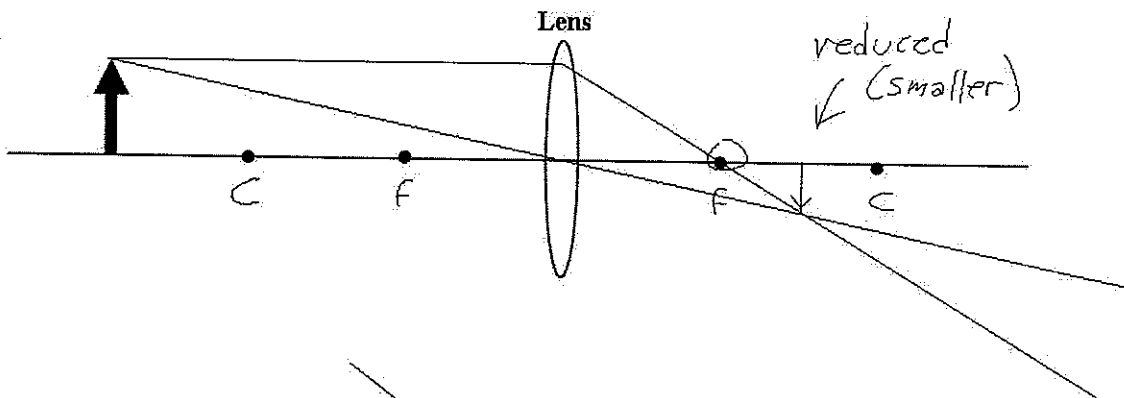# In Class Light Review 1

1. A. Concave or (convex)?
   B. (Convergent) or divergent?
   C. Is f + or −?
   D. Draw the ray diagram.
   E. Is the image magnified or (reduced)?
   F. Is the image (real) or virtual?

Lens

reduced (smaller)

C   F   F   C

2. A. Concave or (convex)?
   B. Convergent or (divergent)?
   C. Is f + or −?
   D. Draw the ray diagram.
   E. Is the image magnified or (reduced)?
   F. Is the image real or (virtual)? *upright + on virtual side of mirror.*

Mirror

"Seems" to come from here

C   F   F   C

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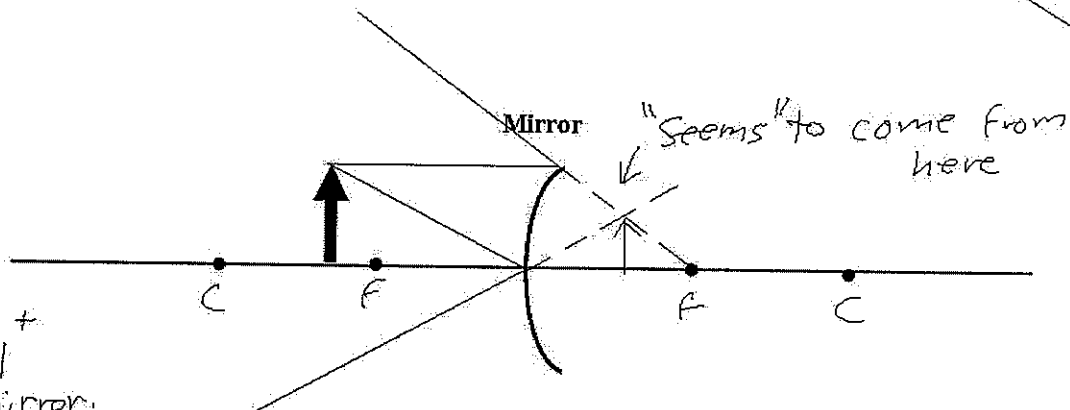
3. Is light a wave or a particle? Prove your answer.
   Both - wave because light can interfere (like with colors); particle because it can go thru the vacuum of space.

4. Where does light come from?
   Electrons falling from high to low orbits.

5. Why did the phosphorous pad (glow-in-the-dark) glow slime green regardless of the light that we shined on it?
   Phosphorus can only give off green light.

6. Make the following additive colors using RGB.

   Cyan __G B__   White __R G B__   Yellow __R G__

   Red __R__   Magenta __R B__   Black __none__

7. Make the following subtractive colors using CMYK.

   Blue __M C__   White __none__   Green __C Y__

   Red __M Y__   Magenta __M__   Black __K__

8. A. What colors does Magenta reflect? __R B__
   B. What color does magenta absorb? __G__

9. What color does Cyan absorb? __R__

10. A. More energy: Microwaves or (X-rays)?
    B. Shorter wavelength: (gamma rays) or radio waves?
    C. Faster speed: green light or radio waves? *same*
    D. Higher frequency: (gamma rays) or visible light?
    E. Less energy: (red light) or blue light?

11. Light is a transverse wave. Does light vibrate parallel or (perpendicular) to the motion of the wave?

12. As a wave, what moves thru the air as light travels: the air particles or the (light energy)?

13. If a light wave has a frequency of 1500 Hz, what is its period?

$$T = \frac{1}{f} = \frac{1}{1500} = 6.7 \times 10^{-4} \, sec$$

14. Find the wavelength of radio waves of 6.2 MHz.

$$v = f\lambda \qquad \lambda = 48 \, m$$
$$3 \times 10^8 = (6.2 \times 10^6)\lambda$$

15. Calculate the speed of 1,200 m microwaves.

$$3 \times 10^8 \, m/s$$ *Same for all kinds of light (both visible and invisible)*

16. If it takes the sun's light 8 minutes to reach the earth, calculate the time it would take a satellite to send its radio signals back to NASA if it is the same distance from the earth as the sun.

radiowaves are light, so same speed — 8 min

17. Fill in this table.
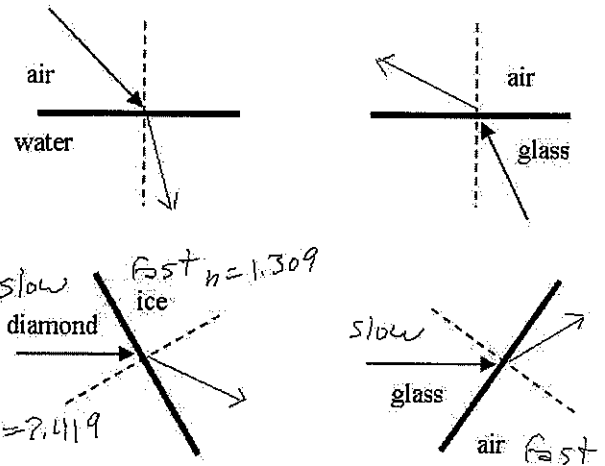
17. Fill in this table.	Convergent or Divergent?	Magnifies or Reduces?	+ or – f?	Which side is real?
Concave Lens	D	R	—	R
Convex Lens	C	both	+	R
Concave Mirror	C	both	+	L
Convex Mirror	D	R	—	L

18. Are the following + or –?

+ q if image is inverted.
+ h always
+ h' if the image is upright
+ M if the image is upright
+ h' if the image is on the right side of a mirror
+ M if the image is virtual

— q if the image is on the left side of a lens
— h' if the image is on the right side of a lens. *real*
+ q if the image is on the left side of a mirror.
— M if the image is real.
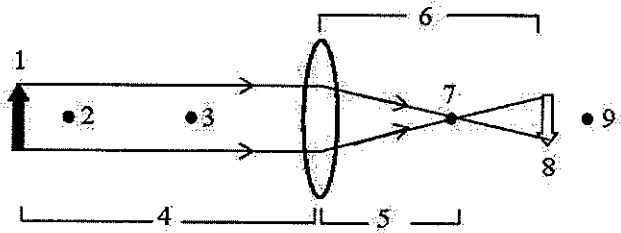
19. Identify the parts of the diagram above.

A. The object: _1_ . E. p: _4_ .
B. Radius of curvature: _2,9_ F. f: _5_ .
C. The focal point: _7_ . G. The image: _8_ .
D. q: _6_ .

20. A 4 cm object is in front of a (convex) mirror with a 3 cm focal length. The image is 2 cm to the right of the mirror.
A) Is this mirror convergent or (divergent)?
B) Is f + or (–) for this mirror?
C) Find where the object is.

$p = ?$
$q = -2 cm$
$f = -3 cm$

$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$

$\frac{1}{p} + \frac{1}{-2} = \frac{1}{-3}$

$\frac{1}{p} - .5 = -.333$

$\frac{1}{p} = -.333 + .5$

$\frac{1}{p} = .167$

$p = \frac{1}{.167} = 6 cm$

D) Find the height of the image.

$M = \frac{h'}{h}$ $\frac{1}{3} = \frac{h'}{4}$ $h' = \frac{4}{3} = 1.33 cm$

E) Find the magnification of the mirror.

$M = \frac{-q}{p} = \frac{-(-2)}{6} = \frac{2}{6} = \frac{1}{3} = .333$

F) Is the image real or (virtual)? Div. devices on make virt. images

21. The object is placed between the focal length and center of curvature of a convex lens.
A) Where will the image be? outside C
B) Will the image be (real) or virtual?
C) Will the image be (magnified) or reduced?

22. Why does light refract?
*Light hits at an angle and changes speed.*

23. How can you decide which way light will refract?
The side that hits first slows down and bends that way OR speeds up and bends away.

24. Draw what will happen for the following situations.

25. Find the speed of light in a diamond.

$n = \frac{c}{v}$ $v = \frac{c}{n} = \frac{3 \times 10^8}{2.419} = 1.24 \times 10^8 \, m/s$

26. Light travels thru a substance at 1.6×10^8 m/s. What is the index of refraction for this substance?

$n = \frac{c}{v} = \frac{3 \times 10^8}{1.6 \times 10^8} = 1.875$

27. Two substances: A (n = 1.65); B (n = 2.44).
A. In which substance will light travel slower? B
B. In which substance will light refract more from air? B

28. A ray of light is going 15° in water. At what angle will it be going when it passes into air?

$n_1 \sin\theta_1 = n_2 \sin\theta_2$
$1.33 \sin 15° = 1 \sin\theta_2$
$1.33 (.259) = \sin\theta_2$
$.344 = \sin\theta_2$
$\theta_2 = \sin^{-1}(.344)$
$\theta_2 = 20°$

29. Find the critical angle from a diamond to air.

$\sin\theta_c = \frac{n_2}{n_1}$ $\theta_c = \sin^{-1}\left(\frac{1}{2.419}\right) = 24.4°$

30. The critical angle for a substance is 35°.
A. What happens at 32°? refracts thru
B. What happens at 37°? reflects back