Chemistry 105-Fundamental Chemistry
Exam 1-Tuesday, 6 October 1998

Name_____
Laboratory Section _____
ID Number_____

PLEASE ANSWER IN THE SPACE PROVIDED. SHOW **ALL** WORK WHEREVER POSSIBLE- ESPECIALLY STOICHIOMETRIC FACTORS AND UNIT CONVERSIONS. THERE WILL BE ABSOLUTELY NO TALKING DURING THIS EXAM PERIOD. IF YOU HAVE A QUESTION, RAISE YOUR HAND. IF YOU FINISH EARLY, BRING YOUR EXAM TO ME AND LEAVE QUIETLY. DURING THE LAST TEN MINUTES OF THE EXAM PERIOD, DO NOT LEAVE YOUR SEAT AND DO NOT SPEAK TO OTHERS UNTIL ALL PAPERS HAVE BEEN COLLECTED. INITIAL EACH PAGE SO THAT IF THE PAGES BECOME SEPARATED I CAN PIECE YOUR EXAM BACK TOGETHER. USE A PEN. FILL YOUR STUDENT ID NUMBER IN THE SPACE PROVIDED. GOOD LUCK.

Selected equations, constants, and information:

$M_1V_1=M_2V_2$, 1J = 1 kg m^2 $s^{-2,}$ 4 qts = 1 gal, 1.057 qts = 1L, 4.184 J = 1 cal, 2.54 cm = 1 in, 2000 lbs = 1 ton, 5280 ft = 1 mile, 453.6g = 1.00lb, 12 = dozen, 101.325 kps = 1 atm, 1.00 troy oz. = 1.10 avoirdupois [ordinary] oz., 16.0 avoirdupois oz. = 1.00 avoirdupois pound, R=0.08206L atm/K mol, 1atm=29.92 in=760torr=760mm Hg

Soluble compounds	**Insoluble compounds**
compounds of Group 1 elements	carbonates, chromates, and phosphates, **except** those of the Group 1 elements and NH_4^+
ammonium compounds	sulfides, **except** those of the Group 1 and 2 elements and NH_4^+
chlorides, bromides, and iodides, **except** those of Ag^+, Hg_2^{2+}, and Pb^{2+}*	hydroxides and oxides, **except** those of the Group 1 and 2 elements**
nitrates, acetates, chlorates, and perchlorates	
sulfates, **except** those of Ca^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}, Hg_2^{2+}, and Ag^+***	

*$PbCl_2$ is slightly soluble.
**$Ca(OH)_2$ and $Sr(OH)_2$ are sparingly (slightly) soluble; $Mg(OH)_2$ is only very slightly soluble.
***Ag_2SO_4 is slightly soluble.

I. Nomenclature (15pts)

Place the proper chemical formula for each name in the blank provided.

1) iron (III) carbonate _____
2) magnesium sulfide _____
3) potassium nitrate _____
4) calcium oxide _____
5) octane _____
6) sodium permanganate _____
7) aluminum ion _____

PRINT the name for each chemical formula in the space provided.

8) SO_3 _____
9) $CuSO_4$ _____
10) K_2CO_3 _____
11) C_4H_{10} _____
12) ZnO _____
13) $(NH_4)_3PO_4$ _____
14) PCl_5 _____
15) $MgBr_2$ _____

II. Vocabulary (20pts) Place the most appropriate term in the blank provided.

Chemistry is the study of the properties and interactions of matter. Matter may be defined as anything that has _____ and takes up _____. All matter can be thought of as consisting of atoms. In pure form, an _____ is a substance composed of only one kind of atom. Each different type of atom is represented by a _____ of one or two letters. Each particular atom has a fixed number of _____ which define that atom as being of a particular type. In fact, the _____ is equal to this number of subatomic particles. The atomic mass number is the number of _____ added to the number of _____, another type of subatomic particle. These particles along with the _____ make up the three different subatomic particles. Matter is generally not found in atomic form but rather as a _____. Furthermore, it is found in two principal forms, either ionic or _____. Matter that is ionic is made up of _____, which are positively charged, and _____ which bear a negative charge. Together, these ions combine in definite whole number ratios to form _____. When an ionic compound is _____ in water, the ions which make up the compound are separated by water molecules and are spread throughout the water. The water in this case is called the _____ because it is dissolving the ionic compound which must therefore be called the _____ or the substance being dissolved. When comparing two solutions, the solution which contains more solute per unit volume is said to be more _____. One unit of concentration is molarity. Molarity is defined as the moles of _____ per liter of _____.

III. Short Answer

1) (10 pts) Calculate the total number of atoms in 500mg of vitamin C (the molecular formula is $C_6H_8O_6$).

2) (10 pts) How many milliliters of 0.10 M NaBr would you need to supply 2.60 g of NaBr.

For the next two questions, write a balance chemical equation.

3) (5 pts) Potassium chlorate may be heated to produce potassium chloride and potassium perchlorate.

4) (5 pts) Calcium carbonate yields calcium oxide and carbon dioxide when heated.

5) (10 pts) As you might have guessed, Professor Czerwinski loves geography. So far we have discussed units of measure in Canada and Germany (therefore we need another country). We now turn our attention to the island nation of Japan. In Japan, most things are smaller than in the U.S. --except prices. Gasoline costs 108.30 yen per liter. If the current exchange rate is $1.00 = 135.88 yen (the Japanese unit of currency), how much would 59.5 liters (i.e., "filling up the tank") of gasoline cost in American dollars if you bought it in Japan?

6) (10 pts) A chemist believes that she has synthesized L-dopa, a drug used to treat Parkinson's disease. After elemental analysis the compound in question is found to be 54.82% carbon, 5.62% hydrogen, and 7.10% nitrogen. What is the empirical formula for the compound synthesized? What is molecular formula?

V. Laboratory (15pts)

The following data were obtained experimentally to determine the density of an unusually dense pure liquid compound. A buret was used to add an amount of the liquid to a glass bottle. However, prior to the first addition, the student forgot to record the mass of the bottle. Complete the table, make a graph of total mass versus total volume delivered, compute the mass of the empty bottle into which the liquid was added and compute the density of the liquid from the graph. The initial buret reading was 0.46 mL. Graph paper may be found on the next page.

Data Point	Buret Reading (mL)	Total Volume Delivered	Total Mass (g)
1	25.57		126.189
2	29.89		137.152
3	31.64		141.597
4	35.40		151.148
5	38.28		158.463