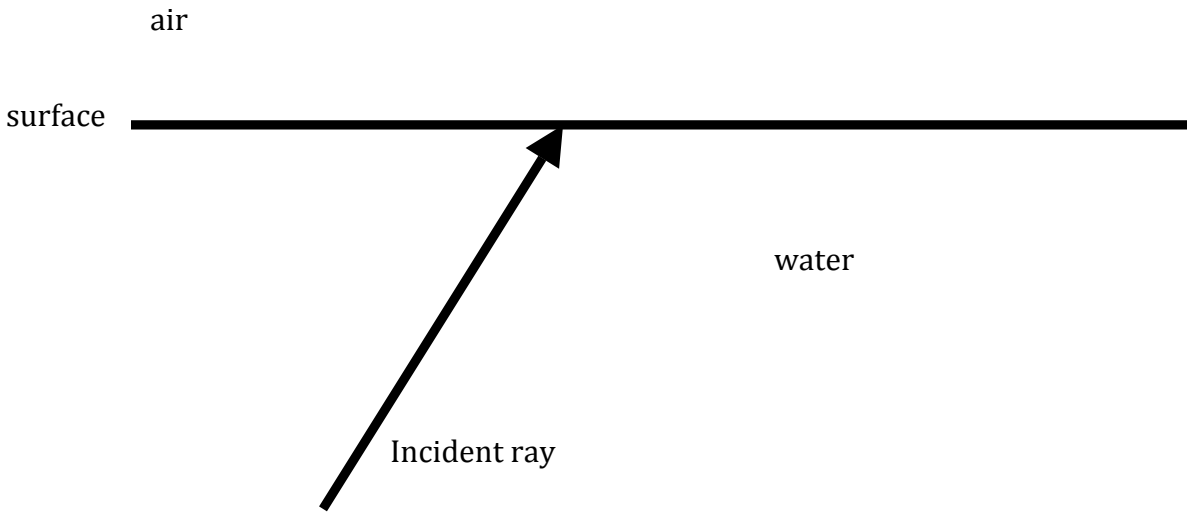
33. Draw in the complete ray diagram to locate the image of the object (the arrow) in the lens problem below. Make sure you label the image with an "I" for full credit.



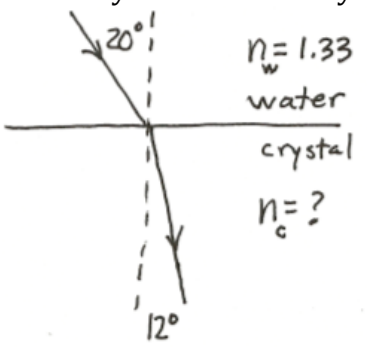
34. Fill in the blanks in the paragraph below regarding the human eye:

The _____ is made up of 2 types of photoreceptors, the _____ and the _____. The _____ are responsible for seeing colors while the _____ are responsible for seeing black/white and intensity. The 3 colors some of these photoreceptors are capable of seeing are _____, _____, and _____.

35. In the diagram below, assuming the angle of incidence is less than the critical angle, draw in the refracted ray showing which way it would travel as it enters the air after leaving the water from below. Make sure you have an arrow showing the direction the light is going. **No calculations needed, just draw in approximately where it would go.**

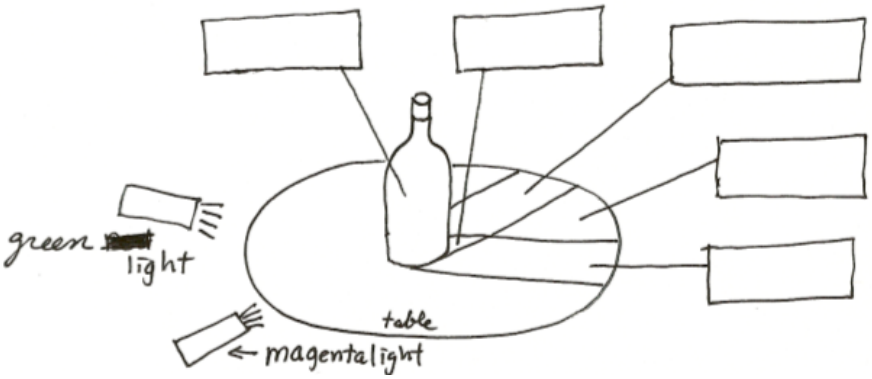


36. Light enters a crystal from water at an angle of incidence of 20.0°. If the refracted ray makes an angle of 12.0° with respect to the normal in the crystal, what is the index of refraction of the crystal? Show all of your work clearly in the space below.



37. A yellow tennis ball (when in white light) is in a dark room. A blue light is turned on to illuminate the tennis ball. Then a red light is turned on to illuminate the tennis ball along with the blue light. What is the appearance of the tennis ball now (ie, what color is the ball now)? Explain your answer (how you decided on what color you'd see).

38. A red bottle sits on a white table. It is illuminated by a green light and a magenta light as shown below. Label the colors you would see in each area indicated by the lines. Write your answers in the boxes. For this exercise, white and black would be considered "colors."



39. The WCCO 830AM radio station broadcasts its radio signal at a frequency of 830.0 kHz (k = x1000). What is the wavelength of the WCCO radio signal (in meters)? Show all of your work in the space below.

40. How fast (in m/s) must a galaxy be moving away from us if a 500.0 nm wavelength light wave is shifted and seen as a 501.0 nm wavelength light wave? Show all of your work in the space below.

41. One bright line in a emission spectra has a wavelength of 465.0 nm (nanometer). Calculate the energy of this light in Joules. Show your work in the space below.

42. Absorption spectra are usually produced by which type of gas, hot or cold? Answer: _____

43.

A pair of toy cart wheels are rolled obliquely from a smooth surface onto two plots of grass — a rectangular plot as shown at the left, and a triangular plot as shown at the right. The ground is on a slight incline so that after slowing down in the grass, the wheels speed up again when emerging on the smooth surface. Finish each sketch and show some positions of the wheels inside the plots and on the other side. Clearly indicate their paths and directions of travel.