Name Key Hour _____

Review for the Multiple Choice: (This part is OPTIONAL)

1. What is the purpose of the rods, and where are they located? retina - black + white / dim
2. What is the purpose of the cones, and where are they located? retina - color / bright light
3. What part of the eye should light rays be focused to for 20/20 vision? retina
4. Which type of image can be projected because light rays actually cross at that point? real
5. Type of image in which light rays are drawn behind the mirror and can NOT be projected. virtual
6. Which type of mirror can make a real image? concave
7. Which type of lens can make a real image? converging
8. Which type of mirror has a negative f? convex
9. Which type of lens has a negative f? diverging
10. According to $c=f\lambda$, as the wavelength increases, what happens to the frequency? ↓
11. When is q negative for mirrors? behind the mirror
12. When is q negative for lenses? object + image on SAME side of lens
13. When is hi negative? inverted
14. What type of mirror AND lens can make an inverted image? concave + converging
15. What happens in your eye if you are nearsighted? light rays meet before retina
16. What happens in your eye if you are farsighted? light rays meet too late (behind retina)
17. What does a converging lens do to light? makes light rays come together
18. What does a diverging lens do to light? spreads out light
19. A converging lens is thicker in the middle
20. A diverging lens is thicker at the edges
21. Which type of lens will correct nearsightedness? diverging
22. Which type of lens will correct farsightedness? converging
23. What does a magnification of 2.5 mean? 2.5 times bigger + upright
24. What does a magnification of -0.75 mean? 75% original size + inverted

Ligth/Mirror/Lens Review Problems: This part is worth points!

1. The wavelength of blue light is about 475 nm and orange light is 650 nm. Find the **frequency** of each and determine which has more **waves per second.**

↑ $f = \downarrow\lambda$ BLUE

B- $475\,nm \times \frac{10^{-9}\,m}{1\,nm} = 4.75\times10^{-7}\,m \rightarrow$

O- $650\,nm \times \frac{10^{-9}\,m}{1\,nm} = 6.5\times10^{-7}\,m \rightarrow$

$c = f\lambda$

$3\times10^8 = f(4.75\times10^{-7}) = 6.32\times10^{14}\,Hz$

$3\times10^8 = f(6.5\times10^{-7}\,m) = 4.61\times10^{14}\,Hz$

2. How many **miles** will light travel in a year? (5.88×10^{12} miles)

$\frac{3\times10^8\,m}{s} \times \frac{3600\,s}{1\,hr} \times \frac{24\,hr}{1\,day} \times \frac{365\,d}{1\,y} = 9.46\times10^{15}\,\frac{m}{yr} \times \frac{1\,mi}{1609\,m} = 5.88\times10^{12}\,\frac{mi}{yr}$

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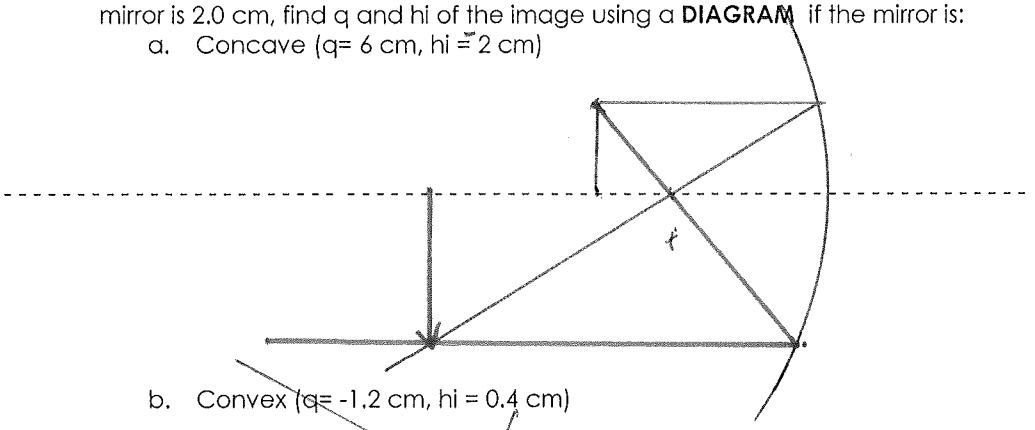
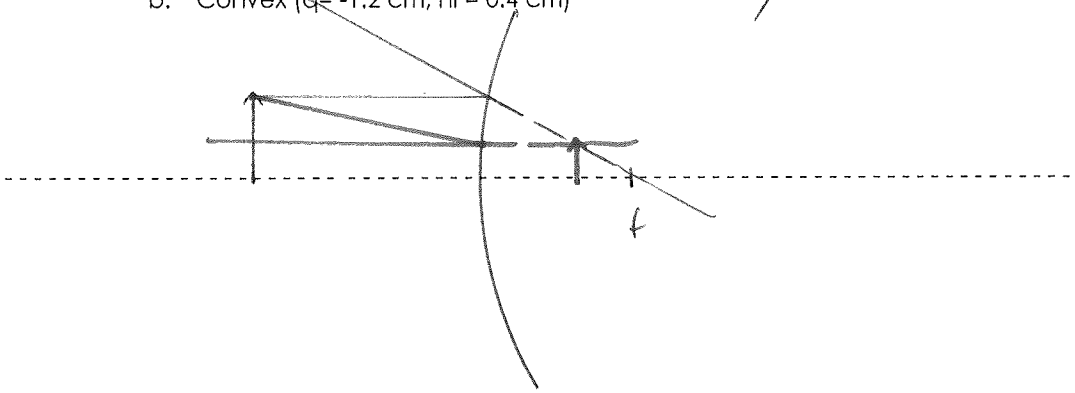
3. Your nose is 3.0 cm from a mirror. If the tip of your nose is 1.0 cm high and the focal length of the mirror is 2.0 cm, find q and hi of the image using a **DIAGRAM** if the mirror is:

   a. Concave (q= 6 cm, hi = 2 cm)



q = 6 cm
hi = -2 cm

   b. Convex (q= -1.2 cm, hi = 0.4 cm)



q = -1.2 cm
hi = .4 cm

4. A 1.2 cm tall candle is in front of a <u>concave mirror</u>. The mirror magnifies the candle -0.75 times and forms **an image that is 4.6 cm in front of the mirror's surface.** Find the distance from the mirror to the candle using **equations.** *(ans. 6.1 cm)*

ho=1.2
m=-0.75
q=4.6

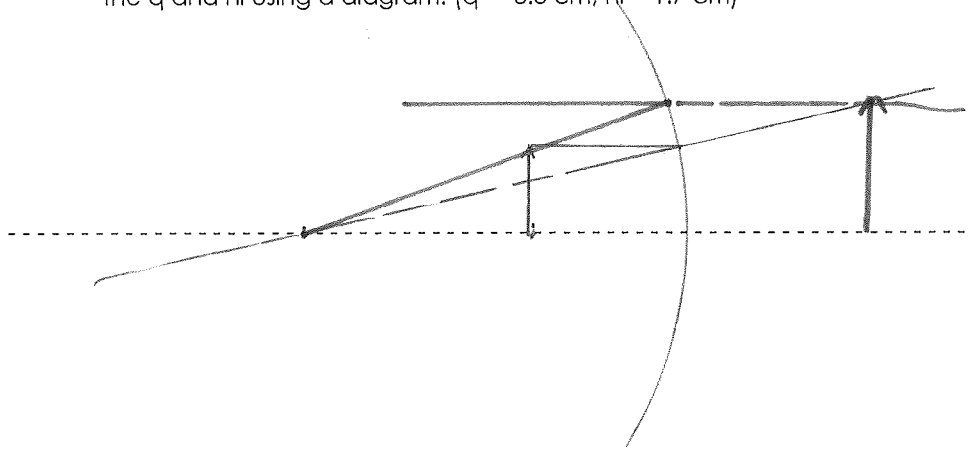
$m = \frac{-q}{p}$ $-.75 = \frac{-4.6}{p}$ $p = 6.13\text{cm}$

5. A toy is placed 5 cm (p) in front of a curved mirror and the image appears 2.5 cm (q) **BEHIND the mirror.** Find the **focal length** of the mirror using equations and determine which type of mirror it is. Make sure to make q negative! (f= -5 cm, convex because f is negative)

p=5
q=-2.5

$\frac{1}{f} = \frac{1}{5} + \frac{1}{-2.5}$ $f = -5\text{cm}$ convex

6. A 1.0 cm tall object is placed 2 cm in front of a concave mirror with a focal length of 5 cm. Find the q and hi using a diagram. (q = -3.3 cm, hi = 1.7 cm)



q = -3.3 cm
hi = 1.7 cm

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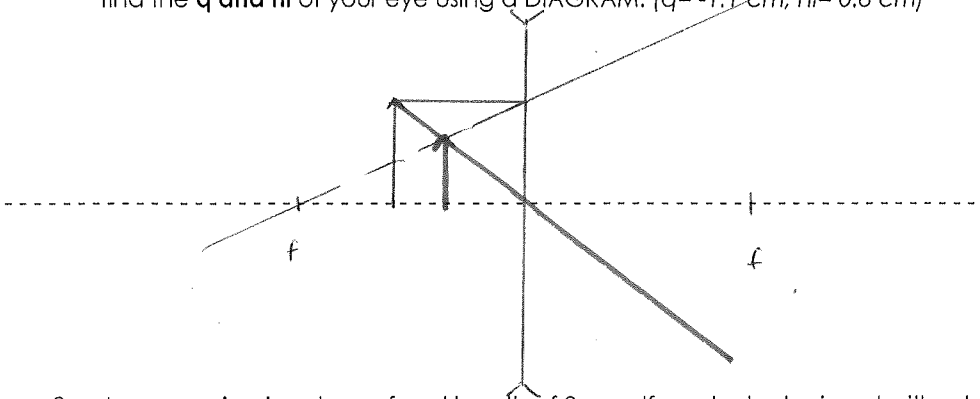
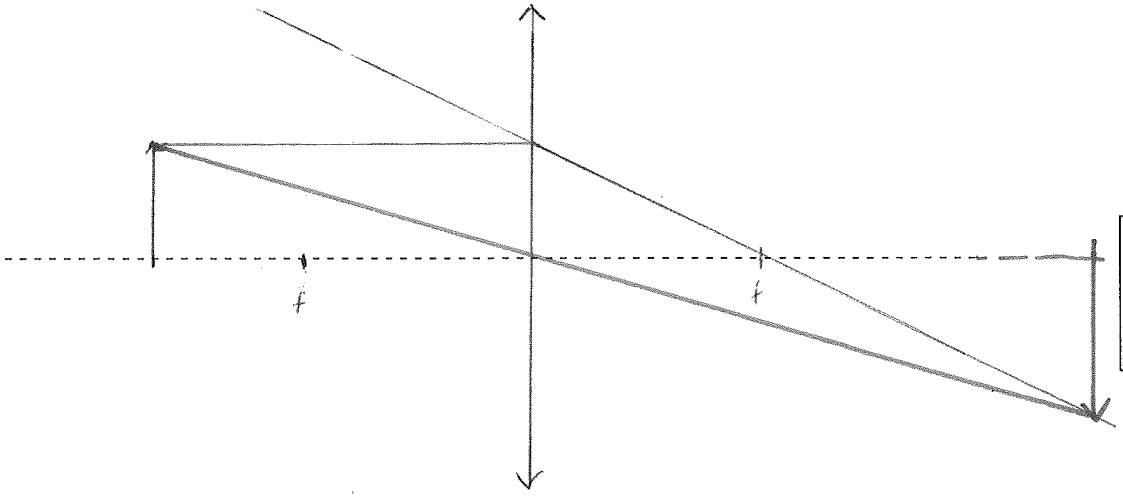
7. You hold a **diverging lens**, with a focal length of 3 cm up to your eye to show your friend how funny your eyeball looks. If the height of your eye is 1.3 cm and your eye is 1.7 cm away from the lens (p), find the **q and hi** of your eye using a DIAGRAM. *(q= -1.1 cm, hi= 0.8 cm)*



q = -1.1cm
hi = 0.8cm

8. A **converging lens** has a focal length of 3 cm. If you look at a jewel with a height of 1.5 cm while holding it 5.0 cm from the lens. Find the **q and hi** using **a DIAGRAM:** (q= *7.5 cm, hi= -2.25cm) This is a LARGE drawing, you might be off by more than usual!*

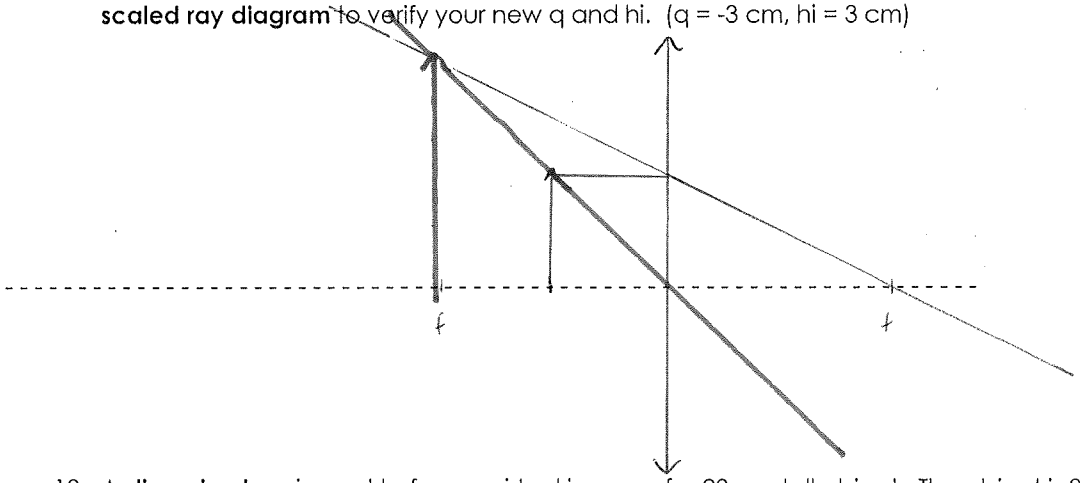
f = 3
p = 5
ho = 1.5



q = 7.5cm
hi = -2.25cm

9. If you move the jewel closer to the lens (p=1.5 cm), what should happen to the image? **Draw a scaled ray diagram** to verify your new q and hi. (q = -3 cm, hi = 3 cm)

f = 3
p = 1.5
ho = 1.5



q = -3 cm
hi = 3cm

10. A **diverging lens** is used to form a virtual image of a 20-cm tall object. The object is 80 cm **in front** of the lens and the image is 40 cm **in front** of the lens. Find the focal length of the lens using **equations**. *(ans. -80 cm)*

p = 80
q = -40

$\frac{1}{f} = \frac{1}{80} + \frac{1}{-40}$

$\frac{1}{f} = -.0125$

f = -80cm