Cell phones, PDAs, mp3 players, and other electronic devices must be turned off and stowed out of sight (your sight and mine). Calculator policy is in effect. Infractions will cost you points!

ALL outside paper must be stowed out of sight. Unauthorized materials will result in your exam being removed and a score of 0 assigned. If you reach a point where you need more scratch paper than the space available, ask a proctor.

Please clearly and legibly write your name, in ink, at the top of both pages of your answer sheet. Your score will not be recorded and your exam will not be returned if this is not done.

All answers should be rounded to the appropriate precision (correct significant figures.)

Problems marked ** are taken directly from assigned homework problems in the text or handouts/worksheets from class.

Atomic weights are provided in the Periodic Table. These values must be used.

Be certain your answers are clear. If an answer is not clear, it will probably be considered wrong.

Use your time effectively.

When authorized to open your exam, you may carefully remove this cover sheet. When you are finished with your exam, please turn in **only the answer sheet.** Make sure your name is clearly written on both pages.

Time is up at 11:50!!

THE PERIODIC TABLE

	1 (1A)																	18 (8A)
1	1 H 1.008	2 (2A)											13 (3A)	14 (4A)	15 (5A)	16 (6A)	17 (7A)	2 He 4.003
2	3 Li 6.941	4 Be 9.012											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	11 Na 22.99	12 Mg 24.31	3 (3B)	4 (4B)	5 (5B)	6 (6B)	7 (7B)	8	9 (8B)	10	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
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	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 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.96	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
6	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	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)
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (265)	105 Db (268)	106 Sg (271)	107 Bh (272)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uuh (293)	117 Uus (294)	118 Uuo (294)

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	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 (262)

Based on IUPAC 2007 (publ 2009).

Potentially useful information:

6.022×10^{23}

Solubility trends:

1. Group 1 (1A) compounds, ammonium compounds, and acids are soluble.
2. All nitrates, acetates, chlorates, and perchlorates are soluble.
3. Silver, lead, mercury(I) and copper(I) compounds are INSOLUBLE.
4. Chlorides, bromides, and iodides are soluble.
5. Sulfates are soluble except calcium sulfate and barium sulfate.
6. Compounds with anions of 2– or 3– charge are INSOLUBLE.
7. Hydroxides are INSOLUBLE except calcium hydroxide and barium hydroxide.

Gases: one atm = 760 mmHg = 760 torr PV = nRT R = 0.08206 (L atm)/(mol K)

$$D = \frac{PM}{RT} \qquad u_{rms} = \sqrt{\frac{3RT}{M}} \qquad T(K) = T(°C) + 273$$

Heat and heat capacity: q = C × mass × ΔT

Electromagnetic Radiation: $E = h\nu = hc/\lambda$ $h = 6.626 \times 10^{-34}$ J·s $c = 3.00 \times 10^{8}$ m/s

Electron energy in single-electron species: $$E = -2.18 \times 10^{-18} J\left(\frac{Z^2}{n^2}\right)$$

Electron transitions in H atom: $$\Delta E = -2.18 \times 10^{-18} J\left(\frac{1}{n_{final}^2} - \frac{1}{n_{initial}^2}\right)$$

name_____

University of Louisville **Chem 201 Exam 3** **Dr. Hoyt** **Fall 2013**

Scored grade (instructor use only!)_____

1. The following equation is balanced:

$2\ Ag_2O\ (s) \rightarrow 4\ Ag\ (s) + O_2\ (g)$ $\Delta H^o = 62.10$ kJ

a. [2 pts] What is the correct systematic name of Ag_2O? _____

b. [2] Is the reaction above exothermic or endothermic? _____

c. [2] Which element is reduced in the reaction above? _____

d. [3] What is the ΔH^o value for the reaction below?

$4\ Ag_2O\ (s) \rightarrow 8\ Ag\ (s) + 2\ O_2\ (g)$ $\Delta H^o =$ _____ kJ

e. [10] In the box below, write the formation equation (the reaction corresponding to the ΔH^0_f) for Ag_2O (*s*), and give the value of the ΔH^0_f. For full credit, include appropriate phase labels on all species.

$\Delta H_f^o =$ _____ kJ

2. [2 each] Three identical 5-L flasks each contain a sample of gas (He, Ne or Ar) at 273 K and 1 atm. For each of the following quantities or values, circle the best choice.

a. greatest density:	He	Ne	Ar	all same
b. greatest average kinetic energy:	He	Ne	Ar	all same
c. greatest rate of effusion through a valve:	He	Ne	Ar	all same
d. greatest average speed of atoms:	He	Ne	Ar	all same
e. greatest number of atoms:	He	Ne	Ar	all same

3. [6] **41.0 mL of a solution of 0.237 M $Pb(NO_3)_2$ are added to 60.0 mL of a solution of 0.250 M NH_4Cl. How many grams of precipitate can be produced? **SHOW YOUR WORK** in the area below and write your answer in the space provided. (Molar mass of $PbCl_2 = 278.1$, $NH_4NO_3 = 80.05$)

_____grams

4. [6] **A 15.4 L container holds a gas at 38 °C and 2.19 atm. The gas is transferred to a new container of 25.6 L and the new temperature is 87 °C. What is the new pressure (in atm) of the gas? **SHOW YOUR WORK** in the area below and write your answer, rounded appropriately, in the space provided.

_____atm

5. [4] **What is the energy (in J) of the n = 2 level of O^{7+}? SHOW YOUR WORK in the area below and write your answer in the space provided.

_____ J

6. [2 each] **Clearly** assign each statement as TRUE or FALSE. If we can't tell which you mean, it's wrong.

_____ We are being bombarded with electromagnetic radiation right now, from the lights in this room.

_____ A photon of red light has a greater frequency than a photon of blue light.

_____ Humans can see most of the electromagnetic spectrum.

_____ Electrons in atoms can orbit at any distance and can have any energy.

_____ The equation to the right can be used to calculate the energy of any electron in an atom.

$$E = -2.18 \times 10^{-18} J\left(\frac{Z^2}{n^2}\right)$$

_____ When an electron in an atom relaxes from n=3 to n=2, a photon is emitted.

_____ If the temperature of a gas sample rises from 20°C to 40°C, the average kinetic energy of the molecules is doubled.

_____ At a given temperature, all the molecules in a sample of gas have the same kinetic energy.

_____ All diatomic elements are gases under standard conditions.

_____ At the same pressure, temperature and volume, all ideal gas samples have the same average molecular speed.

_____ Gases behave most ideally at high pressures and high temperatures.

_____ At STP, one mole of any substance will occupy a volume of 22.4 L.

_____ Breaking bonds is always an endothermic process.

_____ Combustion of any substance will yield CO_2 and H_2O as products.

_____ For an element in its stable state, $\Delta H_f^o = 0$ and oxidation number = 0.

_____ When the temperature of a sample of gas increases, its density decreases.