Chemistry 115 Name ___________________________
Dr. Cary Willard
Exam 2A March 18, 2009

	Points Earned	Points Possible
Page 1 multiple choice		20
Page 2		24
Page 3		26
Page 4		24
Page 5		12
Total		106

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 (20 points)

1. Each atom of a specific element has the same
   a. Atomic mass
   b. Number of neutrons
   c. Number of protons
   d. Mass number
   e. None of the above

2. What charge does an anion possess?
   a. Positive
   b. Negative
   c. Neutral
   d. Unable to determine

3. Which pair of symbols represents isotopes?
   a. ${}^{22}_{11}Na$ and ${}^{23}_{12}Na$
   b. ${}^{7}_{3}Li$ and ${}^{6}_{3}Li$
   c. ${}^{63}_{29}Cu$ and ${}^{29}_{64}Cu$
   d. ${}^{12}_{24}Mg$ and ${}^{12}_{26}Mg$
   e. all of the above

4. The mass of an atom is primarily determined by the mass of its
   a. Protons
   b. Neutrons
   c. Electrons
   d. Both neutrons and electrons
   e. Both protons and neutrons

5. An atom of atomic number 53 and mass number 127 contains how many neutrons
   a. 53
   b. 74
   c. 127
   d. 180

6. Which of the following contains the largest number of moles?
   a. 1.0 g Li
   b. 1.0 go Na
   c. 1.0 g Al
   d. 1.0 g Ag

7. The reaction
$BaCl_2 + (NH_4)_2CO_3 \rightarrow BaCO_3 + 2\ NH_4Cl$
is an example of
   a. A combination reaction
   b. A decomposition reaction
   c. A single displacement reaction
   d. A double displacement reaction

8. The reaction
$$2\ PbO_2 \rightarrow 2\ PbO + O_2$$
is an example of
   a. A combination reaction
   b. A single displacement reaction
   c. A decomposition reaction
   d. A double displacement reaction
   e. Unable to determine

Given the activity series Mg>Zn>Cu>Ag, predict the products of the following reactions.

9. $Mg + Cu(NO_3)_2 \rightarrow$
   a. $Mg(NO_3)_2 + Cu$
   b. $MgNO_3 + Cu$
   c. $MgCu + 2\ NO_3$
   d. No reaction
   e. Unable to determine based on information provided

10. $Ag + Zn(NO_3)_2 \rightarrow$
    a. $AgNO_3 + Zn$
    b. $Ag(NO_3)_2 + Zn$
    c. $Ag_2Zn + NO_3$
    d. No reaction
    e. Unable to determine based on information provided

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

IUPAC Name	Chemical Formula
Magnesium sulfate	
Nickel(II) iodide	
Ammonium nitrite	
Sodium perchlorate	
	Li_3PO_4
	Ag_2S
	$Ca(OH)_2$
	NO_2

Part 3 – Problems (68 points)

1. (4 points) What particles in an atom contain practically all of its mass?

2. (4 points) How is it possible for there to be more than one kind of atom of the same element?

3. (4 points) Explain why the name for $MgCl_2$ is magnesium chloride but the name for $CuCl_2$ is copper(II) chloride.

4. (4 points) What is meant by the physical state of a substance? What symbols are used to represent these physical states and what does each symbol mean?

5. (6 points) Balance the equations below

a. Al + $O_2 \rightarrow$ Al_2O_3

b. H_3PO_4 + $Zn(OH)_2 \rightarrow$ H_2O + $Zn_3(PO_4)_2$

6. (20 points) Given a 9.52 g sample of the acetylsalicylic acid ($C_9H_8O_4$) or aspirin, calculate the following:

a. molar mass of aspirin

b. moles of aspirin

c. moles of carbon atoms

d. molecules of aspirin

e. number of oxygen atoms

7. (24 points) Trinitrotoluene, $C_7H_5N_3O_6$, is an explosive otherwise known as TNT. The equation for its combustion is

$$4\ C_7H_5N_3O_6\ +\ 33\ O_2 \longrightarrow 28\ CO_2\ +\ 10\ H_2O\ +\ 6\ N_2$$

a. How many moles of oxygen are required to react with 3.40 mol $C_7H_5N_3O_6$?

b. How many grams of carbon dioxide will be produced when 4.68 mol of $C_7H_5N_3O_6$ are burned?

c. If 1120 grams of CO_2 are produced in part b, what is the percent yield of the reaction?

d. How many molecules of TNT will react with 132 molecules of oxygen gas?

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

f. How many moles of CO_2 will be produced by the reaction of 7.00 moles of TNT with 72.0 moles of oxygen gas?

8. (7 points) Calculate the empirical formula of cacodyl which is composed of 22.88% C, 5.76% H, and 71.36% As.

9. (5 points) A compound with empirical formula C_2H_4O has a molar mass of 132 g/mol. Determine the molecular formula for the compound.