Exam 5a
Chem 1121
Summer 2008

Name:_____

Take a deep breath, and relax! First, answer the questions you know how to do and then work on the more difficult problems. Don't forget to show all your work, so I can give you as much credit as possible.

Good Luck!

Andy

Q1 [10 pts.] Sketch a diagram of energy vs. time for an ENDOTHERMIC reaction. Be sure to clearly label the position of the Reactants, Products, Transition-State, and the Activation Energy.

Q2 [8 pts.] Consider the equilibrium: $CO_2(g) + H_2O(l) \rightleftharpoons H_2CO_3(aq)$ + heat

Which direction (*left* or *right*) does the equilibrium shift when:

a) The amount of CO_2 is increased. _____

b) The amount of H_2CO_3 is decreased._____

c) The amount of H_2O is increased. _____

d) Heat is added. _____

Q3 [6 pts.] What are the three factors that affect the rate of chemical reactions?

i)

ii)

iii)

Q4 [6 pts.] What is the %(w/w) of a solution of 5.40 g of glucose and 45.00 g of water?

Q5 [6 pts.] How many grams of glucose are there in 125 mL of a 1.50 %(w/v) solution of glucose?

Q6 [12 pts.] Describe what would happen if a red blood cell was placed into:

i) An isotonic solution:

ii) A hypertonic solution:

iii) A hypotonic solution:

Q7 [8 pts.] Write down the chemical reaction corresponding to the self-ionization of water. At 25 ºC, what are the concentrations of the individual ions?

Q8 [6 pts.] Explain the difference between a strong acid and a weak acid.

Q9 [8 pts.] Sulfuric acid is a diprotic acid.

i) What does diprotic mean?

ii) Write down the dissociation reaction(s) for sulfuric acid in water.

Q10 [12 pts] For the following chemical equation:

$$NH_3 + CH_3CO_2H \rightleftharpoons NH_4^+ + CH_3CO_2^-$$

Identify each of the four species: NH_3, CH_3CO_2H, NH_4^+, and $CH_3CO_2^-$ as being either an acid or a base according to the Brønsted-Löwry of acids and bases.

Q11 [12 pts.] Give two properties of acids and bases:

ACIDS:

i)

ii)

BASES:

i)

ii)

Q12 [6 pts.] What is a catalyst? How does it work?

BONUS QUESTION:

What is an enzyme?

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]

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

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

$R = 0.08206$ L·atm/mol·K

$T(\text{K}) = t(^\circ\text{C}) + 273$

$\text{pH} = -\log_{10}[\text{H}^+]$ $\quad [\text{H}^+] = 10^{-\text{pH}}$ $\quad K_w = 1.0 \times 10^{-14} = [\text{H}^+][\text{OH}^-]$ (25°C)