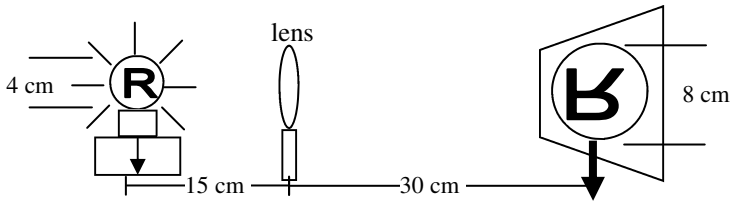
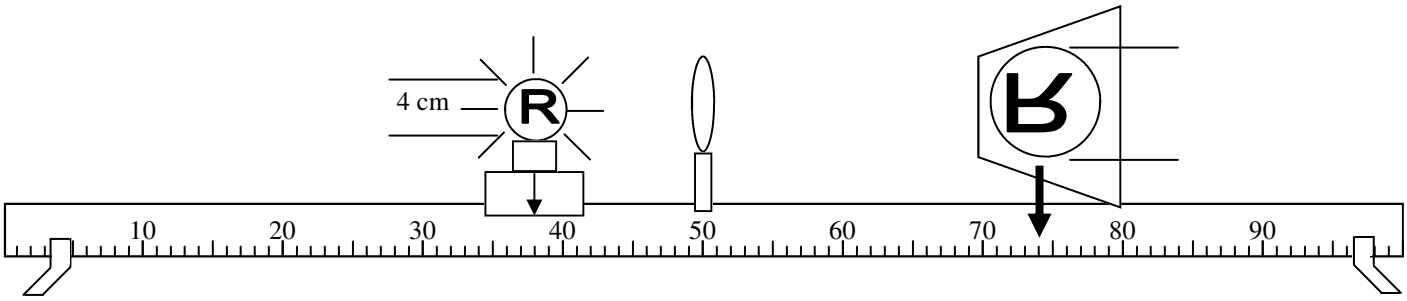
B-day: Due Wed., May 5
A-day: Due Thurs., May 6

2009-10 PreAP Light and Optics 6



1. A. h' = B. h =
   C. Calculate M =

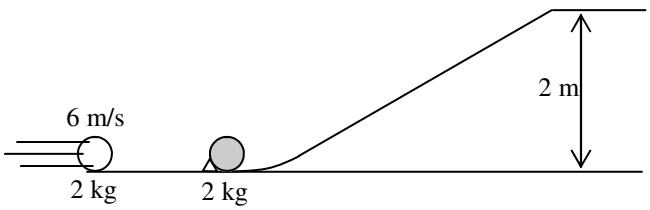
   D. Magnified, reduced, or same.
   E. Real or virtual image?
   F. p = _ G. q =
   G. Calculate f.



2. Use the above image to answer the following.

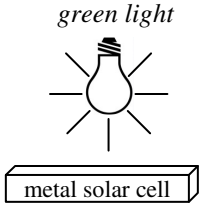
   A. Label p, q, h, and h' on the diagram above.
   B. Is q + or −?
   C. Will the value of (the number for) M be + or −?
   D. Why?
   E. Calculate the focal length.
   F. What is the radius of curvature for this lens?
   G. Label f and C on the diagram on both sides.
   H. Calculate the magnification.
   I. Calculate the height of the image.
   K. To make the image bigger, which way would you move the object?

3. An object makes an image with a lens and M = –0.5.
   A. Is the image real or virtual? B. Where is the object?
   C. Where is the image?
   D. What kind of lens must is be?



4. A. On the diagram at the left, calculate the potential energy necessary to get the ball up the ramp.
   B. Calculate the energy in the moving ball.
   C. Does the moving ball have enough energy to get the left ball up the ramp?
   D. If you hit the stationary ball with a second identical moving ball, would it get up the ramp?
   D. What would happen if the moving ball had 50 J of energy and gave all of it to the stationary ball?

5. *From the "Photoelectric Effect" notes*:
6. Which has more energy? A. blue or red light? B. High or low frequency light? C. Long or short wavelengths?
7. A photovoltaic cell (*solar cell*) has green light shining onto it, but no electrons are being ejected (*coming off*).
   A. Would electrons start to flow if you left the light on for a long time?
   B. Would electrons be ejected if you changed to red light?
   C. Would electrons come out if you changed to blue light?
   The photoelectric effect is how we know that the energy of photons are "quantized", meaning each photon has a particular amount of energy.



8. A photon has a wavelength of 340 nm.
   A. Calculate its energy.

   B. Convert this into eV (*see your notes*).

   C. What is the frequency of this light?

The work function is the amount of energy "just to get up the ramp" and have no KE at the top.

9. Light of 620 nm is the threshold wavelength to get electrons out of a metal plate.
   A. Calculate the work function for this photocell.

   B. The light source is then made brighter (greater intensity). How do the electrons change?

   C. The light source is changed again so that 700 nm light is used. What happens?

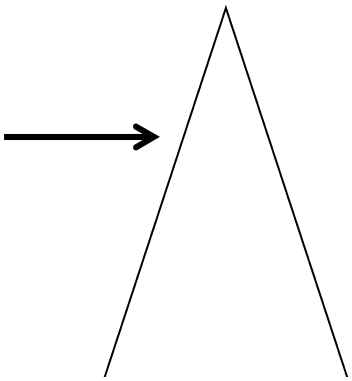
   D. The light source is changed once again so that 550 nm light is used. What happens?

   E. Calculate the KE of the electrons when 620 nm light is used.

   F. Calculate the KE of the electrons when 550 nm light is used.

Be sure to read the back part of the "Photoelectric" notes.

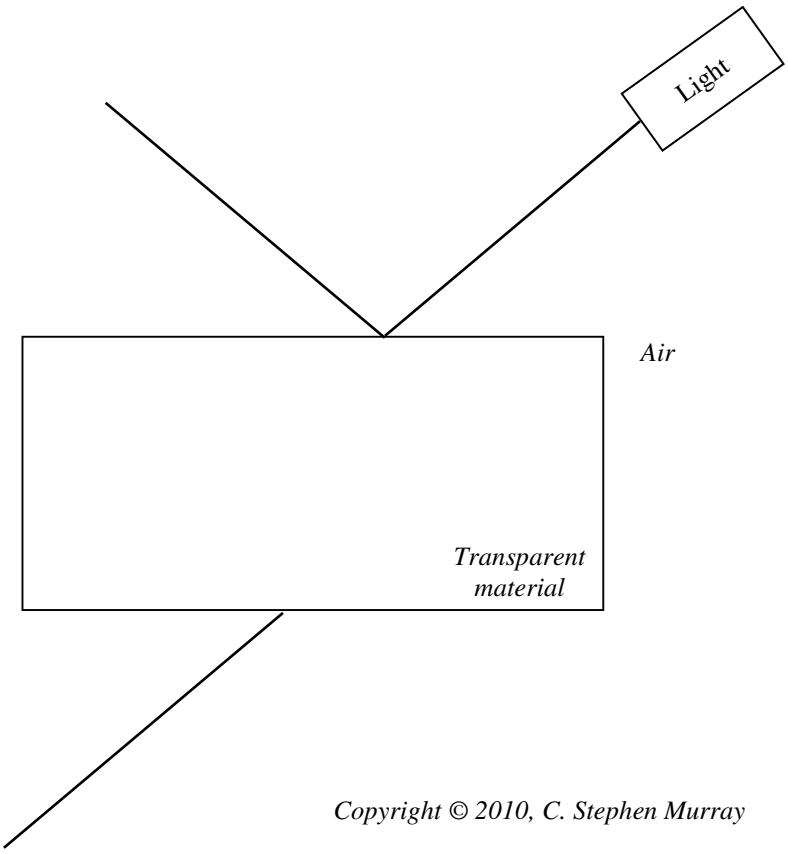
10. Light passes from air into a glass lens. Draw the path into and out of the lens.



11. Yellow light shines on a magenta object. What color do you see the object as?

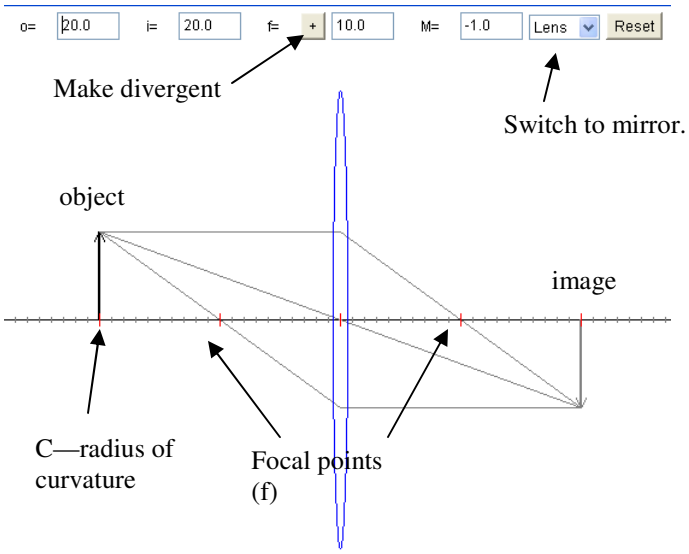
At this point I expect you to be able to calculate n, v, f, λ, θ, etc. So, here's from the quiz…

12. Using a protractor and ruler (*for the last time*)…
    A. Calculate the index of refraction of the block of transparent material.



   B. In which material 1 (air) or 2 (the block)?
      i. Light travels the fastest?
      ii. Light has the shortest wavelength?
      iii. Light has the greatest frequency?

   C. If the index of refraction of the transparent material is increased, will the angle in the material increase or decrease? (*Don't know? Make up a # and do the math.)*



Get ready to spend a little time with our Internet Lens Applet (in Light Links marked VERY IMPORTANT). Get a cup of hot chocolate, your house shoes, a warm blanket…. (The diagram at the right will help you with navigation).

The regions you will use are: outside C; at C; between C and f; at f; inside f. Other descriptions you already know: virtual, real, magnified, reduced, on real side, etc. You don't have to do the mirror or the divergent devices, but feel free. Be sure, though, to memorize the convex lens.

13. Fill in the following table.

Device	convergent/ divergent	For the object	For the image:		
		location	location	Real/ virtual	magnified/ reduced
Convex Lens		At C			
		outside C			
		between C and f			
		at f			
		inside f			

Answer the following questions about convex lenses.

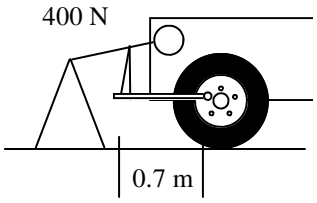
14. The object is placed inside the focal length.
    A. On which side of the lens it the image?
    B. For this situation, which is greater p or q?
    C. Is h' + or −?

15. An inverted image is produced of a real upright object. The image is the same size as the object.
    A. Which is greater: p or q?
    B. If the image is 12 cm away from the lens, what is the focal length of the lens?

16. For a convex lens, when can the image be upright and closer to the lens than the object?

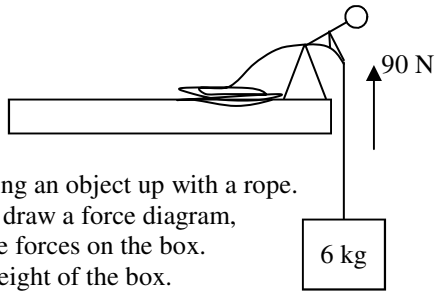
17. If the lens is using a very distant tree as an object, where will the image be produced?

18. A student works the following problem: "*A convex lens with a 4 cm focal length produces an image 10 cm from the right side of the lens. Find the distance of the object.*" The student works the problem and gets an answer of p = 9 cm. WITHOUT WORKING THE PROBLEM, how can you tell that they did it wrong?



19. Slim Jim has a flat tire. He push on the lug wrench with 400 N, 0.7 m away from the lug nut.
    A. Calculate the amount of torque he uses to remove the lug nut.

    B. Give 2 ways to increase the torque.



20. Slim Jim is lifting an object up with a rope.
    A. On the dot draw a force diagram, labeling the forces on the box.
    B. Find the weight of the box.

    C. If Jim pulls on with 90 N, find the net force on the object.

    D. Calculate the acceleration of the box.