Sample Questions for Chem 002 Final WS07

1. 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 –

2. 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.

3. Antacids: You are given 1.12 M HCl and 1.56 M NaOH. The antacid you use contains 300 mg of $CaCO_3$ and 100 mg of $Al(OH)_3$. If the antacid dissolved in 35.0 ml of HCl and was then back titrated with 15.6 ml of NaOH., find the following: the mmoles of HCl used to dissolve the antacid; the mmoles of NaOH used to backtitrate; the mmoles of antacid used to neutralize the antacid. Write the balanced equations. Find the mmoles of each component and the theoretical number of mmoles of HCl that should have been needed to neutralize the antacid.

4. Radioactive Decay:

a. Balance the following radioactive decay equations:

$$^{222}_{86}\mathrm{Rn} \rightarrow \_\_\_\_\_ + {}^{4}_{2}\mathrm{He}$$

$$^{234}_{90}\mathrm{Th} \rightarrow \_\_\_\_\_ + {}^{0}_{-1}\mathrm{e} + \textit{anti}\text{-}\upsilon$$

b. Determine the specific decay constant, initial activity and half-life of a radioactive isotope. Given

Time, minutes	Counts/Min	ln (Counts/Min)
0		
2	14635	
3	14458	
4	14248	
5	14095	
6	13920	
7	12749	

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

2. Determine the initial activity, Ao.

3. Determine the half-life.

5. 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)

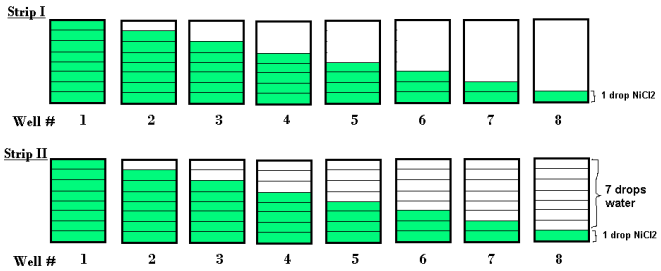
Blue Dye Max. Absorbance = _____ at _____nm (λ Max)

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				

6. 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?

7. 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.

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

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

$$\mathbf{C = \lambda\upsilon}$$

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
$n_2 = 3$ & $n_1 = 1$			
$n_2 = 2$ & $n_1 = 1$			
$n_2 = 5$ & $n_1 = 2$			
$n_2 = 4$ & $n_1 = 2$			
$n_2 = 3$ & $n_1 = 2$			

8. Flame Tests:

a. copper –

b. lithium –

c. potassium –

d. magnesium –

e. sodium –

9. 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?

10.Gas Chromatography:

For peak A, the retention time is 120 seconds, the baseline width is 60 seconds, and the height is 30 seconds. For peak B, the retention time is 200 seconds, the baseline width is 45 seconds, and the height is 20 seconds.

a. For each peak, calculate the number of theoretical plates, N, where $\mathbf{N = 16\ (t_R\ /\ w_b)^2}$.

P_A = P_B =

b. For each peak, calculate the area. This has been simplified to the equation for the area of a triangle, where **A = ½ (base)(height)**.

P_A = P_B =

c. Which peak, corresponds to the most efficient elution through the column?

d. Using the peak areas, calculate the composition of (ratio of) the mixture A B.

10. People:

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