Sample Questions for Chem 1319 Final WS16

1. MSDS (the rest listed on review):

a. Proper attire –

b. Acid Spill –

c. Bunsen Burners –

d. Phenolphthalein –

2. Studies of Light - Atomic Spectra Portion: 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
$n_2 = 3$ & $n_1 = 1$			
$n_2 = 2$ & $n_1 = 1$			
$n_2 = 5$ & $n_1 = 2$			
$n_2 = 4$ & $n_1 = 2$			
$n_2 = 3$ & $n_1 = 2$			

d. Why did the Hydrogen spectrum have the fewest lines?

e. For the Hydrogen spectra, why was the red line more intense (brighter) than the other lines?

3. Studies of Light – Colorimetry Portion: The student was using a **blue dye standard solution (5.05 ppm)** and diluted it. The student used 3 drops of dye and added 5 drops of distilled water to it.

a. Using $C_1V_1 = C_2V_2$, what is the approximate concentration in ppm for the unknown?
C_1 = original volume of dye & C_2 = total volume

b. Using the equation, A=abc determine the concentration of an unknown solution when %T = 61.1. (b = 1.00)

4. Radioactive Decay:

a. Safety precautions: Types of radiation (listed below) are stopped by what type of material?

alpha –

beta –

gamma –

neutron –

b. Determine if alpha or beta, then balance the following radioactive decay equations:

(alpha / beta) $^{222}_{86}Rn \rightarrow \_\_\_\_\_ + {}^{4}_{2}He$

(alpha / beta) $^{234}_{90}Th \rightarrow \_\_\_\_\_ + {}^{0}_{-1}e + anti\text{-}\upsilon$

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

$A = A_0e^{-kt}$ $\ln A = -kt + \ln A_0$ $\ln 2 = 0.693$ $t_{½} = \ln 2 / k$ $y = mx + b$ $m = (y_2 - y_1) / (x_2 - x_1)$

and the data:

Time, minutes	Counts/Min	ln (Counts/Min)
0		
2	14472	
3	14328	
4	14248	
5	14095	
6	13920	
10	13359	

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

2. Determine the initial activity, A_o.

3. Determine the half-life.

5. Antacids: You are given 1.12 M HCl and 1.48 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 21.8 ml of NaOH, find the following:

a. The original number **mmoles of HCl** used to dissolve the antacid and neutralize the base.

b. The number of **mmoles of NaOH** used to back titrate the acid.

c. The number of **mmoles of acid** used to neutralize only the antacid (a.k.a. the excess HCl).

d. Write the **balanced equations** for the neutralization of the antacid (Both $CaCO_3$ and $Al(OH)_3$).

e. Using the **number of mg in the tablet**, calculate the mmoles of each component (Both $CaCO_3$ and $Al(OH)_3$).

f. Based on the **mmoles of each component**, calculate the theoretical number of mmoles of HCl that should have been needed to neutralize the antacid. (*Hint: Use the mole ratios*.)

g. What was the **total number of theoretical mmoles of HCl** that should have been neturalized?

h. Calculate the **percent error** in order to compare the theoretical (g.) to the actual (c.). What are possible reasons this discrepancy could have occurred?

6. Ternary Mixture: A mixture is known to contain the four compounds in the table.

A.) Draw a flow chart to show the steps that you would use to separate the following compounds.

	Cold water	Hot water	3M HCl	3M NaOH
benzoic acid	no	yes	no	yes
$Mg(OH)_2$	no	no	yes	no
Na_2SO_4	yes	yes	yes	yes
$Zn(OH)_2$	no	no	yes	yes

B.) The initial mass was 5.025g. The resulting masses were benzoic acid = 1.760g, $Mg(OH)_2$ = 0.754g, Na_2SO_4 =1.005g, and $Zn(OH)_2$ 1.256g. Calculate the percent recovery of each component and the total percent recovery.

7. Millikan Drop:

a. For the following data, reorder it by descending masses, then take the mass difference (*1st value minus 2nd value, 2nd value minus 3rd value, etc.*)

Number	Mass (g)	Masses in Descending Order	Mass Differences
1	19.624		
2	30.852		
3	14.812		
4	42.080		
5	18.020		
6	27.644		
7	37.268		

b. Determine the mass value of a single "electron."

8. Statistics:

a. For the following data set (2.10, 3.20, 3.50, 4.90, 4.30, 2.90) find the mean (average).

b. For the average of the data set above, calculate the % Error if the expected answer was 3.500.

c. For this data set would you calculate the standard deviation or the standard deviation estimate? Explain why.

9. Dimensional Analysis:

a. Choose problems from sets 1, 2, 4 or 5 and work them.

b. Dimensional analysis problems are generally incorporated within the other problems. For example:

1. Converting from mg to mmole in the antacid problem.
2. Converting from mmHg to torr or atm in the gas laws problem.
3. Converting from ^{o}C to K in the gas laws problem.

11. Scientific Notation & Significant Figures:

a. Choose problems from sets 1 & 2 and work them.
b. Review problems similar to those on the midterm exams.

_____ 24. What is the **numerical value** of 5.000×10^2 ?
a. 0.05 b. 0.05000 c. 500.0 d. 500

_____ 25. How many **significant figures** are there in the number 0.030170 ?
a. 4 b. 5 c. 6 d. 7

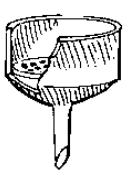
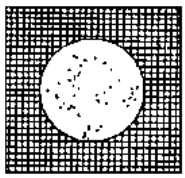
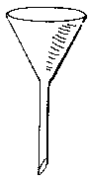
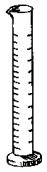
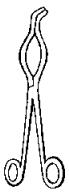
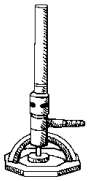
_____ 26. Which of the following numbers has **3 significant figures**?
a. 0.0290 b. 0.4160 c. 508.0 d. 29.10

_____ 27. Using the **correct number of significant figures**, what is the answer to 1453.2-6.58 g?
a. 1450 g b. 1447 g c. 1446.6 g d. 1446.62 g

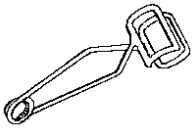
_____ 28. Using the **correct number of significant figures**, what is the answer when 6.5 is multiplied by 0.0341?
a. 0.222 b. 0.2217 c. 0.2 d. 0.22

_____ 29. Find the **number of moles** in 50.00g of carbon dioxide, CO_2.
a. 6.840×10^{23} b. 44.01 c. 1.136 d. 0.8802

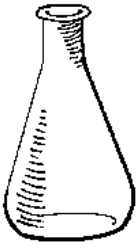
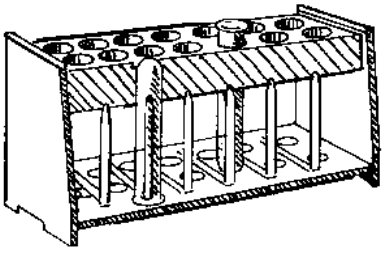
10. Glassware and equipment: Identify the equipment below.







12. Nomenclature: List the chemical names for the chemicals below.

a. HCl

b. NaOH

c. $Al(OH)_3$

d. $MgCO_3$

e. $CaCO_3$

f. $NaHCO_3$

g. NaCl

h. SiO_2

i. K_2CO_3

13. People – How did these people contribute to the experiments we did in Chem 1319?
(*All powerpoints are available at* http://web.mst.edu/~tbone)

a. Henri Becquerel (Nuclear)

b. Svante Arrhenius (Antacid)

c. Johannes Nicolaus Brønsted and Thomas Martin Lowry (Antacid)

d. Gilbert N. Lewis (Antacid)

e. Joseph von Fraunhofer (Atomic Spectra)

f. Bunsen & Kirchhoff (Atomic Spectra)

g. Johann Balmer (Atomic Spectra)

h. Max Planck (Atomic Spectra)

i. Albert Einstein (Nuclear)

j. Neils Bohr (Atomic Spectra)

k. My TA's name is…

C1 – Umanga De Silva
B1, F1 – Peng Geng
B2 – Hasan Golpour
A2, E2 – Ke Li
C2 – Prashanth Sandineni
A1, E1 – Sharen Wang
D1, F1 – Brad Welch

***Note:** *Most of the questions on the final will be similar to those on review and/or on quizzes.*