Chemistry 115
Dr. Cary Willard
Exam 2A

Name ___________________________

October 15, 2008

	Points Earned	Points Possible
Page 1 multiple choice		12
Page 2		25
Page 3		28
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Total		101

Note: All work must be shown to receive credit. On calculation problems show answer with the correct number of significant figures using scientific notation if necessary.

Avogadro's number 6.022×10^{23}/mol

PERIODIC CHART

IA																VIIA	NOBLE GASES
1 **H** 1.008	IIA											IIIA	IVA	VA	VIA	1 **H** 1.008	2 **He** 4.002
3 **Li** 6.941	4 **Be** 9.012					Transition Metals»						5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 23.00	12 **Mg** 24.30	IIIB	IVB	VB	VIB	VIIB	ÉÍÍÍVIIIBÍÍÍÍ»			IB	IIB	13 **Al** 27.00	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.70	29 **Cu** 63.55	30 **Zn** 65.38	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (99)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.9	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.0	89 **Ac** 227.0	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (268)	110 **??** (???)								

Lanthanide series	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (147)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
Actinide series	90 **Th** 232.0	91 **Pa** 231.0	92 **U** 238.0	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)

Part 1 - Multiple Choice (12 points)

1. Which is not part of Dalton's atomic model?
   a. Chemical compounds are composed of two or more atoms of different elements.
   b. Elements are composed of minute, indivisible particles called atoms.
   c. Atoms of the same element are alike in mass.
   d. Atoms of the same element can be different in size.
   e. All of the above are part of Dalton's atomic model

2. What charge does a cation possess?
   a. Positive
   b. Negative
   c. Neutral
   d. It is not possible to determine the charge

3. The nucleus of an atom usually contains
   a. Protons
   b. Neutrons
   c. Electrons
   d. Both choices A and B
   e. Neither, choices A, B, nor C

4. The number of protons in an atom is known as its
   a. Mass number
   b. Molecular mass
   c. Atomic Mass
   d. Atomic number
   e. None of the above

5. Different isotopes of an element are atoms of that element which have
   a. The same atomic number and the same mass number
   b. The same atomic number and different mass number
   c. Different atomic number and the same mass number
   d. Different atomic number and different mass number
   e. None of the above

6. The atomic mass of an element is
   a. The arithmetic average of the masses of the isotopes of that element
   b. The ratio of the mass of one atom of an isotope of that element to the mass of hydrogen
   c. The mass of the most abundant isotope of that element
   d. The weighted average of the masses of the naturally occurring isotopes of that element
   e. None of the above

Part 2 – Nomenclature (8 points) Fill in the following table with the correct IUPAC name or formula

IUPAC Name	Chemical Formula
Calcium nitrate	
Ferric chloride	
Disulfur tetraoxide	
Ammonium phosphide	
	K_2SO_4
	Cr_2O_3
	$Mg(OH)_2$
	P_3I_7

Part 3 – Problems (80 points)

1. (6 points) Fill in the chart below

species	protons	neutrons	electrons
^{32}P			
$^{39}Cl^{-1}$			

2. (5 points) Explain how an empirical and a molecular formula differ.

3. (6 points) Balance the equations below

a. $Li + N_2 \rightarrow Li_3N$

b. $Na_3PO_4 + AgNO_3 \rightarrow NaNO_3 + Ag_3PO_4$

4. (8 points) Complete and balance the equations below. (Both reactions will occur.)
   a. Zn + $AgNO_3$ (single replacement reaction)

   b. $CoSO_4$ + NaOH (double displacement reaction)

5. (20 points) Given a 7.35 g sample of the amino acid phenylalanine, $C_9H_{10}NO_2$,.calculate the following:
   a. molar mass of phenylalanine

   b. moles of phenylalanine

   c. moles of carbon atoms

   d. molecules of phenylalanine

   e. number of oxygen atoms

6. (24 points) Butane, C_4H_{10}, is a common fuel for heating homes in areas not serviced by natural gas. The equation for its combustion is

$$2\ C_4H_{10} + 13\ O_2 \longrightarrow 8\ CO_2 + 10\ H_2O$$

a. How many moles of oxygen are required to react with 3.40 mol C_4H_{10}?

b. How many grams of carbon dioxide will be produced when 4.68 mol of C_4H_{10} are burned?

c. If 795 grams of CO_2 are produced in part b, what is the percent yield of the reaction?

d. How many molecules of butane will react with 52 molecules of oxygen gas?

e. How many molecules of water will be produced by the combustion of 3.00 g of butane?

f. How many moles of CO_2 will be produced by the reaction of 7.00 moles of butane with 56.0 moles of oxygen gas?

7. (7 points) Calculate the empirical formula of a compound which is composed of 38.76% Cl and 61.24% O

8. (5 points) A compound with empirical formula SO_2F_2 has a molar mass of 204 g. Determine the molecular formula for the compound.