CHEM 1215 Exam II John II. Gelder October 13, 1999

Name	
TA's Name	

Lab Section

## **INSTRUCTIONS**:

- 1. This examination consists of a total of 5 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 <u>now</u> in the space at the top of this sheet. <u>DO</u> <u>NOT SEPARATE THESE PAGES</u>.
- 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. Point values are shown next to the problem number.
- 5. 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.
- 6. Look through the exam before beginning; plan your work; then begin.
- 7. Relax and do well.

	Page 2	Page 3	Page 4	TOTAL
SCORES				
	(36)	(48)	(16)	(100)

Compound Name	Formula
sulfuric acid	
	N <sub>2</sub> O <sub>3</sub>
	HBr(aq)
Hydrogen peroxide	
Acetic acid	
Sodium hydrogen carbonate	
	KClO <sub>4</sub>
Tetraphosphorus decaoxide	
	FePO <sub>4</sub>

(18) 1. Complete the following table by inserting the name of the compound or the formula.

(7) 2. When solid barium hydroxide is added to solid ammonium chloride and mixed a wet slush containing aqueous barium chloride and water, and smelling of ammonia is produced. Write a balanced chemical equation from this description. Be sure to include the phase for each substance.

- (11) 3. Predict the solubility of the following compounds in water. For those soluble compounds write the formula for the cation and anion that exists in aqueous solution.
  - a) CuCl<sub>2</sub> c) HNO<sub>3</sub>
  - b) KMnO<sub>4</sub> d) BaSO<sub>4</sub>

- (36) 4. 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.
  - a) Na(s) + H<sub>2</sub>O(l)  $\rightarrow$
  - b)  $HCl(aq) + Ba(OH)_2(aq) \rightarrow$
  - c)  $NH_3(aq) + H_2SO_4(aq) \rightarrow$
  - d)  $Fe(NO)_3(aq) + Na_2S(aq) \rightarrow$
  - e)  $H_2(g) + O_2(g) \rightarrow$
  - $f) \qquad C_4H_{10}(l) \ + \ O_2(g) \ \rightarrow$
  - $g) \qquad K(s) \ + \ Br_2(l) \ \rightarrow \qquad$
  - h) Mg(s) + HNO<sub>3</sub>(aq)  $\rightarrow$
  - i)  $Na_2CO_3(s) + HCl(aq) \rightarrow$
- (12) 5. Write the balanced ionic and balanced net ionic chemical equations for 1d) and one other choosing from 1a, 1b or 1i. (Remember to include the correct charges on all ions and the phase of each species.)1d)

Ionic equation:

Net Ionic equation:

1a, 1b or or 1i) Ionic equation:

Net Ionic equation:

(8) 6a. Briefly define a chemical reaction. List at least three 'driving forces' which are common to chemical reactions.

b) When a soluble ionic solid is added to water it dissolves. Is this 'process' a chemical reaction? Yes or No. Briefly defend your answer.

(8) 7. When an ionic compound like NaCl(s) is added to water we observe it dissolving. The same thing happens when HCl(g) is added to water, it dissolves. Use the space below to sketch two diagrams one depicting at the atomic level the NaCl(aq) solution and the other depicting at the atomic level the HCl(aq) solution. Clearly label the important species in your diagrams.



	IA Periodic Table of the Elements											VIIIA						
1	$\mathbf{H}^{1}$																	$\frac{2}{\mathbf{He}}$
	1.008 I	IA										1	IIIA	IVA	VA	۷IA م	VIIA	4.00
2	<b>Li</b> 6.94 9	<b>Be</b> .01											<b>B</b> 10.81	<b>C</b> 12.01	<b>N</b> 14.01	<b>O</b> 16.00	<b>F</b> 19.00	<b>Ne</b> 20.18
3	11 Na N	12 <b>/Ig</b>											13 <b>Al</b>	14 <b>Si</b>	15 <b>P</b>	16 <b>S</b>	17 <b>Cl</b>	18 <b>Ar</b>
	22.99 24	4.30	IIIB	IVB	VB	VIB 24	VIIB	26	-VIII-	20	IB 20	IIB	26.98	28.09	30.97	32.06	35.45	39.95
4	<b>K</b> 39.10 40	20 C <b>a</b> 0.08	<b>Sc</b> 44.96	<b>Ti</b> 47.88	23 <b>V</b> 50.94	<b>Cr</b> 52.00	25 Mn 54.94	<b>Fe</b> 55.85	<b>Co</b> 58.93	28 <b>Ni</b> 58.69	29 Cu 63.55	50 <b>Zn</b> 65.38	<b>Ga</b> 69.72	<b>Ge</b> 72.59	33 As 74.92	54 Se 78.96	<b>Br</b> 79.90	50 Kr 83.80
~	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
3	<b>Rb</b> 85.47 87	<b>Sr</b> 7.62	<b>Y</b> 88.91	<b>Zr</b> 91.22	<b>Nb</b> 92.91	<b>Mo</b> 95.94	Тс (98)	<b>Ru</b> 101.1	<b>Rh</b> 102.9	<b>Pd</b> 106.4	<b>Ag</b> 107.9	<b>Cd</b> 112.4	<b>In</b> 114.8	<b>Sn</b> 118.7	<b>Sb</b> 121.8	Те 127.6	<b>I</b> 126.9	<b>Xe</b> 131.3
6	55 Cs H	56 <b>3a</b>	57 La	72 <b>Hf</b>	73 <b>Ta</b>	74 <b>W</b>	75 <b>Re</b>	76 <b>Os</b>	77 Ir	78 <b>Pt</b>	79 <b>A</b> 11	<sup>80</sup> Н9	81 <b>T</b>	82 <b>Pb</b>	83 <b>Bi</b>	84 <b>Po</b>	85 At	86 <b>Rn</b>
	132.9 13	37.3	138.9	178.5	180.9	183.8	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209.0	(209)	(210)	(222)
7	87 Fr F	88 <b>Ra</b>	89 Ac	104 <b>Rf</b>	105 <b>Db</b>	106 <b>Sg</b>	107 <b>Bh</b>	108 <b>Hs</b>	109 Mt									
	(223) 22	26.0	227.0	(261)	(262)	(263)	(262)	(265)	(266)									
						-												
		Laı	nthan	ides	58 <b>Ce</b>	59 <b>Pr</b>	60 <b>Nd</b>	61 <b>Pm</b>	62 Sm	63 Eu	64 <b>Gd</b>	65 <b>Tb</b>	66 <b>Dy</b>	67 <b>Ho</b>	68 Er	69 <b>Tm</b>	70 <b>Yb</b>	71 <b>Lu</b>
		Ac	ctinid	es	90 <b>Th</b>	91 <b>Pa</b>	144.2 92	93 <b>Nn</b>	94 <b>P</b> 11	95 <b>Am</b>	96 <b>Cm</b>	97 <b>Bk</b>	162.5 98 Cf	99 <b>Fs</b>	167.3 100 <b>Fm</b>	108.9 101 <b>Md</b>	173.0 102 <b>No</b>	175.0 103 L.r
					232.0	231.0	238.0	237.0	(244	) (243)	(247)	) (247)	(251)	) (252)	(257)	(258)	(259)	(260)
								Solu	bility	Table	;							
	lon				Solul	<u>oility</u>		<u>E</u>	xcep	otions								
	$NO_3$				solut	ole		r	one									
	$CIO_4$	-			solub	ole		r	one			_	-					
	Cl			•	solub	ole		e	excep	t Ag <sup>+</sup>	, Hg <sub>2</sub>	<sup>2+</sup> , ∗P	<sup>2+</sup>	_	_			
	SO <sub>4</sub> <sup>2-</sup>	-			solub	ole		e	excep	$t Ca^2$	<sup>+</sup> , Ba	<sup>2+</sup> , Sr	<sup>.2+</sup> , H	g <sup>2+</sup> , F	<sup>2+</sup> ,	Ag <sup>+</sup>		
	CO <sub>3</sub> <sup>2-</sup>	-			insol	uble		e	excep	t Gro	up IA	and	NH <sub>4</sub>	F				
	PO <sub>4</sub> <sup>3-</sup>	-			insol	uble		e	excep	t Gro	up IA	and	NH <sub>4</sub>	F				
	CrO <sub>4</sub> <sup>2-</sup> insoluble					e	except Group IA, IIA and $NH_4^+$											
	-OH insoluble						e	except Group IA, *Ca <sup>2+</sup> , Ba <sup>2+</sup> , Sr <sup>2+</sup>										
	S <sup>2-</sup> insoluble						e	except Group IA, IIA and $NH_4^+$										
	$Na^+$				solut	ole		r	one									
	${\sf NH_4}^+$				solut	ole		r	one									
	K <sup>+</sup>				solut	ole		r	one				*-	المحل		uble		
													"S	signt	y soi	elau		