City College, Chemistry Department
Chemistry 10301, sections T and T2, Prof. T. Lazaridis
First Midterm exam, Sep. 28, 2006
Name (last name first): ___________________________________
I.D. Number: ____
Workshop leader: _______________________________________

Note: There are 7 questions in this exam (check both sides of the sheet).
Fill in your answer in the blank space provided immediately following each question. Half a point will be subtracted every time you report a numerical result with an incorrect number of significant figures. A copy of the periodic table is attached. Good luck!

1. a. (4) What is the chemical formula of calcium nitrate?

b. (4) What is the chemical formula for zinc sulfate?

c. (4) How many protons and electrons does the calcium ion have?

d. (4) What is the molar mass of carbon tetrachloride (CCl_4) ?

e. (4) Give the atomic symbol of the elements:

argon:

iron:

chromium:

manganese:

2. Write a balanced equation for each of the following reactions (it is not necessary to indicate the states of each substance):

a. (6) Burning of styrene (C_8H_8) in air

b. (6) Decomposition of mercury(II) nitrate to form solid mercury(II) oxide, gaseous nitrogen dioxide, and oxygen. (mercury: Hg)

3. Balance the following chemical equations and indicate their type (combustion, combination, or decomposition):

a. (6) $Al\,(s) + Cl_2\,(g) \text{ -----> } AlCl_3(s)$

b. (6) $NH_4NO_3\,(s) \text{ -----> } N_2O(g) + H_2O\,(l)$

c. (6) C_5H_6O (l) + O_2 (g) -----> CO_2 (g) + H_2O (l)

4. (15) Wine production involves the fermentation of glucose to produce ethanol and carbon dioxide:

$$C_6H_{12}O_6\,(aq) \;\text{----->}\; 2C_2H_5OH\,(aq) + 2CO_2(g)$$

(a) (5) How many moles of CO_2 are produced from 0.300 mol of $C_6H_{12}O_6$?

(b) (5) How many grams of $C_6H_{12}O_6$ are needed to form 2.00 g of C_2H_5OH ?

(c) (5) How many grams of CO_2 form when 2.00 g of C_2H_5OH are produced?

5. (15) Combustion analysis of toluene gives 5.86 mg of CO_2 and 1.37 mg of H_2O. If the compound contains only carbon and hydrogen, what is its empirical formula?

6. (15) Consider the reaction of ammonia with oxygen

$$4NH_3(g) + 5O_2(g) \text{ -----> } 4NO(g) + 6H_2O(g)$$

In a certain experiment 2.50 g of NH_3 reacts with 2.85 g of O_2.

(a) (5) Which one is the limiting reagent?

(b) (5) How many grams of NO form?

(c) (5) How many grams of the excess reactant remains after the limiting reactant is completely consumed?

7. (5) Name the following compounds:

$CaCl_2$

$NaClO_3$

KOH

$MgCO_3$

C_3H_8