CHEM 1215
Final Exam
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Name _____

TA's Name _____

Lab Section _____

INSTRUCTIONS:

1. This examination consists of a total of 7 different pages. The last two pages includes a periodic table, some useful information 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 or short answer questions.

4. No credit will be awarded if your work is not shown in problems 1, 2, 4 and 6.

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	_____ (34)	_____ (22)	_____ (14)	_____ (30)	_____ (100)

(16) 1. Make the following conversions and show the mathematical set-up.

a) 1.00×10^5 meters to feet

b) $0.258 \frac{\text{lb}}{\text{in}^3}$ to $\frac{\text{g}}{\text{cm}^3}$

(8) 2. Peanut oil has a density of 0.920 $\text{g}\cdot\text{mL}^{-1}$. A recipe calls for 0.667 cups of peanut oil (1 cup = 0.225 L). Calculate the mass, in grams, of peanut oil in this particular recipe.

(10) 3. Diagram the following systems as viewed at the atomic level in the space provided. *Be sure to clearly label each of the substances in your diagram.*

A homogeneous mixture of water vapor and helium gas.

Sodium chloride dissolved in liquid water.

(14) 4. One way to prepare ammonia in the laboartory is by using the neutralization reaction between calcium oxide and ammonium chloride, as shown below;

$$CaO_{(s)} + NH_4Cl_{(s)} \rightarrow NH_{3(g)} + H_2O_{(g)} + CaCl_{2(s)}$$

How many gram of ammonia can be produced when 18.0 g of CaO are combined with 30.0 g of NH_4Cl?

Calculate the mass of each reactant remaining after the reaction has gone to completion.

(8) 5. Complete the following table by inserting the name of a compound or a formula.

Compound Name	Formula
phosphoric acid	
Barium nitrate	
	N_2O_4
	$PbSO_4$

(14) 6. Sulfur dioxide, SO_2, is a common pollutant in the effluent gases of some industrial processes. It can be removed by passing the gas through limestone, $CaCO_3$, before the gas enters the environment. The important reaction is described by the equation,

$$2SO_{2(g)} + 2CaCO_{3(s)} + O_{2(g)} \rightarrow 2CaSO_{4(s)} + 2CO_{2(g)}$$

A 150. g sample of limestone is placed in the effluent stream of a smoke stack. Answer each of the following,

a) how many moles of limestone are there in the 150. g sample?

b) what is the maximum amount of sulfur dioxide, in grams, that could be removed by 150. g of limestone?

c) After passing some effluent gas through a 150. g sample of limestone, analysis shows there is 180. g of $CaSO_4$ in the sample. Can anymore effluent gas be passed over the sample? Support your answer with a calculation.

(12) 7. 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) $Zn_{(s)} + HCl_{(aq)} \rightarrow$

b) $Ba(OH)_{2(aq)} + H_2SO_{4(aq)} \rightarrow$

c) $Na_2CO_{3(s)} + HBr_{(aq)} \rightarrow$

(4) 8. Write the balanced ionic and balanced net ionic chemical equation for 7b. (Remember to include the correct charges on all ions and the phase of each species.)

b))

Ionic equation:

Net Ionic equation:

(7) 9. Describe the difference between an ionic compound and a covalent compound. (Hint: Given a formula how to you tell the difference between an ionic and covalent compound. Describe any characteristic physical properties.)

(7) 10. Describe the difference between an ionic bond and a covalent bond.

Periodic Table of the Elements

	IA												IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1 **H** 1.008	IIA																2 **He** 4.00
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	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.95
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

1 pound (lb) = 453.59237 gram (gm)

1 liter (L) = 1.056718 quart (qt)

4 qt = 1 gallon (gal)

1 inch (in) = 2.54 centimeters (cm)

1 mile = 5280 feet (ft)

$^{\circ}C = \frac{5}{9}(^{\circ}F - 32)$

density of water = $1.00 \frac{g}{mL}$

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

average atomic mass = Σ(isotopic mass · fractional abundance)

6.02×10^{23}

$\lambda = \frac{c}{\nu}$ $E = h\nu$ $c = 3.00 \times 10^{8} \frac{m}{s}$ $h = 6.626 \times 10^{-34}$ J·s

Solubility Table

Ion	Solubility	Exceptions
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