Quiz 6
Physics 221

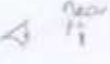
Names: Solution

1. Bob has a near point of 12 cm and a far point of 60 cm.
   a. Is he farsighted or near sighted, why?

   nearsighted because he can see clearly close up but not far away.

   b. Does he need a converging or a diverging lens, why?

   Diverging lens for nearsighted eyes

   A nearsighted eye focuses light before the retina. A diverging lens will cause it to focus further back.

   c. Determine his prescription for corrective lenses.

   Want to see far so $s = \infty$

   Can see 60cm so $s' = -0.60m$ negative because image is in front of the lens.

   $\frac{1}{\infty} + \frac{1}{-0.60m} = \frac{1}{f}$ $f = -0.60m$

   $P = 1/f = \frac{1}{-0.60m} = \boxed{-1.67\,D}$

2. When wearing the corrective lenses above, has Bob's near point also changed? If so, determine Bob's new near point when wearing these lenses.

   Bob can see up to 12cm so an image at 12cm will be clear for him. With the -1.67D lens, where can an object be and produce an image at 12cm? $s = ?$, $s' = -0.12m$, $f = -0.60$

   $\frac{1}{s} + \frac{1}{-0.12m} = \frac{1}{-0.60m}$ $\boxed{s = 0.15m}$ only slightly changed.

3. A concave mirror has a radius of curvature of 3.0 cm. If an object is placed 2.0 cm from the mirror and produces an image 0.60 cm in height, find where the image is located and the height of the object. Include an accurate ray diagram to scale. Describe the image.

   $R = 3.0cm \rightarrow f = 1.5cm$ $s = 2.0cm$ $h' = 0.60cm$ $\frac{1}{2.0cm} + \frac{1}{s'} = \frac{1}{1.5cm}$

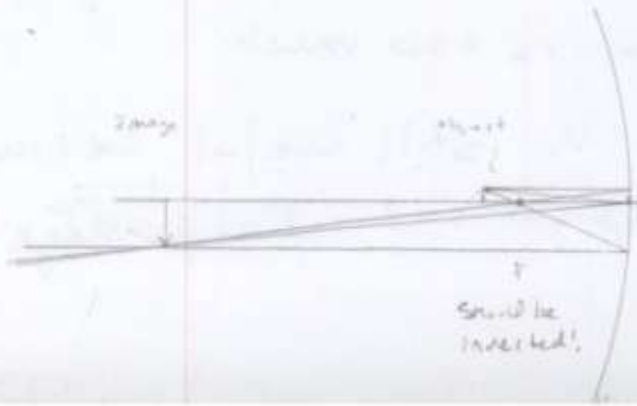
   $\boxed{s' = 6.0cm}$

   $m = \frac{-s'}{s} = \frac{h'}{h}$

   $\frac{-6.0cm}{2.0cm} = \frac{0.60cm}{h}$

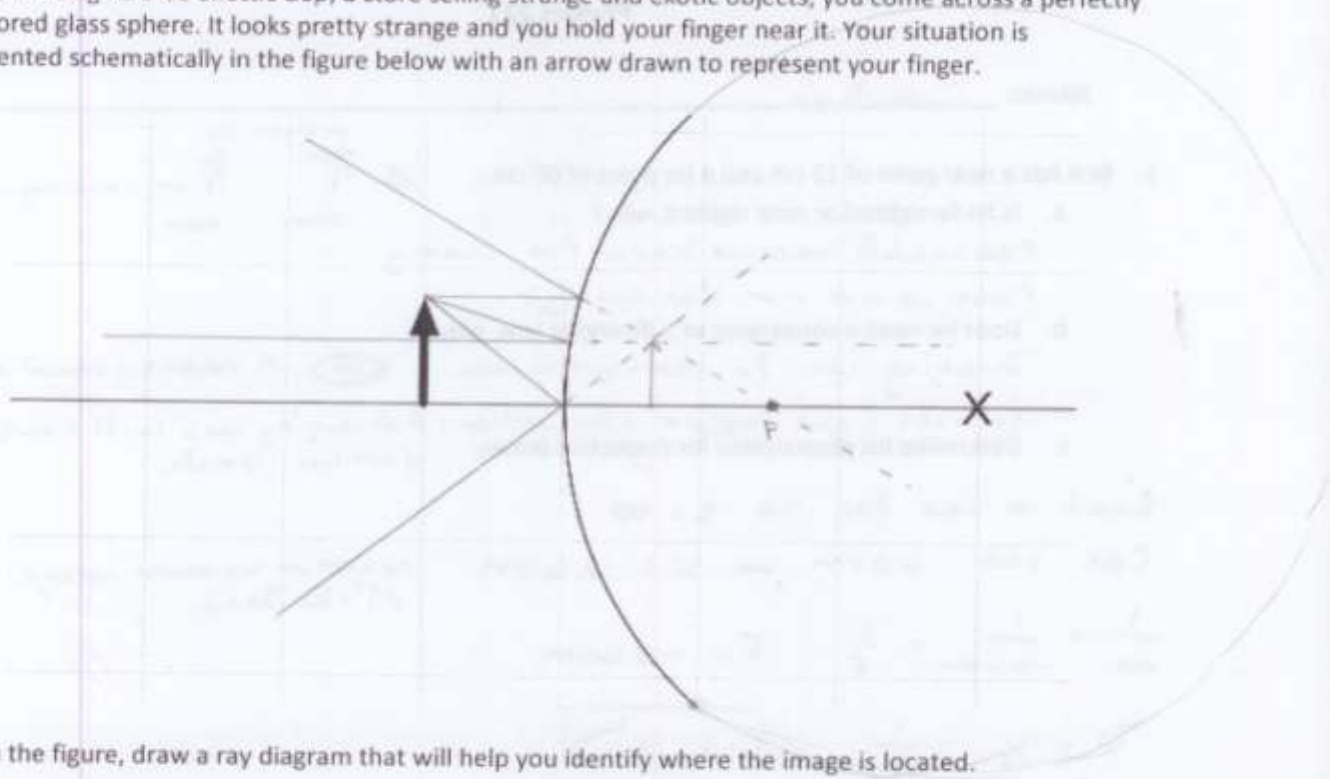
   $\boxed{h = -0.20cm}$

   Image is Real inverted Magnified

4. ***Looking into a Mirror Ball***

While visiting *Ye Olde Shottle Bop*, a store selling strange and exotic objects, you come across a perfectly mirrored glass sphere. It looks pretty strange and you hold your finger near it. Your situation is presented schematically in the figure below with an arrow drawn to represent your finger.



A) On the figure, draw a ray diagram that will help you identify where the image is located.

B) Is the image real or virtual? Explain why you say so.

Virtual because it is behind the mirror and no light is actually in that location.

C) The mirror has a radius of 24 cm, the finger is a distance of 8 cm from the surface of the mirror, and the finger is 8 cm long. Calculate the location and the size of the image using the mirror equation. Does your calculation agree with your drawing? If not, explain why not.

R = 24cm f = -12cm negative because it's a diverging mirror

s = 8cm

h = 8cm $\frac{1}{8cm} + \frac{1}{s'} = \frac{1}{-12cm}$ $s' = -4.8\,cm$

My diagram and my math do not quite match up.

I would say it is because the curve of the mirror on the diagram is too much.

But the diagram is still useful because it shows a virtual, upright and reduced image just like the math.