

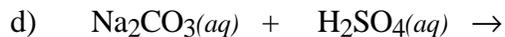
Name \_\_\_\_\_  
TA's Name \_\_\_\_\_  
Lab Section \_\_\_\_\_

### 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 4, 5 and 7 - 9.
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	_____	_____	_____	_____	_____
	(30)	(30)	(20)	(20)	(100)

(12) 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:

(10)3a. Complete the following table by inserting the name of the compound or the formula.

Compound Name	Formula
hydrochloric acid	
	$\text{N}_2\text{O}_4$
Ammonium phosphate	
Potassium nitrite	
	$\text{Al}(\text{OH})_3$

(12) 4. At 25 °C the density of liquid water is 0.997 g cm<sup>3</sup>, while at -10 °C the density of solid water is 0.917 g cm<sup>3</sup>.

a) If a soft drink can with a volume of 250 cm<sup>3</sup> is completely filled with water at 25 °C, and then frozen at -10 °C, calculate the volume of the water in the can.

b) Can the can contain the ice at -10 °C? Explain.

(18) 5. Perform the following conversions;

a) the number of miles in 15.0 km

b) convert 38.5 °C to °F and K.

c) the area of a standard sheet of paper is 93.5 in<sup>2</sup>, calculate the area in km<sup>2</sup>.

(8) 6. Write the formula for the binary compound formed from the following pairs of elements. Indicate the probable phase of each compound.

a) calcium and oxygen

b) nitrogen and hydrogen

c) carbon and fluorine

d) potassium and sulfur

(12) 7. Calculate the following,

a) the number of  $\text{P}_2\text{O}_5$  molecules and the number of oxygen atoms in 92.8 g of  $\text{P}_2\text{O}_5$ .

b) the number of hydrogen atoms in 3.8 mol  $\text{C}_6\text{H}_{12}\text{O}_6$ .

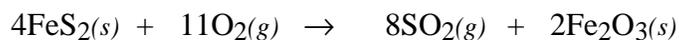
c) the mass, in grams, of a single molecule of carbon dioxide.

(8) 8. For the reaction



Calculate how many grams of  $\text{MnO}_2$  that must react to produce  $4.13 \times 10^{-2}$  g of  $\text{Cl}_2$ . (Assume  $\text{HCl}$  is in excess.)

(12) 9. In the reaction,



156.6 g of iron(IV) sulfide are added to an amount of oxygen. After the reaction occurs 167.0 grams of  $\text{SO}_2$  are produced. Answer each of the following,

a) the grams of  $\text{Fe}_2\text{O}_3$  produced?

b) 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.)

**Periodic Table of the Elements**

	IA																VIII A	
1	1 <b>H</b> 1.008																	2 <b>He</b> 4.00
2	3 <b>Li</b> 6.94	IIA	4 <b>Be</b> 9.01										IIIA	IVA	VA	VIA	VIIA	10 <b>Ne</b> 20.18
3	11 <b>Na</b> 22.99	12 <b>Mg</b> 24.30											5 <b>B</b> 10.81	6 <b>C</b> 12.01	7 <b>N</b> 14.01	8 <b>O</b> 16.00	9 <b>F</b> 19.00	18 <b>Ar</b> 39.95
4	19 <b>K</b> 39.10	20 <b>Ca</b> 40.08	IIIB	IVB	VB	VIB	VIIB	VIII		IB	IIB	13 <b>Al</b> 26.98	14 <b>Si</b> 28.09	15 <b>P</b> 30.97	16 <b>S</b> 32.06	17 <b>Cl</b> 35.45	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)

$$\lambda = \frac{c}{\nu}$$

$$E = h\nu$$

$$c = 3.00 \times 10^8 \frac{\text{m}}{\text{s}}$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$1 \text{ nm} = 1 \times 10^{-9} \text{ m}$$

$$1 \text{ pound (lb)} = 453.59237 \text{ gram (gm)}$$

$$1 \text{ liter (L)} = 1.056718 \text{ quart (qt)}$$

$$\text{heat} = \text{mass} \cdot \text{S.H.} \cdot \Delta T$$

$$1 \text{ inch (in)} = 2.54 \text{ centimeters (cm)}$$

$$\text{Specific Heat (capacity) for H}_2\text{O} = 4.184 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}}$$

$$^\circ\text{F} = \frac{9}{5}^\circ\text{C} + 32$$

$$\text{K} = ^\circ\text{C} + 273.15$$

$$\text{average atomic mass} = \Sigma(\text{isotopic mass} \cdot \text{fractional abundance})$$

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