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.

Q1. What is the mass of a single atom of Carbon-12?

a) 12.01 u b) 12 u (exactly) c) 12.01 g
d) 12 g (exactly) e) 6.022×10^{-23} g

Q2. How many moles of Li are in a 4.0-g sample?

a) 28 b) 0.58 c) 1.7 d) 0.29 e) 6.9

Q3. What is the name of the instrument that can "weigh" individual atoms and molecules by converting them into ions, and measuring their deflection as they move through a magnetic field?

a) Analytical Balance b) Nuclear Magnetic Spectrometer c) Mass Spectrometer
d) Gas-Chromatograph e) Magnetron

Q4. Calculate the percent by mass of carbon in the compound $C_6H_{12}O_6$.

a) 25% b) 33% c) 40.% d) 50.% e) 72%

Q5. 3.0 mol of N_2 reacts with 4.0 mol of H_2 according to the balanced chemical equation: $N_2 + 3H_2 \longrightarrow 2NH_3$
The limiting reagent is:

a) N_2 b) H_2 c) NH_3 d) There is no limiting reagent

Q6. An example of a weak electrolyte is:

a) $C_6H_{12}O_6$ b) NH_3 c) HCl d) NaOH e) KCl

Q7. Aqueous lead(II) acetate is mixed with aqueous potassium chloride. The precipitate formed is:

a) PbCl b) $PbCl_2$ c) $KC_2H_3O_2$ d) PbK e) PbK_2

Q8. Which of the following compounds is NOT a strong acid:

a) HCl b) H_2SO_4 c) $HClO_4$ d) HNO_3 e) HF

Q9. The oxidation number of Mn in the MnO_4^- ion is:

a) +3 b) +4 c) +7 d) +8 e) –8

Q10. How many moles of H_2SO_4 are there in a 54.0 g sample?

a) 0.551 b) 98.1 c) 1.82 d) 1.59 e) 0.130

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 **underlined** atom in each of the following compounds:

a) $NaH\underline{\mathbf{C}}O_3$ _____

b) $\underline{\mathbf{C}}_2H_3OH$ _____

c) $\underline{\mathbf{I}}Br_3$ _____

d) $Li\underline{\mathbf{H}}$ _____

e) $K_2\underline{\mathbf{S}}O_4$ _____

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 Rules for Common Ionic Compounds in Water at 25°C

Soluble Compounds	Exceptions
Halides (Cl^-, Br^-, I^-)	Halides of Ag^+, Hg_2^{2+}, and Pb^{2+}
Sulfates (SO_4^{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^-)	Compounds containing alkali metal ions and the Ba^{2+} ion

Useful Information:

$M_1V_1 = M_2V_2$

$N_A = 6.022 \times 10^{23}$

Periodic Table

1 IA												13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1 H 1.01	2 IIA																2 He 4.00
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
11 Na 22.99	12 Mg 24.31	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIIIB	10	11 IB	12 IIB	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.1	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 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
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 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.6	53 I 126.9	54 Xe 131.29
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	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	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac^ (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 Ds (271)	111 Rg (272)							

*	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 157.3	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
^	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	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)