

March 18, 2009

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

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  $6.022 \times 10^{23}$ /mol

PERIODIC CHART

														NOBLE GASES			
IA										IIIA	IVA	VA	VIA	VIIA	2		
1 H 1.008										5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18		
3 Li 6.941	4 Be 9.012	Transition Metals<									13 Al 27.00	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95	
11 Na 23.00	12 Mg 24.30	IIIB	IVB	VB	VIB	VII	VIII	IX	X	IB	IIB	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
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	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
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	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
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						
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
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)

Actinide series

Part 1 - Multiple Choice (20 points)

- Each atom of a specific element has the same
  - Atomic mass
  - Mass number
  - Number of neutrons
  - Number of protons
  - None of the above
- What charge does an anion possess?
  - Neutral
  - Positive
  - Negative
  - Unable to determine
- Which pair of symbols represents isotopes?
  - ${}^{22}_{11}\text{Na}$  and  ${}^{23}_{12}\text{Na}$
  - ${}^7_3\text{Li}$  and  ${}^6_3\text{Li}$
  - ${}^{63}_{29}\text{Cu}$  and  ${}^{29}_{64}\text{Cu}$
  - ${}^{12}_{24}\text{Mg}$  and  ${}^{12}_{26}\text{Mg}$
  - all of the above
- The mass of an atom is primarily determined by the mass of its
  - Protons
  - Neutrons
  - Electrons
  - Both neutrons and electrons
  - Both protons and neutrons
- An atom of atomic number 53 and mass number 127 contains how many neutrons
  - 53
  - 127
  - 74
  - 180
- Which of the following contains the largest number of moles?
  - 1.0 g Na
  - 1.0 g Al
  - 1.0 g Ag
  - 1.0 g Li

- The reaction
$$\text{BaCl}_2 + (\text{NH}_4)_2\text{CO}_3 \rightarrow \text{BaCO}_3 + 2 \text{NH}_4\text{Cl}$$
is an example of
  - A single displacement reaction
  - A double displacement reaction
  - A combination reaction
  - A decomposition reaction
- The reaction
$$2 \text{PbO}_2 \rightarrow 2 \text{PbO} + \text{O}_2$$
is an example of
  - A double displacement reaction
  - A single displacement reaction
  - A combination reaction
  - A decomposition reaction
  - Unable to determine

Given the activity series  $\text{Mg} > \text{Zn} > \text{Cu} > \text{Ag}$ , predict the products of the following reactions.

- $\text{Mg} + \text{Cu}(\text{NO}_3)_2 \rightarrow$ 
  - $\text{MgNO}_3 + \text{Cu}$
  - $\text{Mg}(\text{NO}_3)_2 + \text{Cu}$
  - $\text{MgCu} + 2 \text{NO}_3$
  - No reaction
  - Unable to determine based on information provided
- $\text{Ag} + \text{Zn}(\text{NO}_3)_2 \rightarrow$ 
  - $\text{AgNO}_3 + \text{Zn}$
  - $\text{Ag}(\text{NO}_3)_2 + \text{Zn}$
  - $\text{Ag}_2\text{Zn} + \text{NO}_3$
  - No reaction
  - Unable to determine based on information provided

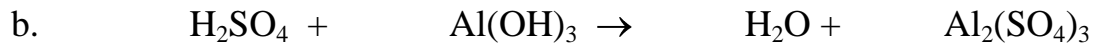
Part 2 – Nomenclature (8 points) Fill in the following table with the correct IUPAC name or formula

IUPAC Name	Chemical Formula
Aluminum phosphite	
Chromium(II) bromide	
Ammonium chlorate	
Sodium carbonate	
	$\text{Ca}(\text{BrO})_2$
	$\text{ZnI}_2$
	$\text{Ba}(\text{OH})_2$
	$\text{SO}_3$

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  $\text{MgCl}_2$  is magnesium chloride but the name for  $\text{CuCl}_2$  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



6. (20 points) Given a 6.24 g sample of the acetylsalicylic acid ( $\text{C}_9\text{H}_8\text{O}_4$ ) or aspirin, calculate the following:

a. molar mass of aspirin

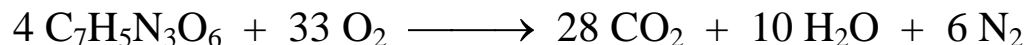
b. moles of aspirin

c. moles of carbon atoms

d. molecules of aspirin

e. number of oxygen atoms

7. (24 points) Trinitrotoluene,  $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$ , is an explosive otherwise known as TNT. The equation for its combustion is



- a. How many moles of oxygen are required to react with 6.20 mol  $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$ ?
  
  
  
  
  
  
  
  
  
  
- b. How many grams of carbon dioxide will be produced when 3.68 mol of  $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$  are burned?
  
  
  
  
  
  
  
  
  
  
- c. If 1020 grams of  $\text{CO}_2$  are produced in part b, what is the percent yield of the reaction?
  
  
  
  
  
  
  
  
  
  
- d. How many molecules of TNT will react with 99.0 molecules of oxygen gas?
  
  
  
  
  
  
  
  
  
  
- e. How many molecules of water will be produced by the combustion of 2.00 g of butane?
  
  
  
  
  
  
  
  
  
  
- f. How many moles of  $\text{CO}_2$  will be produced by the reaction of 8.00 moles of TNT with 92.0 moles of oxygen gas?

8. (7 points) Calculate the empirical formula of cadaverine which is composed of 58.77% C, 13.81% H, and 27.42% N.

9. (5 points) A compound with empirical formula  $C_2H_4O$  has a molar mass of 220 g/mol. Determine the molecular formula for the compound.