B-day: Due Tues., April 13
A-day: Due Wed., April 14

2009-10 Light 1

1. Photon	A. The fastest speed in the universe: the speed of light.
2. 3×10^8 m/sec	B. An orbit of electrons. To move from low to high requires energy.
3. Prism	C. All light: visible and invisible.
4. Light	D. Used to separate white light into its colors.
5. EM Spectrum	E. A single particle or packet of light.
6. Energy Level	F. A wave that can travel through a vacuum.

7. Radio waves	A. Electromagnetic waves we feel as heat.
8. Infrared	B. Dangerous EM waves that have very high energy and come from nuclear reactions.
9. Ultraviolet	C. EM waves that have very low energy and long wavelengths.
10. X-rays	D. EM waves that can pass through skin and have short wavelengths.
11. Gamma rays	E. EM waves with more energy than visible light and can cause sunburns.
12. Microwaves	F. Long wavelengths; used in cell phones.

13. Is light a wave or a particle? Prove your answer

14. Where does light come from?

15. Why do we see lightening and hear the thunder a few seconds later?

16. Put these three in order from slowest to fastest:
Light waves; sound waves; water waves.

17. Radio waves; Ultraviolet; X-rays; Visible; Microwaves
   A. Which has the longest wavelength?
   B. Which has the least energy?
   C. Which is the fastest?
   D. Which is used by cell phones?

18. What do scientists call all light, both visible and invisible?

19. Pigment	A. A color model that uses pigments on a white background.
20. Magenta	B. A color made from red and green.
21. Cyan	C. Dyes and paints are a type of this.
22. Yellow	D. A color made from blue and red.
23. RGB	E. A color model that uses lights on a black background.
24. CMYK	F. A color made from green and blue.

27. White or Black?
   A. What is the background for RGB?
   B. What is the background for CMYK?

28. A. Which is made by turning on lights: CMYK or RGB?
   B. Which is made by using paint: CMYK or RGB?

29. Decide if the following use RGB or CMYK and why.

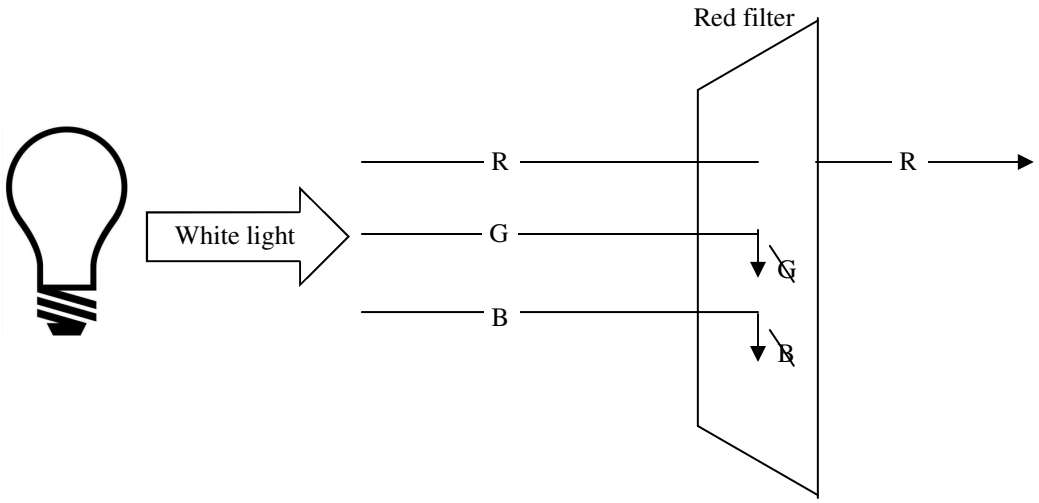
Television: _____ Why? _____

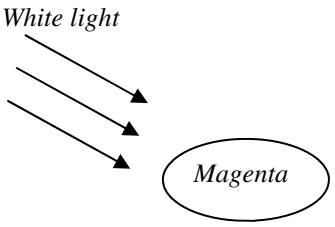
Paint on a wall: _____ Why? _____

Help with subtractive color:

Our eyes can only see lights. When looking at a red stop sign, we can only see the red light reflected OFF of the stop sign.

In the example at the right, notice that a red filter only allows red light to go thru. Therefore a red filter would block (absorb) green and blue light. If I put a blue light behind a red filter, you would see black, because blue cannot get thru a red filter.





30. A. What colors make up white light (label them on the diagram)?
    B. What color lights must be reflected for us to see Magenta (label them as arrows coming off of Magenta)?
    B. So, what color does Magenta absorb?

31. Using the same logic, what color does Cyan absorb?

32. In a printer you only have cyan, magenta, yellow, and black. What colors would the printer use to make red?

Let's be sure we remember some prefixes:
"Kilo" means $x10^3$ (1000g = 1 kg); Mega means $x10^6$ (1,000,000 m = 1 Mm); 1 nanometer = 1 x 10^{-9} m. (1 m = 1,000,000,000 nm)

Interestingly 10,000 nm = width of a human hair (approximately)

So 3.4 MHz = 3,400,000 Hz (that's a lot of times per second); 350 nm = 350 x 10^{-9} m = $3.5x10^2x10^{-9}$ m = 3.5 x 10^{-7} m

33. Express the following in standard units (m, etc) and in scientific notation:
    A. 8 nm B. 500 nm (Visible light) C. 105 MHz (FM radio)

34. What is 750 nm: period, frequency, amplitude, speed, or wavelength?

35. What is the speed of light (*from the notes*)?

36. What is the speed of microwaves?

37. What is the speed of x-rays?

38. Calculate the frequency of 750 nm light.

39. Find the frequency of a 25 cm long light wave (be sure to change it to meters).

AND do the TAKS Homework.

Day 24—Linear Motion

Speed (or Velocity) —How fast an object changes positions.

Speed (in meter/sec) → $S = \frac{\Delta D}{\Delta T}$ ← Distance travelled... (in meters); ...in this Time (in seconds)

Speed equals distance divided by time.

Acceleration —How fast an object changes speed.

Acceleration (in m/s^2) → $a = \frac{V_{final} - V_{initial}}{\Delta T}$ ← Change of Speed (in meters/sec); Time to Change Speed (in seconds)

Acceleration equals change of speed divided by time.

Momentum—How hard to stop a moving object. Momentum is negative if moving to the left.

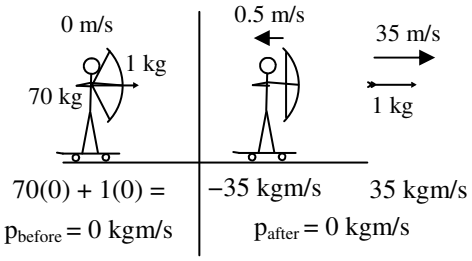
Momentum (in kgm/sec) → $p = mv$ ← Velocity (in m/sec); Mass (in kg)

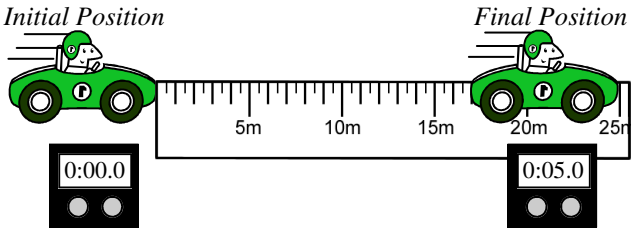
Momentum equals mass times velocity.

Conservation of Momentum:

$p_{total\ before} = p_{total\ after}$

When objects collide or push off from each other, the total momentum before must equal all of the momentum after.





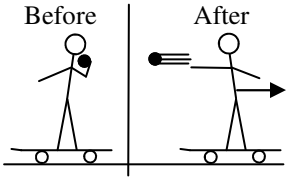
1. A. Measuring from the front of the race car, how far does it travel?
   B. If the timer reads seconds, how long did it take for it to travel that distance?
   C. Calculate the speed of the race car under the diagram.

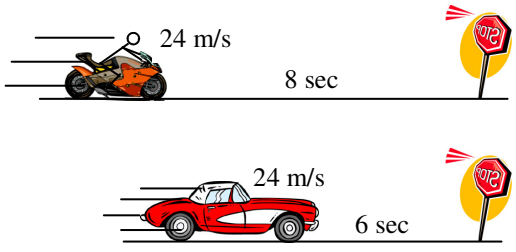
   D. If the race car is 1200 kg, calculate its momentum.

2. Slim Jim throws a ball to the left.
   A. How much total momentum is there before he throws the ball?

   B. Which will be moving faster afterwards: Jim or the ball?

   C. Which will have more momentum afterwards: Jim or the ball?





3. Two cars are moving 24m/s to the right. Both stop at a stop sign.
   A. What is the final velocity of each vehicle when they stop (write it under the stop sign)? V_{final} =
   B. Which one had the bigger change of speed?
   C. The motorcycle takes 8 seconds to stop. Calculate its acceleration.

   D. The car takes only 3 seconds to stop. Calculate its acceleration.

4. A cannon is at rest before hand and then shoots a cannonball.
   A. How much total momentum is there before?

   B. How much momentum does the cannon have afterwards (*put this under the diagram*)?

   C. Since the ball must have as much momentum as the cannon, under the diagram, calculate the velocity of the ball afterwards.