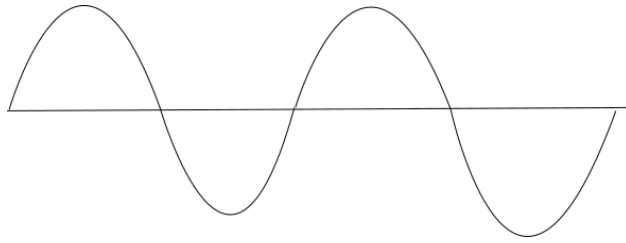Worksheet 14: Final Exam Review II

1. Using the diagram below, identify the wavelength and amplitude of the wave.

2. What are the units of frequency for a wave?

3. What is the relation between frequency and wavelength?

4. What is the relation between frequency and energy? What about wavelength and energy?

5. What is a wavenumber?

6. On the figure below, label the types of electromagnetic radiation. Frequency values are shown in Hz.

10^{20} 10^{18} 10^{16} 10^{14} 10^{12} 10^{10}
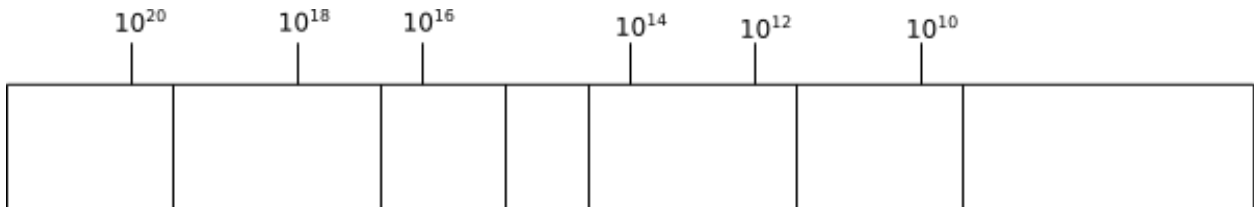
7. What is the name for the lowest energy state in a molecule? What about for a higher state?

8. What are the four crucial components for a single-beam spectrophotometer?

9. Write the expression for transmittance and define each of the terms.

10. How does absorbance relate to transmittance?

11. What is Beer's law? What do each of the terms mean and when does it break down?

12. What part of the molecule is responsible for light absorption?

13. What type of radiational transition is associated with fluorescence? What about with phosphorescence? Which one is higher in energy?

14. What is the difference between an internal conversion and an intersystem crossing?

15. What makes luminescence so much more sensitive than absorbance? What modifications are necessary to make a luminescence spectrophotometer?

16. If we want to decrease the absolute uncertainty of our mean by a factor of 5, by what factor must we increase our number of samples?

17. What are the two main types of experimental error? Explain the effects of each on precision and accuracy.

18. Determine the type of error associated with each of the following.
    (a) A pH meter was standardized incorrectly by the TA

    (b) You are forced to read in between the lines on the graduated cylinder

    (c) A manufacturer does not calibrate a buret before it leaves the factory

    (d) The air conditioner turns on and off during your experiment

19. How is the additivity of error different for addition and subtraction when compared to multiplication and division?