Sample Questions for Final FS06

1. Statistics: For the following data set (2.10, 3.20, 3.50, 4.90, 4.30, 2.90) find the mean (average) and the % Error if the expected answer was 3.50.

2. Atomic Spectra: Using the Rydberg equation (where R = 3.29 x 10^{15} Hz) and the speed of light (C = 2.998 x 10^{8} m/s):

a. Calculate the expected frequencies in Hertz (s^{-1}) of the radiation emitted by a hydrogen atom for the following electronic transitions.

$$\nu = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

b. Calculate the expected wavelengths in nanometers (nm) of the radiation emitted by a hydrogen atom for the same electronic transitions.

$$C = \lambda\upsilon$$

c. Label which wavelengths correspond to the Balmer series and which wavelengths correspond to the Lyman series.

Transitions	Frequency (s^{-1})	Wavelength (nm)	Balmer / Lyman
$n_2 = 3$ & $n_1 = 1$			
$n_2 = 2$ & $n_1 = 1$			
$n_2 = 5$ & $n_1 = 2$			
$n_2 = 4$ & $n_1 = 2$			
$n_2 = 3$ & $n_1 = 2$			

3. Spectrophotometry: Using a Spectrophotometer (Spec 20), a student recorded below the Percent Transmittance data for the following solutions:

Red Dye Standard (9.80 ppm)
Blue Dye Standard (9.01 ppm)
Purple Unknown

	400 nm	450 nm	500 nm	550 nm	600 nm	650 nm
Red Std	63.5	48.5	23.5	38.6	78.3	98.5
Blue Std	80.5	99.0	82.5	56.5	8.5	72.4
Purple Unk	79.3	72.5	35.5	85.8	45.5	65.3

a. Calculate the Absorbance for each of the %T listed above .

	400 nm	**450 nm**	**500 nm**	**550 nm**	**600 nm**	**650 nm**
Red Std						
Blue Std						
Purple Unk						

b. Determine the following from the data calculated in Part 1 (*2 pts*):

Red Dye Max. Absorbance = __________ at __________nm (λ Max)

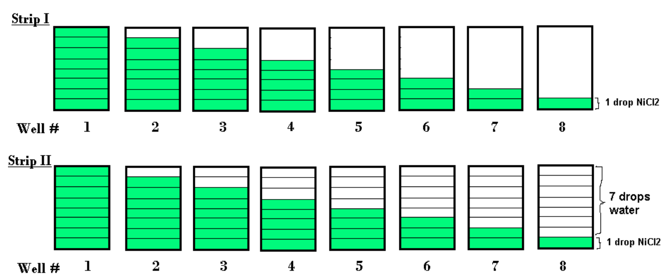
Blue Dye Max. Absorbance = __________ at __________nm (λ Max)

c. Calculate the Absorbance Ratio of the Unknown/Standard at (λ Max).

d. Calculate the Dye Concentration in the Unknown. *(Standard Concentrations given above.)*

	Abs of Unknown (at λ Max)	**Abs of Standard (at λ Max)**	**Abs Ratio Unk/Std (at λ Max)**	**Dye Conc. in Unknown**
Red in Purple				
Blue in Purple				

4. Colorimetry: Using the well strips below, the student put the following number of drops in the wells. In strip I, 1-8 drops of red dye standard solution (9.80 M) were added as shown in the diagram. In strip II, additional drops of water were added in order to have the same total volume of 8 drops for each well.



The student found that the unknown solution of red dye matched well #5 on Strip II.

(Given: 20 drops = 1.0 ml and the red standard solution is 9.80 M.)

a. What is the volume of red standard in ml?

b. What is the volume of red unknown in ml?

c. Using $C_1V_1 = C_2V_2$, what is the approximate concentration in moles/L of the unknown?

5. Gas Laws: Using the ideal gas law calculate the volume of the system.
Given: pressure = 738 mmHg, mass = 0.725 grams, MW_{butane} = 58 g/mole, T = 20°C, R = 0.08206 Latm/molK

a. What is the number of moles of butane?

b. What is the pressure in atm?

c. What is the temperature in K?

d. What is the volume of the system?

e. What would the volume be at STP?

6. Radioactive Decay:

Time, minutes	Counts
0	
2	14635
3	14458
4	14248
5	14095
6	13920
7	12749

a. Determine the specific decay constant, k, for this radioactive decay.

b. Determine the initial activity, Ao.

c. Determine the half-life.

7. **Flame Tests:**
    a. copper –
    b. lithium –
    c. potassium –
    d. magnesium –
    e. sodium –

8. **MSDS (the rest listed on review):**
    a. Proper attire –
    b. Acid Spill –
    c. Bunsen Burners –
    d. Phenolphthalein –
    e. Types of radiation are stopped by
        alpha –
        beta –
        gamma –
        neutron –

9. **People (Hints for Bonus) ☺:**
    a. Galileo
    b. Isaac Newton
    c. Pierre and Marie Curie
    d. Niels Bohr
    e. Max Planck
    f. Albert Einstein
    g. Antoine Lavoisier
    h. Dimitri Mendeleev
    i. Amedeo Avogadro
    j. Henry Moseley
    k. Robert Bunsen
    l. Gustav Kirchoff
    m. Johann Balmer
    n. Ernst Rutherford
    o. Joseph von Fraunhoffer

Gas Chromatography:

Know how to calculate theoretical plates and the areas of the triangles, and information on the worksheet.