**PHY 102 Quiz #5** **Name** _____

**Score** _____

Instructions:
1. Do all of your work on this sheet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box.**
5. If you need more space, you may use the back of the page and write **On back** in the problem space.

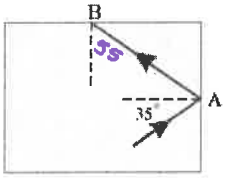
---

1. **Multiple Guess (3 pts)** Find the answer which best fits the question and write it in the space provided.

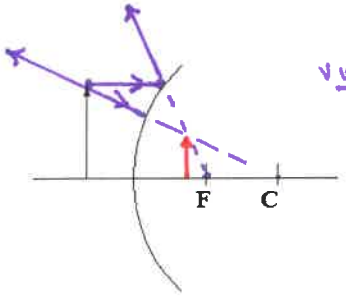
a. Suppose you look into a concave mirror.
a) A real image will always be formed. b) If you are between the center of curvature and the focal point, you will not be able to see your image. c) Your image will always be inverted. d) Your image will be diminished in size. e) None of these is always true. **e**

b. What electromagnetic wave in the list has the largest wavelength ?
a) red light; b) violet light; c) x-rays; d) radio waves; **d**

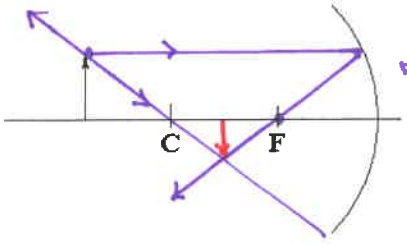
c. A ray of light starts out within a block of amber glass ($n = 1.52$) and travels toward point A. At which points does some of the light escape the glass into air?
a) A. b) B. c) Both A and B. d) Neither **a**




**2. Ray Diagrams (4 pts)** Sketch the ray diagrams for the following mirrors. Clearly show the images and indicate if they are **real or virtual**.



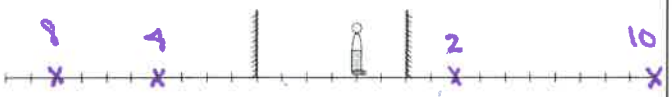

virtual




real

3. **Problems (13 pts)**

a. A person stands 2.0 m from one two parallel plane mirrors separated by 6.0 m. Determine the image distances for the first two images in each of the mirrors. Draw and label these four images.




2

b. An object is 10.0 cm in front of a concave mirror. It forms a real image at 25.0 cm from the mirror.
i. What is the mirror's focal length?

$\frac{1}{f} = \frac{1}{10} + \frac{1}{25} = \frac{7}{50}$

$f = 50/7 = \boxed{7.14\text{cm}}$

2

ii. What is the magnification?

$m = \boxed{-2.5}$

1

c. Green light has a wavelength of 510 nm in a vacuum. What is its frequency?

$f = \frac{c}{\lambda} = \frac{3\times10^{8}}{5.1\times10^{-7}} = \boxed{5.9\times10^{14}\ \text{Hz}}$

2

d. An olive is at the bottom of a glass of alcohol ($n = 1.36$), 6.00 cm beneath the surface. To a person who is directly above the olive, what is the apparent depth of the olive?

$d = \frac{1}{1.36}(6) = \boxed{4.41\text{cm}}$

2

e. An electromagnetic wave, traveling in a certain medium at ~~2.5~~ 3.25 $\times 10^8$ m/s, is incident to an interface with air at ~~30°~~ 45° to the normal. At what angle does the beam emerge?

$\sin\theta_2 = \frac{3}{2.25}\sin 45 = .9428$

$\theta_2 = \boxed{70°}$

2

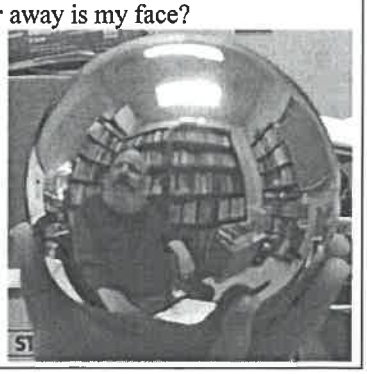
f. My image appears one-ninth its size in a 6.0 inch diameter reflecting sphere. How far away is my face?

$m = \frac{1}{9}$, $f = 3$"

$d_i = -d_o/9$

$\frac{1}{f} = \frac{1}{d_o} - \frac{9}{d_o} = -\frac{8}{d_o}$

$d_o = -8f = \boxed{12"}$



2pts