

CHEM 1215  
Exam III  
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November 10, 1999

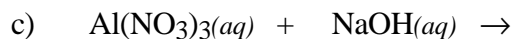
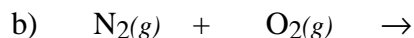
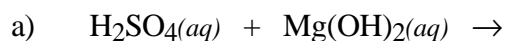
Name \_\_\_\_\_  
TA's Name \_\_\_\_\_  
Lab Section \_\_\_\_\_

### INSTRUCTIONS:

1. This examination consists of a total of 7 different pages. The last page includes a periodic table and a solubility table. All work should be done in this booklet.
2. PRINT your name, TA's name and your lab section number now in the space at the top of this sheet. **DO NOT SEPARATE THESE PAGES.**
3. Answer all questions that you can and whenever called for show your work clearly. Your method of solving problems should pattern the approach used in lecture. You do not have to show your work for the multiple choice (if any) or short answer questions.
4. No credit will be awarded if your work is not shown in problems 3, 5 - 7 and 8.
5. Point values are shown next to the problem number.
6. Budget your time for each of the questions. Some problems may have a low point value yet be very challenging. If you do not recognize the solution to a question quickly, skip it, and return to the question after completing the easier problems.
7. Look through the exam before beginning; plan your work; then begin.
8. ~~Relax~~ and do well.

	Page 2	Page 3	Page 4	Page 5	TOTAL
SCORES	_____	_____	_____	_____	_____
	(29)	(34)	(23)	(14)	(100)

- (9) 1. Write the chemical formula(s) of the product(s) and balance the following reactions. Identify all products phases as either (g)as, (l)iquid, (s)olid or (aq)ueous.



- (8) 2. Write the balanced ionic and balanced net ionic chemical equations for the reactions a) and c) in Problem 1. (Remember to include the correct charges on all ions and the phase of each species.)

1a)

Ionic equation:

Net Ionic equation:

1c)

Ionic equation:

Net Ionic equation:

- (12)3a. Determine the empirical formula of a compound that is 69.8% carbon, 11.7% hydrogen, and 18.6% oxygen by mass.

b) If the molar mass of this compound is  $172 \text{ g mol}^{-1}$ , determine the molecular formula.

(22)4. Complete the following table

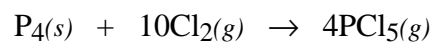
Formula	$M$ , Molar Mass $\left(\frac{\text{g}}{\text{mol}}\right)$	$m$ , Mass of sample (g)	$n$ , Moles of sample (mol)	$N$ , Number of atoms, molecules, or formula units
SO <sub>3</sub>		$4.13 \times 10^{-2}$		
Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>			1.39	
unknown		$9.41 \times 10^2$		$5.91 \times 10^{24}$ atoms
KPtCl <sub>3</sub> (C <sub>2</sub> H <sub>4</sub> )	369	$7.03 \times 10^{-4}$		

Provide the symbol of the unknown element

(12) 5. Calculate the following,

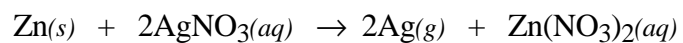
- the mass, in grams, of a single atom of mercury.
- the number of molecules of water in 1.0 mol of the hydrate CuSO<sub>4</sub> · 5H<sub>2</sub>O.
- the number of CH<sub>4</sub> molecules and the number of hydrogen atoms in 9.22 g of methane, CH<sub>4</sub>.

(13) 6. For the reaction

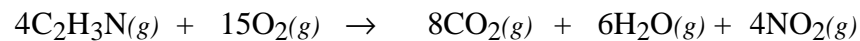


Calculate how many grams of chlorine that must react to produce 32.5 g of  $\text{PCl}_5$ . (Assume phosphorus is in excess.)

(10) 7. Calculate the mass of silver produced when 3.22 g of Zn react with 4.35 g of  $\text{AgNO}_3$ .



- (14) 8. Acetonitrile,  $\text{C}_2\text{H}_3\text{N}$ , is an important nonaqueous solvent. The compound reacts with  $\text{O}_2$  according to the equation,



47.6 g of acetonitrile are added to an amount of oxygen. After the reaction occurs 28.4 grams of  $\text{H}_2\text{O}$  and 48.4 g of  $\text{NO}_2$  are produced. Answer each of the following,

- a) the mol of  $\text{H}_2\text{O}$  produced?
- b) the mass of  $\text{CO}_2$  produced?
- c) Could  $\text{O}_2$  be the limiting reagent or is it in excess in this reaction? Explain. (You may use a calculation to support your answer.)

- (5) 9. THIS IS EXTRA CREDIT. DO NOT ATTEMPT UNTIL AFTER YOU ARE THROUGH DOING THE FIRST 9 QUESTIONS.

A 2.24 gram sample of an unknown metal reacts with HCl to produce 0.0808 g of H<sub>2</sub> gas. Identify the metal assuming all of it reacts. (Show ALL your work!)

Periodic Table of the Elements																		
IA																VIIIA		
1	1 <b>H</b> 1.008															2 <b>He</b> 4.00		
2	3 <b>Li</b> 6.94	4 <b>Be</b> 9.01																
3	11 <b>Na</b> 22.99	12 <b>Mg</b> 24.30																
4	19 <b>K</b> 39.10	20 <b>Ca</b> 40.08	21 <b>Sc</b> 44.96	22 <b>Ti</b> 47.88	23 <b>V</b> 50.94	24 <b>Cr</b> 52.00	25 <b>Mn</b> 54.94	26 <b>Fe</b> 55.85	27 <b>Co</b> 58.93	28 <b>Ni</b> 58.69	29 <b>Cu</b> 63.55	30 <b>Zn</b> 65.38	31 <b>Ga</b> 69.72	32 <b>Ge</b> 72.59	33 <b>As</b> 74.92	34 <b>Se</b> 78.96	35 <b>Br</b> 79.90	36 <b>Kr</b> 83.80
5	37 <b>Rb</b> 85.47	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.91	40 <b>Zr</b> 91.22	41 <b>Nb</b> 92.91	42 <b>Mo</b> 95.94	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.9	46 <b>Pd</b> 106.4	47 <b>Ag</b> 107.9	48 <b>Cd</b> 112.4	49 <b>In</b> 114.8	50 <b>Sn</b> 118.7	51 <b>Sb</b> 121.8	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.3
6	55 <b>Cs</b> 132.9	56 <b>Ba</b> 137.3	57 <b>La</b> 138.9	72 <b>Hf</b> 178.5	73 <b>Ta</b> 180.9	74 <b>W</b> 183.8	75 <b>Re</b> 186.2	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.1	79 <b>Au</b> 197.0	80 <b>Hg</b> 200.6	81 <b>Tl</b> 204.4	82 <b>Pb</b> 207.2	83 <b>Bi</b> 209.0	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)
7	87 <b>Fr</b> (223)	88 <b>Ra</b> 226.0	89 <b>Ac</b> 227.0	104 <b>Rf</b> (261)	105 <b>Db</b> (262)	106 <b>Sg</b> (263)	107 <b>Bh</b> (262)	108 <b>Hs</b> (265)	109 <b>Mt</b> (266)									

Lanthanides	58 <b>Ce</b> 140.1	59 <b>Pr</b> 140.9	60 <b>Nd</b> 144.2	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.4	63 <b>Eu</b> 152.0	64 <b>Gd</b> 157.2	65 <b>Tb</b> 158.9	66 <b>Dy</b> 162.5	67 <b>Ho</b> 164.9	68 <b>Er</b> 167.3	69 <b>Tm</b> 168.9	70 <b>Yb</b> 173.0	71 <b>Lu</b> 175.0
Actinides	90 <b>Th</b> 232.0	91 <b>Pa</b> 231.0	92 <b>U</b> 238.0	93 <b>Np</b> 237.0	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (260)

Solubility Table

<u>Ion</u>	<u>Solubility</u>	<u>Exceptions</u>
$\text{NO}_3^-$	soluble	none
$\text{ClO}_4^-$	soluble	none
$\text{Cl}^-$	soluble	except $\text{Ag}^+$ , $\text{Hg}_2^{2+}$ , $\text{Pb}^{2+}$
$\text{SO}_4^{2-}$	soluble	except $\text{Ca}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Sr}^{2+}$ , $\text{Hg}^{2+}$ , $\text{Pb}^{2+}$ , $\text{Ag}^+$
$\text{CO}_3^{2-}$	insoluble	except Group IA and $\text{NH}_4^+$
$\text{PO}_4^{3-}$	insoluble	except Group IA and $\text{NH}_4^+$
$\text{CrO}_4^{2-}$	insoluble	except Group IA, IIA and $\text{NH}_4^+$
$\text{OH}^-$	insoluble	except Group IA, $\text{Ca}^{2+}$ , $\text{Ba}^{2+}$ , $\text{Sr}^{2+}$
$\text{S}^{2-}$	insoluble	except Group IA, IIA and $\text{NH}_4^+$
$\text{Na}^+$	soluble	none
$\text{NH}_4^+$	soluble	none
$\text{K}^+$	soluble	none

\*slightly soluble

