Exam 3
Chem 1121
Fall 2009

Name:_____

Show all work to receive credit.

Q1. [10 pts.] Balance the following equations using the lowest whole-number coefficients:

a) The oxidation of ethyl alcohol to acetic acid:

$$\_\_C_2H_6O(l) + \_\_O_2(g) \longrightarrow \_\_C_2H_6O_2(l)$$

b) The combustion of butane:

$$\_\_C_4H_{10}(g) + \_\_O_2(g) \longrightarrow \_\_CO_2(g) + \_\_H_2O(l)$$

c) The anaerobic fermentation of sugar:

$$\_\_C_6H_{12}O_6(s) \longrightarrow \_\_C_2H_6O(l) + \_\_CO_2(g)$$

Q2. [9 pts.] Convert the following masses to moles. Show ALL work!

a) 34.5 g urea, N_2H_4CO

b) 24.4 g vitamin C, $C_6H_8O_6$

Q3. [5 pts.] How many moles of formaldehyde are in 24.5 mL of a solution whose molar concentration is 0.350 M? Show all work.

Q4. [8 pts.] A sample of gas with a pressure of 452 mmHg and a volume of 3.2 L is compressed until its new volume is 0.89 L. What will its pressure become? (Assume the temperature does not change.)

Q5. [8 pts.] A cylinder of hairspray with a pressure of 1.01 atm at a temperature of 15 ºC is thrown onto a fire whose temperature is 581 ºC. What will the pressure of the hairspray change to?

Q6. Urea breaks down via the following unbalanced chemical equation:

$$\_\_N_2H_4CO + \_\_H_2O \longrightarrow \_\_NH_3 + \_\_CO_2$$

a) [4 pts.] Balance the chemical equation using the lowest set of whole number coefficients.

b) [4 pts.] How many moles of NH_3 are formed from the complete reaction of 3.4 mol urea, N_2H_4CO? Show all work. Be sure to use the conversion-factor (factor-label) method.

c) [8 pts.] How many grams of NH_3 can be formed from the complete break-down of 15.1 g urea, N_2H_4CO? Show all work. Be sure to use the conversion-factor (factor-label) method.

Q7. [8 pts.] Define the following terms:

a) Saturated solution

b) Unsaturated solution

c) Supersaturated solution

d) Aqueous solution

Q8. [4 pts.] How does adding an ionic compound, such as ammonium nitrate, NH_4NO_3, to water affect its boiling point and freezing point?

a) Effect upon boiling point

b) Effect upon freezing point

Q9. [10 pts.] Using the ideal gas equation, calculate the pressure that 1.4 g of CH_4 will exert at a temperature of 0 ºC and a volume of 1.03 L.

Q10. [1 pt.] What will happen if a red blood cell is added to a *hypotonic* solution?

[4 pts.] Explain why.

Q11. [9 pts.] What are the three steps involved in the dissolving of an ionic compound, such as NaCl? Draw pictures to illustrate.

i)

ii)

iii)

Q12. (i) [2 pts.] What is meant by the term: vapor pressure?

ii) [6 pts.] Sketch a graph of vapor pressure vs. temperature. Label your axes. Explain how you can use your graph to determine the *normal boiling point* of the substance it represents.

BONUS QUESTION:
Ringer's solution, used in the treatment of burns and wounds, is prepared by dissolving 8.6 g NaCl, 0.3 g KCl, and 0.33g $CaCl_2$ in water and diluting to a volume of 1.00 L.

What is the molarity of each component?

Useful Information

1 atm = 760 mmHg = 760 torr = 101,325 Pa

$pV = nRT$ $P_1V_1=P_2V_2$ $V_1/T_1=V_2/T_2$ $P_1/T_1=P_2/T_2$

$R = 0.08206$ L·atm/mol·K

$T(K) = t(°C) + 273$

Periodic Table of the Elements

IA	IIA											IIIA	IVA	VA	VIA	VIIA	VIIIA
1																	*18*
1 H 1.01	*2*											*13*	*14*	*15*	*16*	*17*	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*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	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 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	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 74.92160	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 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba* 137.33	71 Lu 174.97	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po [210]	85 At [210]	86 Rn [222]
87 Fr [223]	88 Ra** [226]	103 Lr [262]	104 Rf [261]	105 Db [262]	106 Sg [266]	107 Bh [264]	108 Hs [265]	109 Mt [268]	110 [269]	111 [272]	112 [277]	113	114 [285]	115	116 [289]	117	118 [293]

*	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm [145]	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04
**	89 Ac [227]	90 Th 232.04	91 Pa 231.04	92 U 238.03	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]