B-day: Due Wed., Feb 27 (Assigned Mon., Feb 25)
A-day: Due Thurs., Feb 28 (Assigned Tues., Feb 26)

2008 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.

25. Make the following additive colors using RGB.

Cyan _____	White _____	Yellow _____
Red _____	Magenta _____	Black _____

26. Make the following subtractive colors using CMYK.

Blue _____	White _____	Green _____
Red _____	Magenta _____	Black _____

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? _____

Movie Theater: _____ Why? _____

Color Printer: _____ Why? _____

30. A. What color lights must be reflected to make Magenta?

   B. So, what color does Magenta absorb?

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

32. What color is a stop sign?

33. Does a stop sign use additive or subtractive color?

34. What two colors would a printer use to make this color?

2008 Light 1

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

35. 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)

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

37. What is the speed of light?

38. What is the speed of microwaves?

39. What is the speed of x-rays?

40. Calculate the frequency of 750 nm light.

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