NAME: KEY

Lab Section: __1(TuTh@3:30) __2(TuTh@6) __3(TuTh@9) __4(MW@1)

CHM 101
25 points, 20 mins.

Wallace

Basic Competency Quiz #5

Chemistry, 7th ed., Zumdahl & Zumdahl, 2.8 + 5.1-5.6 + 6.1-6.2

Fall 2008
week 9

revised 11/13/2008

Unless otherwise specified, each question is worth 5 points.

1. Complete the following table: (*1 point each*)

	Formula	Name
a.	CuCl	COPPER (I) CHLORIDE
b.	$CuCl_2$	copper(II) chloride
c.	$Fe(NO_3)_3$	IRON (III) NITRATE
d.	$Sn(SO_4)_2$	tin(IV) sulfate
e.	$CoPO_4$	COBALT (III) PHOSPHATE

2. If 10. liters of sulfur dioxide gas ~~moles~~ LITERS reacts with 5.0 liters of oxygen gas (as shown in the reaction, below), how many ~~moles~~ of sulfur trioxide gas will be produced? (Assume that the temperature and pressure remains constant.)

$$2\ SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$$

$$10.\text{L}\ SO_2 \times \frac{2\ \text{L}\ SO_3}{2\ \text{L}\ SO_2} = 10.0\ \text{L}\ SO_3$$

$$5.0\ \text{L}\ O_2 \times \frac{2\ \text{L}\ SO_3}{1\ \text{L}\ O_2} = 10.0\ \text{L}\ SO_3$$

10. L $SO_3(g)$

KEY

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3. When sodium reacts in water (as I described in class), it produces hydrogen gas. How many liters of hydrogen gas would be produced in lab @ 625 torr and 21°C if 1.00 g of sodium was dropped into a large beaker of water? The balanced redox reaction for this is:

#0 $2Na(s) + 2H_2O\,(liq) \rightarrow 2NaOH(aq) + H_2(g)$

#1: $1.00\,g\ Na \times \frac{1\,mol\ Na}{22.99\,g} = 0.0435\ mol\ Na$

#2: $0.0435\ mol\ Na \times \frac{1\,mol\ H_2(g)}{2\,mol\ Na} = 0.0217\ mol\ H_2(g)$

#3: $P = R\frac{T \times n}{V}$ $\quad V = \frac{R \times T \times n}{P}$ $\quad T = 21 + 273 = 294\,K$

$P = 625 \times \frac{1\,atm}{760\,torr} = 0.822\,atm$

$V = \frac{0.08206 \times 294 \times 0.0217}{0.822} = \boxed{0.637\ L\ H_2(g)}$

4. Calculate ΔE for each of the following gaseous systems: (*2 points each*)

   a. 500. J of work is done on a system and 500. J of heat is transferred from the system to the surroundings.

$\Delta E = q + w = -500. + 500. = \boxed{0\ J}$

   b. 100. J of heat is transferred into a system and the system expands against external pressure which requires 250. J of work.

$\Delta E = q + w = 100. - 250. = \boxed{-150.\,J}$

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5. Consider the following chemical reaction (that occurs in your Bunsen Burner):

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g) \quad \Delta H = -803\ kJ$$

a. Is this reaction exothermic or endothermic (*circle one*)? (*1 point*)

b. How much heat is produced by this reaction if 10.0 g of water is produced? (*5 points*)

#1: $10.0\ g\ H_2O \times \frac{1\ mol\ H_2O}{18.02\ g} = 0.555\ mol\ H_2O$

#2: $0.555\ mol\ H_2O \times \frac{-803\ kJ}{2\ mol\ H_2O} = 223\ kJ$ PRODUCED

OR $-223\ kJ$

Abbreviated **Periodic Table of the Elements**

1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.01	2 2A																2 He 4.00
3 Li 6.94	4 Be 9.01											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 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	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 (98)	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	89 Ac** (227)	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub						

POSSIBLY HELPFUL INFORMATION:

R (gas constant) = 0.08206 $\left(\frac{L \bullet atm}{mol \bullet K}\right)$

$K = °C + 273.15$

1 atm = 760 mmHg = 760 torr

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