# Chem 1141 Fall 2012 Exam 2A

## Name:\_\_\_\_\_

Please write your full name, and which exam version (2A) you have on the scantron sheet.

Multiple Choice. [3 points each.] Record your answers to the multiple choice questions on the scantron sheet.

ngle atom of Carbon-12 b) 12 u (exac e) 6.022 x 10	2? tly) <sup>-23</sup> g	c) 12.01 g				
are in a 4.0-g sample? 8 c) 1.7	d) 0.29	e) 6.9				
instrument that can "w lection as they move th b) Nuclear M ch e) Magnetror	veigh" individual nrough a magneti Iagnetic Spectron n	atoms and molecules by converting them into c field? neter c) Mass Spectrometer				
mass of carbon in the % c) 40.%	compound C <sub>6</sub> H <sub>12</sub> d) 50.%	eO <sub>6</sub> . e) 72%				
n 4.0 mol of H <sub>2</sub> accordi s: c) NH <sub>3</sub>	ing to the balance d) There is no	ed chemical equation: $N_2 + 3H_2 \longrightarrow 2NH_3$ limiting reagent				
ectrolyte is: I <sub>3</sub> c) HCl	d) NaOH	e) KCl				
is mixed with aqueous Cl <sub>2</sub> c) KC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	potassium chlor d) PbK	ide. The precipitate formed is: e) PbK <sub>2</sub>				
compounds is NOT a s SO4 c) HClO4	strong acid: d) HNO3	e) HF				
f Mn in the MnO <sub>4</sub> <sup>-</sup> ion c) +7	is: d) +8	e) –8				
2SO <sub>4</sub> are there in a 54.0 1 c) 1.82	) g sample? d) 1.59	e) 0.130				
	hgle atom of Carbon-12 b) 12 u (exac e) $6.022 \times 10$ are in a 4.0-g sample? 8 c) 1.7 instrument that can "w lection as they move th b) Nuclear M ph e) Magnetron mass of carbon in the % c) $40.%h 4.0 mol of H2 accordingis:c) NH3ectrolyte is:H3 c) HClis mixed with aqueoussCl2 c) KC2H3O2compounds is NOT a seSO4 c) HClO4f Mn in the MnO4- ionc) +72SO4 are there in a 54.01 c) 1.82$	hgle atom of Carbon-12? b) 12 u (exactly) e) $6.022 \ge 10^{-23}$ g are in a 4.0-g sample? 8 c) 1.7 d) 0.29 instrument that can "weigh" individual lection as they move through a magnetic b) Nuclear Magnetic Spectron ph e) Magnetron mass of carbon in the compound C <sub>6</sub> H <sub>12</sub> % c) 40.% d) 50.% a 4.0 mol of H <sub>2</sub> according to the balance is: c) NH <sub>3</sub> d) There is no ectrolyte is: H <sub>3</sub> c) HCl d) NaOH is mixed with aqueous potassium chlor Cl <sub>2</sub> c) KC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> d) PbK compounds is NOT a strong acid: SO <sub>4</sub> c) HClO <sub>4</sub> d) HNO <sub>3</sub> f Mn in the MnO <sub>4</sub> <sup>-</sup> ion is: c) +7 d) +8 2SO <sub>4</sub> are there in a 54.0 g sample? 1 c) 1.82 d) 1.59				

#### Short Response.

Show all work to receive credit. You must use the factor-label (conversion-factor) method for all conversions. Be sure to show all units and write your answers using the correct number of significant figures or decimal places.

Q11. [10 pts.] Calculate the empirical formula of a compound that contains 64.26% C, 7.21% H, and 28.54% O by mass. If the molar mass of this compound is 168.2 g, then what is its molecular formula?

Q12. [15 pts.] 38.4 g of  $C_2H_6$  undergoes a combustion reaction with 41.0 g of  $O_2$ , and forms 31.4 g of  $CO_2$ . Calculate the percent yield of this reaction.

Hint: Start by writing out a balanced chemical equation.

Q13. [10 pts.] Write out the balanced molecular, full-ionic, and net-ionic equations for the following reaction: Be sure to include all state symbols and charges where necessary.

MOLECULAR:  $\_HBr(aq) + \_Na_2CO_3(aq) \longrightarrow$ 

FULL-IONIC:

NET-IONIC:

Q14. [6 pts.] Write formulas for the following polyatomic ions:

a) sulfite	
b) nitrite	
c) bicarbonate	
d) ammonium	
e) cyanide	
f) nitrate	
/	

Q15. [6 pts.] How many protons, neutrons, and electrons are there in the common ion of calcium-38?

Q16. [5 pts.] Calculate the oxidation number of the **<u>underlined</u>** atom in each of the following compounds:

a) NaH <u>C</u> O3	
b) <b>C</b> <sub>2</sub> H <sub>3</sub> OH	
c) <u>I</u> Br <sub>3</sub>	
d) Li <u>H</u>	
e) K <sub>2</sub> <b>S</b> O <sub>4</sub>	

Q17. [12 pts.] A 5.00 mL sample of  $H_2SO_4(aq)$  required 13.4 g of KOH to completely neutralize it. Calculate the molar concentration of the  $H_2SO_4$ .

Q18. [6 pts.] Give one example of an intensive property, and one example of an extensive property.

#### **INTENSIVE:**

#### EXTENSIVE:

BONUS Question. [3 pts.]

Do you prefer me to use the over-head projector, or to write on the white-board? WHY?

### **Partial List of Solubility Rules**

TABLE 4.2	Solubility in Water	Rules for Common Ionic Compounds at 25°C						
Soluble Compou	nds	Exceptions						
Halides (Cl <sup>-</sup> , Br <sup>-</sup> , I Sulfates (SO <sub>4</sub> <sup>2-</sup> )	[_)	Halides of $Ag^+$ , $Hg_2^{2+}$ , and $Pb^{2+}$ Sulfates of $Ag^+$ , $Ca^{2+}$ , $Sr^{2+}$ , $Ba^{2+}$ , $Hg_2^{2+}$ , and $Pb^{2+}$						
Insoluble Compounds		Exceptions						
Carbonates ( $CO_3^{2-}$ ), phosphates ( $PO_4^{3-}$ ), chromates ( $CrO_4^{2-}$ ), and sulfides ( $S^{2-}$ )		Compounds containing alkali metal ions and the ammonium ion						
Hydroxides (OH <sup>-</sup> )		Compounds containing alkali metal ions and the $Ba^{2+}$ ion						

## **Useful Information:**

 $M_1 V_1 = M_2 V_2$  $N_A = 6.022 \ge 10^{23}$ 

## **Periodic Table**

1																	18
IA																	VIIIA
1																	2
H	2											13	14	15	16	17	He
1.01	IIA											IIIA	IVA	VA	VIA	VIIA	4.00
3	4											5	6	7	8	9	10
Li	Be											В	С	Ν	0	F	Ne
6.94	9.01											10.81	12.01	14.01	16.00	19.00	20.18
11	12		4	e	~	7	0	0	10	11	10	13	14	15 D	16 C	17	18
Na	Mg	3	4	2	6	/	8	9	10	11	12	AI	Si	Р	S	CI	Ar
22.99	24.31	1118	IVB	VB	VIB	VIIB	24	VIIIB		IB 00	IIB	26.98	28.09	30.97	32.07	35.45	39.95
19	20	21	22	23	24	25	26	2/	28	29	30	31	32	33	54	35 D	30
ĸ	Ca	Sc	11	V	Cr	NIN	re	Co	IN1	Cu	Zn	Ga	Ge	AS	Se	Br	Kr
39.1	40.08	44.96	47.88	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.39	69,72	72.61	74.92	78.96	79.90	83.80
5/ DL	58	39	40	41	42	45		45 DL	40 D-J	4/	40	49 T	50	51 Ch	32 To	33 T	Va Va
KD 05.45	Sr	Y		IND	IVIO	10	Ku 101.07	<b>Kn</b>	ra	Ag		114.02	50	50	107.6	10(0	121.20
85.47	87.62	88.91	91.22	92.91	95.94	(98)	101.07	102.91	79	70	112.41	01	118./1	92	127.0	95	86
0	Do	Ta*	TIE	To	74 XX7	De	0	T.	70 D4	A	Ца	TI	Dh	<b>D</b> ;	Do	44	Dn
122.0	107.0	128.0	179.6	180.0	102.0	Re	US	11	ri I	Au	ng i	11	r D	DI	E 0 1	AL	КЦ
87	157.5	1 130.9	1/01			106.3	100.2	102.2	105.1	107.0	200.6	204.4	207.2	200	(200)	(210)	(222)
	88	80	104	105	183.9	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209	(209)	(210)	(222)
Fr	88 Do	89	104 Df	105 Db	183.9 106	186.2 107 Bh	190.2 108	192.2 109 Mt	195.1 110 De	197.0 111 <b>D</b> a	200.6	204.4	207.2	209	(209)	(210)	(222)
<b>Fr</b>	88 <b>Ra</b> (226)	89 Ac^ (227)	104 <b>Rf</b> (261)	105 Db (262)	106 Sg	186.2 107 Bh (264)	190.2 108 Hs (265)	192,2 109 Mt (268)	195,1 110 <b>Ds</b> (271)	197.0 111 <b>Rg</b> (272)	200.6	204.4	207.2	209	(209)	(210)	(222)
<b>Fr</b> (223)	88 Ra (226)	89 Ac^ (227)	104 <b>Rf</b> (261)	105 Db (262)	106 Sg (263)	186.2 107 Bh (264)	190.2 108 <b>Hs</b> (265)	192.2 109 Mt (268)	195.1 110 <b>Ds</b> (271)	197.0 111 <b>Rg</b> (272)	200.6	204.4	207.2	209	(209)	(210)	(222)
<b>Fr</b> (223)	88 <b>Ra</b> (226)	89 Ac^ (227)	104 <b>Rf</b> (261)	105 Db (262)	183.9 106 <b>Sg</b> (263)	186.2 107 <b>Bh</b> (264)	190.2 108 Hs (265)	192,2 109 Mt (268)	195.1 110 <b>Ds</b> (271)	197.0 111 <b>Rg</b> (272)	200.6	204.4	207.2	209	(209)	(210)	(222)
<b>Fr</b> (223)	88 <b>Ra</b> (226)	89 Ac^ (227)	104 <b>Rf</b> (261) 58	100.9 105 <b>Db</b> (262)	183.9 106 <b>Sg</b> (263) 60	186.2 107 <b>Bh</b> (264) 61	190.2 108 Hs (265)	192.2 109 Mt (268) 63	195,1 110 <b>Ds</b> (271) 64	197.0 111 <b>Rg</b> (272) 65	200.6 66	204.4 67	207.2 68	209 69	(209) 70	(210)	(222)
<b>Fr</b> (223)	88 Ra (226)	89 Ac^ (227)	104 Rf (261) 58 Ce	100.9 105 <b>Db</b> (262) 59 <b>Pr</b>	183.9 106 <b>Sg</b> (263) 60 <b>Nd</b>	186.2 107 <b>Bh</b> (264) 61 <b>Pm</b>	190.2 108 Hs (265) 62 Sm	192.2 109 Mt (268) 63 Eu	195,1 110 <b>Ds</b> (271) 64 <b>Gd</b>	197.0 111 <b>Rg</b> (272) 65 <b>Tb</b>	200.6 66 <b>Dy</b>	204.4 67 <b>Ho</b>	207.2 68 Er	209 69 <b>Tm</b>	(209) 70 <b>Yb</b>	(210) 71 Lu	(222)
<b>Fr</b> (223)	88 Ra (226)	89 Ac^ (227) *	104 <b>Rf</b> (261) 58 <b>Ce</b> 140.1	100.9 105 <b>Db</b> (262) 59 <b>Pr</b> 140.9	183.9 106 <b>Sg</b> (263) 60 <b>Nd</b> 144.2	186.2 107 <b>Bh</b> (264) 61 <b>Pm</b> (145)	190.2 108 Hs (265) 62 Sm 150.4	192,2 109 Mt (268) 63 Eu 152.0	195.1 110 <b>Ds</b> (271) 64 <b>Gd</b> 157.3	197.0 111 <b>Rg</b> (272) 65 <b>Tb</b> 158.9	200.6 66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 <b>Tm</b> 168.9	(209) 70 <b>Yb</b> 173.0	(210) 71 <b>Lu</b> 175.0	(222)
<b>Fr</b> (223)	88 <b>Ra</b> (226)	89 Ac^ (227)	104 <b>Rf</b> (261) 58 <b>Ce</b> 140.1 90 <b>Th</b>	100.9 105 <b>Db</b> (262) 59 <b>Pr</b> 140.9 91	183.9 106 <b>Sg</b> (263) 60 <b>Nd</b> 144.2 92	186.2 107 Bh (264) 61 Pm (145) 93	190.2 108 Hs (265) 62 Sm 150.4 94 Pm	192.2 109 Mt (268) 63 Eu 152.0 95	195,1 110 <b>Ds</b> (271) 64 <b>Gd</b> 157,3 96	197.0 111 <b>Rg</b> (272) 65 <b>Tb</b> 158.9 97	66 Dy 162.5 98	67 Ho 164.9 99	68 Er 167.3 100	69 <b>Tm</b> 168.9 101	(209) 70 <b>Yb</b> 173.0 102	(210) 71 <b>Lu</b> 175.0 103	(222)
<b>Fr</b> (223)	88 Ra (226)	89 Ac^ (227) *	104 Rf (261) 58 Ce 140.1 90 Th	100.9 105 <b>Db</b> (262) 59 <b>Pr</b> 140.9 91 <b>Pa</b>	183.9 106 <b>Sg</b> (263) 60 <b>Nd</b> 144.2 92 U	186.2 107 Bh (264) 61 Pm (145) 93 Np	190.2 108 Hs (265) 62 Sm 150.4 94 Pu Pu	192.2 109 Mt (268) 63 Eu 152.0 95 Am	195,1 110 <b>Ds</b> (271) 64 <b>Gd</b> 157,3 96 <b>Cm</b>	197.0 111 <b>Rg</b> (272) 65 <b>Tb</b> 158.9 97 <b>Bk</b>	200.6 66 Dy 162.5 98 Cf	67 Ho 164.9 99 Es	68 Er 167.3 100 Fm	69 <b>Tm</b> 168.9 101 <b>Md</b>	(209) 70 <b>Yb</b> 173.0 102 <b>No</b>	(210) 71 Lu 175.0 103 Lr	(222)