Use your textbook (L1- Ch 20, L2- Ch 28.1), PPT notes, labs (spectroscopy, telescopes) and class handouts to answer the study questions below.

Electromagnetic Spectrum (handouts, text)

1. What do all the energies on the electromagnetic spectrum have in common?
2. How do light and sound waves differ?
3. What is frequency? What is wavelength?
4. In the visible spectrum, which color has the highest frequency? The lowest frequency? The highest energy? The lowest energy?
5. Which has more energy: radio waves or x-rays? Infrared waves or UV rays? Gamma rays or microwaves?
6. What is the speed of light? What is the relationship between the speed of light, frequency and wavelength

( c= λf). Know the “triangle” (formula) and how to use it.

1. As wavelength decreases, does the energy in the waves become more dangerous or less dangerous to living cells? Why?

Spectroscopy and Light (textbook and Spectroscopy lab)

1. What instrument did you use in class to break light up into individual wavelengths?
2. What can one learn by studying the spectra of visible light coming from stars and outer space?
3. What are the three different spectra? (continuous, emission, absorption) How is each type produced?
4. Which type of spectrum is produced by each of the following: sunlight? Heated Hydrogen or Neon gas? Fluorescent light? Incandescent light? Black light?

Telescopes and Doppler Effect (PPT notes, text)

1. What is the function of a telescope? Name the two types of optical telescopes and explain their differences.
2. What is the best location for a telescope? Why do you think some telescopes have domes?
3. Use the area of a circle (A = πr2)- How does the radius of the lens affect the light gathering power of a telescope?
4. What is the Inverse Square Law? How is it calculated? What is it used to determine in astronomy?
5. How do radio telescopes differ from optical telescopes? What is interferometry?
6. What is the advantage of using space-based telescopes (like Hubble)? What type(s) of radiation can Hubble detect?
7. What types of radiation do Chandra and James Webb telescopes detect? (Note: Webb will be launched in 2018)
8. Describe the red shift? How does this differ from a blue shift? What can these tell you about a distant star?
9. Briefly explain the Doppler effect and use Doppler math to predict when a star (or galaxy) is moving towards or away from the observer. (Equation:

C (Δλ)

Doppler Effect formula: V = ------------------

λo

Here’s what this means:

V = velocity of the object

C = speed of light (300,000 km/sec)

Δλ = difference in wavelengths (observed – actual)

Λo = observed wavelength

Scientific Notation:

1. Convert the following to scientific notation:

450,000,000 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 0.000000000000000045 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Convert the following to regular notation:

6.7 x 1014 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 9.8 x 10-11\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Multiply: Divide:

3 x 108 4.2 x 1010

x 6.7 x 104 ÷2.1 x 106

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