

Review for Light, Mirrors and Lenses

MIRRORS: _____ light

LIGHT:

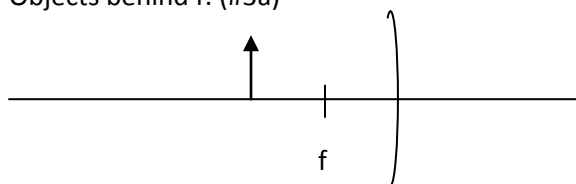
$c = f \times \lambda$

$c = 3 \times 10^8$ m/s
 f = frequency (Hz)

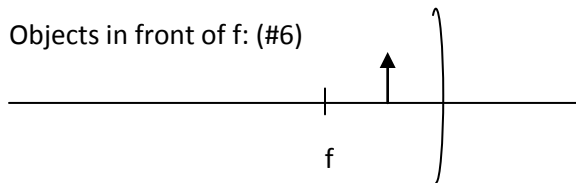
#1, 2

CONCAVE MIRROR: caves inward

Objects behind f : (#3a)



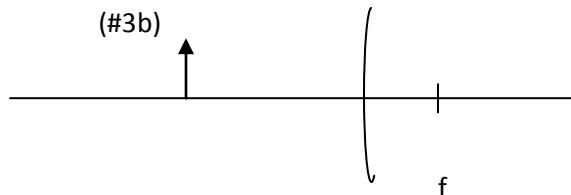
Objects in front of f : (#6)



Equations: (#4, 5)

CONVEX MIRROR: bulges toward

(#3b)



Mirror Sign Conventions:

$f +$ = concave / convex

$f -$ = concave / convex

$q +$ = in front / behind mirror

$q -$ = in front / behind mirror

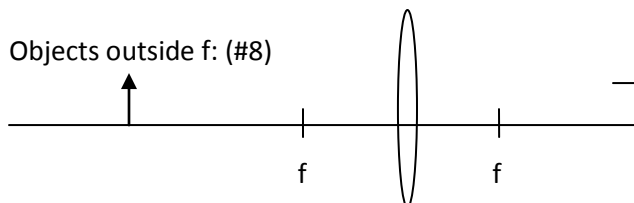
$hi +$ = upright / inverted

$hi -$ = upright / inverted

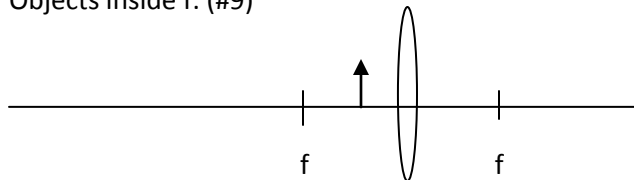
LENSES: _____ light

CONVERGING LENS: thicker in middle

Objects outside f : (#8)



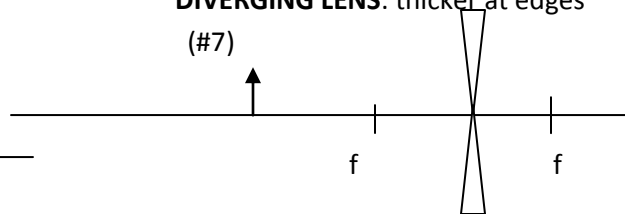
Objects inside f : (#9)



Equations: (#10) Same as mirrors

DIVERGING LENS: thicker at edges

(#7)



Lens Sign Conventions:

$f +$ = converging / diverging

$f -$ = converging / diverging

$q +$ = object and image on _____ side of lens

$q -$ = object and image on _____ side of lens

$hi +$ = upright / inverted

$hi -$ = upright / inverted

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

1. What is the purpose of the rods, and where are they located?
2. What is the purpose of the cones, and where are they located?
3. What part of the eye should light rays be focused to for 20/20 vision?
4. Which type of image can be projected because light rays actually cross at that point?
5. Type of image in which light rays are drawn behind the mirror and can NOT be projected.
6. Which type of mirror can make a real image?
7. Which type of lens can make a real image?
8. Which type of mirror has a negative f ?
9. Which type of lens has a negative f ?
10. According to $c=f\lambda$, as the wavelength increases, what happens to the frequency? _____
11. When is q negative for mirrors?
12. When is q negative for lenses?
13. When is h_i negative?
14. What type of mirror AND lens can make an inverted image?
15. What happens in your eye if you are nearsighted?
16. What happens in your eye if you are farsighted?
17. What does a converging lens do to light?
18. What does a diverging lens do to light?
19. A converging lens is thicker in the _____
20. A diverging lens is thicker at the _____
21. Which type of lens will correct nearsightedness?
22. Which type of lens will correct farsightedness?
23. What does a magnification of 2.5 mean?
24. What does a magnification of -0.75 mean?

Lighth/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**.

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

Name _____ Hour _____

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 h_i of the image using a **DIAGRAM** if the mirror is:
- a. Concave ($q = 6$ cm, $h_i = 2$ cm)

$q =$ _____
$h_i =$ _____

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

$q =$ _____
$h_i =$ _____

4. A 1.2 cm tall candle is in front of a concave mirror. 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*)
5. A toy is placed 5 cm in front of a curved mirror and the image appears 2.5 cm **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)
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 h_i using a diagram. ($q = -3.3$ cm, $h_i = 1.7$ cm)

$q =$ _____
$h_i =$ _____

Name _____ Hour _____

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)

$q =$ _____
 $hi =$ _____

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, $hi = -2.25$ cm) *This is a LARGE drawing, you might be off by more than usual!*

$q =$ _____
 $hi =$ _____

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)

$q =$ _____
 $hi =$ _____

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*)