FIRST LETTER OF YOUR LAST NAME

CHEMISTRY 1127 **EXAM I** **September 26, 2014**

NAME (PRINT) _____ SECTION_____

SIGNATURE _____ TA _____

PLEASE READ THE FOLLOWING INSTRUCTIONS

Do NOT begin the exam until asked to do so.

There are _8_ numbered pages, a useful information page and a periodic table in this exam. Check to see that they are all here before you begin the exam. Return all these papers when you are finished. Write your name on every page.

On the multiple choice section of the test fill out all answers in #2 pencil on the answer sheet. Label the answer sheet with your name, Peoplesoft # (Column A-G) and the last two digits of your section # (column L-M). Make sure to erase completely; there will be no regrades on the multiple choice portion of the test.

Long answer portion of the exam should be done in pen with blue or black ink. Exams done in pencil, erasable ink, or where white-out, liquid paper, etc. have been used are *ineligible for regrades.*

Be sure to follow the directions in answering all questions. Write your final answers in the blanks provided. In working problems, you must **SHOW ALL WORK**. No credit will be given unless all work is clearly shown and the method of solution is logically correct. Use correct units and significant figures.

Do not write below this line

Page	Total	Grader
5	_____ / 20	
6	_____ / 26	
7	_____ / 20	
8	_____ / 15	

Total Grade _____ /150 Checked by _____

On the multiple choice section of the test make fill out all answers in #2 pencil on the answer sheet. Label the answer sheet with your name, Peoplesoft # (Column A-G) and the last two digits of your section # (column L-M). Make sure to erase completely there will be no regrades on the multiple choice portion of the test.

1. Which term best describes liquid water at room temperature

   a. Gas   b. Element   c. Compound

   d. Heterogeneous mixture   e. Homogeneous mixture

2. Which method is best from removing the pulp from orange juice

   a. Distillation   b. Light absorption   c. Electrolysis

   d. Filtration   e. dilution

3. If the temperature of a glass of tea is 153.95°F, what is the temperature in Kelvin

   a. 32.3 ^{0}C   b. 305.37 K   c. 340.9 K   d. 467 K   e. 291 K

4. What is the correct answer to the following expression

$$\frac{418.7 \times 31.8}{19.27 - 18.98}$$

   a. 4.597×10^4 b. 4.59706×10^4 c. 4.60×10^4

   d. 1.3×10^3 e. 4.6×10^4

5. A graduated cylinder is filled to the 23.0 mL mark. A lump of a metal weighing 36.3 g with d = 11.34 g/cm^3 is placed in the cylinder. What is the new level of solution?

   a. 14.84 mL   b. 23.3 mL   c. 26.2 mL   d. 26.5 mL   e. 34.3 mL

6. The fuel efficiency of two cars is compared. Model X gives 30 miles per gallon, model Y gives 12 km per quart, and model Z gives 24 km per liter. Which vehicle is most fuel efficient (1 km = 0.621 mile, 1.000 L = 1.057 quarts, 4 quarts = 1 gallon)

   a. Model Y is most efficient

   b. Model X is most efficient

   c. Models X, and Y, are both most efficient

   d. Models X and Z are both the most efficient

   e. Model Z is most efficient

_____

7. Which answer includes **all** the following that are **chemical** changes and not physical changes?

   I. freezing of water
   II. rusting of iron
   III. dropping a piece of iron into hydrochloric acid (H_2 is produced)
   IV. burning a piece of wood
   a. III and IV
   b. II
   c. I, II, III, and IV
   d. II, and III
   e. II, III, and IV
   Next two questions use the description below:

   Sodium bicarbonate is commonly has a solubility of 9.6 g/100 g H_2O at 30°C and 20 g/100 g H_2O 60°C. At 60°C, 9.2 g of baking soda added to 46 g of water.

8. Is the resulting mixture homogeneous at 60°C? If not, how many grams of baking soda are undissolved?

   a. 1.84 g solid   b. 9.6 g solid   c. 20.0 g solid

   d. homogeneous   e. 2.24 g solid

9. The mixture is cooled to 30°C. How many more grams of water are needed to make a saturated solution?

   a. 95.8 g   b. 49.8 g   c. 0 g   d. 57.5 g   e. 11.5 g

10. Which of the following elements have the same number of electrons?

   a. ^{57}Fe, ^{56}Fe and ^{58}Fe   b. ^{57}Fe, ^{58}Co and ^{55}Mn   c. ^{57}Fe, ^{56}Fe and ^{58}Co

   d. ^{56}Fe, ^{57}Co and ^{55}Mn   e. ^{56}Fe, ^{57}Co and ^{54}Mn

11. Which periodic table group is most likely to contain elements that favor a +2 charge?

   a. Group 1   b. Group 2   c. Group 16   d. Group 17   e. Group 18

12. Suppose that O-16 $\left(^{16}_{8}O\right)$ was taken as the standard for expressing the atomic masses and assigned an atomic mass of 5.00 amu. What is the mass of sulfur (in amu) if this is the standard?

   a. 5 amu   b. 10.00 amu   c. 16.00 amu   d. 32.00 amu   e. 20.00 amu

13. How many protons, neutrons, and electrons are in a Zr^{4+} ion with a mass number of 90?

   a. 40 protons, 25 neutrons, 25 electrons

   b. 36 protons, 25 neutrons, 30 electrons

   c. 40 protons, 50 neutrons, 36 electrons

   d. 40 protons, 30 neutrons, 25 electrons

   e. 40 protons, 50 neutrons, 40 electrons

14. You have a mystery element with 79 electrons when it has no charge. What is it?

   a. Au   b. Cl   c. Se   d. Br   e. H

15. What is the name of the BrO_4^- ion?

   a. Perbromite   b. Bromate   c. Perbromate

   d. Bromite   e. hypobromate

16. Of the naturally occurring elements in group 15, how many are nonmetals, metalloids, and metals?

   a. 0 nonmetals, 3 metalloids, and 2 metals

   b. 1 nonmetal, 2 metalloids, and 2 metals

   c. 2 nonmetals, 2 metalloids, and 1 metal

   d. 2 nonmetals, 1 metalloid, and 2 metals

   e. 3 nonmetals, 0 metalloids, and 2 metals

17. If 5.0 mol of both hydrochloric acid and sodium sulfide are mixed and reacted according to the equation below, how many moles of hydrogen sulfide (H_2S) are produced?

       $HCl + Na_2S \rightarrow H_2S + NaCl$

   a. 1.0 mol   b. 1.25 mol   c. 2.5 mol   d. 3.0 mol   e. 5.0 mol

18. Assume you allow 28.0 g of titanium(IV) chloride (molar mass = 189.7 g/mol) to react with 6.00 g of water. What is theoretical yield of titanium(IV) oxide?

   $TiCl_4(l) + 2\ H_2O(g) \rightarrow TiO_2(s) + 4\ HCl(g)$

   a. 5.90 g   b. 6.00 g   c. 11.8 g   d. 13.3 g

       _____

The next two questions use the description below.

Gaseous sulfur dioxide, SO_2, can be removed from smokestacks by treatment with limestone and oxygen.

$$2 \ SO_2(g) + 2 \ CaCO_3(s) + O_2(g) \rightarrow 2 \ CaSO_4(s) + 2 \ CO_2(g)$$
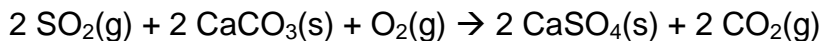
19. How many grams of $CaCO_3$ are required to remove 150.0 g of SO_2?

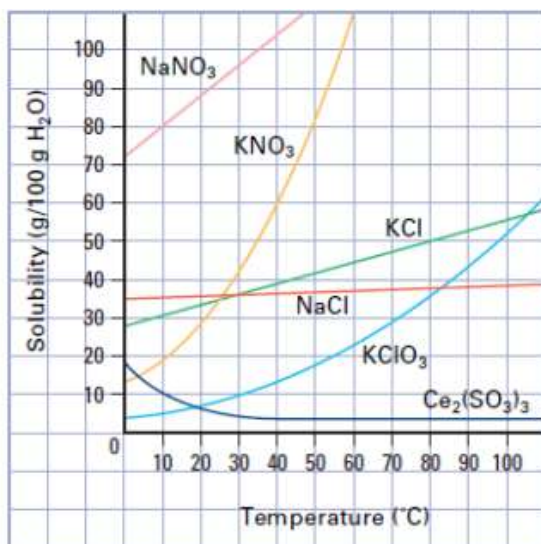a. 117 g   b. 150 g   c. 234 g   d. 468 g

20. How many grams of $CaSO_4$ are formed when 150.0g of SO_2 is consumed completely?

a. 150 g   b. 136 g   c. 159 g   d. 319 g

The next three questions use the diagram below.

Using the graph below answer the questions

21. At 20°C, what salt is the most soluble?

a. $NaNO_3$ b. $KClO_4$ c. KNO_3 d. KCl

22. At what temperature is the solubility of potassium chloride and sodium chloride the same?

a. 30°C   b. 8°C   c. 20°C   d. 25°F   e. 83°C

23. What is the minimum temperature at which the mass of sodium nitrate soluble in water is greater than the mass of water itself?

a. 20°C   b. 35°C   c. 50°C   d. 83°C   e. 100°C

_____

I.

A. (4 points) At what point is the temperature in ˚C twice that of the temperature in ˚F?

_____

B. (6 points) A 15% by mass solution of Hydrogen peroxide has a density of 1.135g/mL at 20°C. Calculate the mass of hydrogen peroxide in 0.350 L of this solution.

_____

C. (10 points) Write the formulas of the following:

a. Carbon monoxide   _____

b. Manganese(III) nitrite   _____

c. Calcium hydrogenphosphate _____

d. Phosphine   _____

e. Ammonium iodate   _____

_____

D. (10 points) Write the names of the following:

　　a. CH_4　　　　　　　　　　_____

　　b. HI (aq)　　　　　　　　　_____

　　c. CuS　　　　　　　　　　　_____

　　d. CCl_4　　　　　　　　　　_____

　　e. $Co(SO_3)_2$　　　　　　　　_____

E. (6 points) Bromine has two naturally occurring isotopes. Br-79 has an atomic mass of 78.92 amu and an abundance of 50.69 %. What is the mass (in amu) of the other isotope of bromine?

_____

F. (10 points) When 0.3354 g of iron is heated in air it forms an oxide with generic formula (Fe_xO_y). The reaction yields 0.4631 g of oxide. What is the simplest formula of the oxide?

_____

G. (4 points) What is the mass, in grams, of single Pb atom?

_____

H. (8 points) Combustion of a 0.3425-g sample of phellandrene yields 0.3624 g of H_2O. What is the % mass of hydrogen in phellandrene?

_____

I. (8 points) A solution if prepared by mixing 0.10 L of 0.12 M magnesium chloride with 0.23 L of 0.18 M $AlCl_3$. What is the molarity of Cl^- after mixing? (Assume the volumes are additive).

_____

J. (15 points) Urea (CH_4N_2O) is a common fertilizer that can be obtained by the reaction of ammonia with carbon dioxide.

$2NH_3(aq) + CO_2(aq) \rightarrow CH_4N_2O (aq) + H_2O$
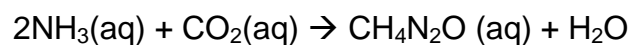
In an industrial synthesis of urea, a chemist combines 126.4 kg of ammonia with 209.4 kg of carbon dioxide and obtains 168.kg of urea.

1. What is the theoretical yield? **Work must be shown**

_____

2. What is the percent yield?

_____

3. How much of the reactant in excess is remaining after the reaction is complete? (in grams)

_____