

CHEM 1225
Exam I
John I. Gelder
February 4, 1999

Name _____

TA's Name _____

Lab Section _____

Please sign your name below to give permission to post your course scores on homework, laboratories and exams. If you do not sign no scores will be posted. All scores will be posted by a random number which will be assigned to you by Dr. Gelder.

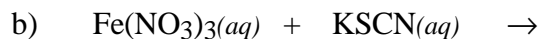
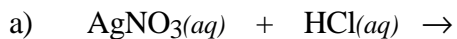
(signature)

INSTRUCTIONS:

1. This examination consists of a total of 8 different pages. The last page includes a periodic table, a solubility table and some useful information. 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.** You will receive 2 points for knowing your TA's name AND laboratory section number in which you are officially enrolled.
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 8, 9 and 10.
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	Page 6	TOTAL
SCORES	_____	_____	_____	_____	_____	_____
	(17)	(18)	(35)	(15)	(13)	(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 any two of the reactions in Problem 1. (Remember to include the correct charges on all ions and the phase of each species.)

1a, 1b or 1c)

Ionic equation:

Net Ionic equation:

1a, 1b or 1c)

Ionic equation:

Net Ionic equation:

(18)3a. Give an example of the formula of an ionic compound.

b) Based on the elements in the chemical formula for a compound, state the general rule we use to identify whether a substance is an ionic compound.

c) Give an example of the formula of a covalent compound.

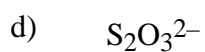
d) Based on the elements in the chemical formula for a compound, state the general rule we use to identify whether a substance is a covalent compound.

e) A bond is described as a force that holds two atoms together. Describe the nature of the bond in an ionic compound.

f) A bond is described as a force that holds two atoms together. Describe the nature of the bond in a covalent compound.

g) List a chemical or physical property, which distinguishes ionic compounds from covalent compounds.

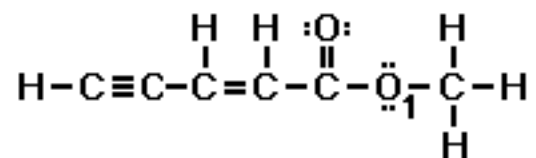
(15) 4. Draw a possible Lewis electron-dot structure for each of the species below. Include all resonance structures if they are needed to adequately represent the bonding.



(21) 5. Complete the following table

Compound	Number of bonding groups on central atom	Number of non-bonding pairs on central atom	Name of the molecular geometry	Bond Angle(s)	Polarity (polar or nonpolar)
SCl_2					
NF_3					
NO_2^+					
SO_2					
NH_2^-					

(7) 6. Consider the Lewis structure for the compound



(a) What are the approximate bond angles about each of the carbon atoms? (Be careful to clearly indicate which carbon atom you associate with each bond angle.)

(b) What is the approximate bond angle around the oxygen atom labeled O₁?

(8) 7. What is the electron-pair geometry in H₂O? What is its molecular geometry? Explain why the H-O-H bond angle is not 109.5°

(4) 8. The other day the measured atmospheric pressure was 30.07 inches of mercury. Convert this pressure to units of mm Hg and atmospheres.

(6) 9. A fixed quantity of an ideal gas at constant pressure occupies a volume of 6.75 L at $-10.5\text{ }^{\circ}\text{C}$. Calculate the temperature the sample will have to be heated to for the volume to be 14.8 L.

(3) 10. A fixed quantity of an ideal gas at a constant temperature exhibits a pressure of 715 torr and occupies a volume of 12.3 L. Calculate the volume the gas will occupy at 1.40 atm.

Periodic Table of the Elements

	IA																VIII A	
1	1 H 1.008																	2 He 4.00
		IIA										IIIA	IVA	VA	VIA	VIIA		
2	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	
3	11 Na 22.99	12 Mg 24.30										13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95	
			IIIB	IVB	VB	VIB	VIIB	VIII		IB	IIB							
4	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
5	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
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 226.0	89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)									

Lanthanides	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 157.2	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
Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	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 (260)

Useful Information

$P \cdot V = k$ (at constant T and mol)

$V = k \cdot T$ (at constant P and mol)

$V = k \cdot n$ (at constant P and T)

1 atm = 760 mm Hg = 760 torr = 101,325 pascals (Pa)

$K = ^\circ C + 273.15$

Solubility Table

<u>Ion</u>	<u>Solubility</u>	<u>Exceptions</u>
NO_3^-	soluble	none
ClO_4^-	soluble	none
Cl^-	soluble	except Ag^+ , Hg_2^{2+} , Pb^{2+}
SO_4^{2-}	soluble	except Ca^{2+} , Ba^{2+} , Sr^{2+} , Hg^{2+} , Pb^{2+} , Ag^+
CO_3^{2-}	insoluble	except Group IA and NH_4^+
PO_4^{3-}	insoluble	except Group IA and NH_4^+
CrO_4^{2-}	insoluble	except Group IA, IIA and NH_4^+
OH^-	insoluble	except Group IA, Ca^{2+} , Ba^{2+} , Sr^{2+}
S^{2-}	insoluble	except Group IA, IIA and NH_4^+
Na^+	soluble	none
NH_4^+	soluble	none
K^+	soluble	none

*slightly soluble