CHM 1045 (11:15 am Lecture) **HOUR TEST 2** **Name _____**
Dr. Light **March 1, 2004** **(please print)**

Check your recitation section:
___Sec. 21 5:30-6:20 pm (Popovic) ___Sec. 24 3:30-4:20 pm (Giunta)
___Sec. 22 6:30-7:20 pm (Popovic) ___Sec. 25 4:30-5:20 pm (Giunta)
___Sec. 23 7:30-8:20 pm (Popovic) ___Sec. 26 5:30-6:20 pm (Giunta)

This exam consists of 4 pages. Make sure you have one of each. Print your name at the top of each page now. A fifth page contains a periodic chart. You may tear it off and use it for scratch paper. Show your work on calculations, including unit conversions, and give answers in the correct units and appropriate number of significant figures. For two points extra credit, write the name of the SI unit of energy at the top of page 3.
In problems involving molecular and formula weights, you may use values rounded to the nearest 0.1 amu.
If anything confuses you or is not clear, raise your hand and ask!

Page	Points
1	_____
2	_____
3	_____
4	_____
Total	**_____**

Points

(6) 1. In the following list of compounds, **circle** those that are insoluble in water:

$Pb(NO_3)$ **K_2S** **$Ba_3(PO_4)_2$** **$Mg(OH)_2$**

(6) 2. Classify as **strong acid, weak acid, strong base, weak base**, or **salt**:

HF **CH_3NH_2**

$Ca(OH)_2$ **HNO_3**

(8) 3. Complete the following precipitation reactions with **balanced molecular**, **total ionic**, and **net ionic** equations. Be sure to indicate precipitates with (s).

A. **$Hg_2(NO_3)_{2\,(aq)}$ + $KI_{(aq)}$** ®

Balanced molecular:

Total ionic:

Net ionic:

B. **$FeSO_{4\,(aq)}$ + $Ba(OH)_{2\,(aq)}$** ®

Balanced molecular:

Total ionic:

Net ionic:

(6) 4. Give the oxidation number of the indicated element in each of the following compounds or ions:

C in CO_2_____ **Br** in BrO_4^-_____ **P** in HPO_3^{2-}_____

(10) 5. Given the following oxidation-reduction reaction:

$$S_2O_4^{2-} + CrO_4^{2-} \rightarrow SO_3^{2-} + Cr^{3+}$$

(a) Identify: The **reagent** being oxidized _____
The **reagent** being reduced _____
The oxidizing agent _____
The reducing agent _____
(This refers to the complete ion, not just the element changing oxidation number)

(b) Balance the equation **in acidic solution**. (Show your work, including the beginning and ending oxidation numbers of the elements that undergo a change).

(8) 6. Three 5-L flasks each contain 4 g of gas at 273 K. Flask A contains H_2, flask B contains He, and flask C contains CH_4. Rank the contents of each flask in terms of the following properties by circling the correct relationship:

Pressure:	A>B>C	C>B>A	A=B=C
Density:	A>B>C	C>B>A	A=B=C
Average Molecular Kinetic Energy:	A>B>C	C>B>A	A=B=C
Average Molecular Velocity:	A>B>C	C>B>A	A=B=C

7. Oxygen gas can be produced by the decomposition of potassium chlorate in the presence of a catalyst, according to the following reaction:

$$2\ KClO_{3\,(s)} \rightarrow 2\ KCl_{(s)} + 3\ O_{2\,(g)}$$

(12) (a) A sample of $KClO_3$ was decomposed in this fashion, and the oxygen was collected over water by displacing the water from an upended container. The volume of the oxygen collected was 1.56 L at a temperature of 20 ^oC. The atmospheric pressure was 755 torr, and the vapor pressure of water at 20 ^oC is 17.5 torr. Calculate the **moles** of $KClO_3$ and the **grams** of $KClO_3$ in the sample. (Show your work). **R = 0.08206 L-atm-mol^{-1}-K^{-1}.**

(6) (b) ΔH_f^o for $KClO_{3\,(s)}$ = -397.7 kJ/mol; ΔH_f^o for $KCl_{(s)}$ = -436.7 kJ/mol. Calculate ΔH for the decomposition of one mole of $KClO_3$. Is the reaction **exothermic,** or **endothermic**?

(4) (c) Calculate ΔH for the decomposition of the quantity of $KClO_3$ specified in part a.

(10) 8. A tank of gas with a volume of 3.6 L is under a pressure of 75 atmospheres at 30 ^{o}C. If the gas were completely released into plastic bag at 0.95 atmospheres pressure and 5 ^{o}C, what volume would the gas occupy in the bag?

(12) 9. An unknown metal weighing 44.7 g is heated to a temperature of 87.2 ^{o}C and placed in an insulated cup containing 105.6 g of water at a temperature of 20.5 ^{o}C. After the metal cools, the final temperature of the metal and the water is 23.4 ^{o}C.
(Specific heat of water = 4.184 J/g-^{o}C)

(a) How much heat has the metal lost?

(b) What is the specific heat of the metal?

(12) 10. Heats of reaction can often be calculated using Hess's Law and data from combustion experiments in a calorimeter. An example is the reaction of ethylene ($C_2H_{4\,(g)}$) with water to form ethyl alcohol ($C_2H_5OH_{\,(l)}$):

$$C_2H_{4\,(g)} + H_2O_{\,(l)} \rightarrow C_2H_5OH_{\,(l)}$$

Write and balance the combustion equations for $C_2H_{4\,(g)}$ and $C_2H_5OH_{\,(l)}$, and use their heats of combustion to calculate ΔH for the above reaction.

($\Delta H_{comb}\ C_2H_{4\,(g)}$ = -1411 kJ/mol; $\Delta H_{comb}\ C_2H_5OH_{\,(l)}$ = -1367 kJ/mol)