Chem 1B Midterm 1

Practice Test

Credit will only be given for answers on this sheet. Units must be included in your answers and points will be taken off for incorrect or missing units. No partial credit will be awarded. Calculators are allowed. Cell phones may not be used as calculators. **If any of the following occurs you will receive a 0 on your test: 1) your cell phone goes off or if 2) you are not following making policies.**

Name:	**Perm Number**

Make sure writing is dark and large enough to be picked up by a scanner. Failure to do this results in the loss of 5 points on the exam.

If you are sitting next to someone with the same version of the test you both will lose 5 points.

Fundamentals	
Question (Points)	**Answer**
1 (5 pts)	13.7
2 (6 pts)	8×10^{18}
3 (7 pts)	9.8×10^{-5}
4 (5 pts)	$K = \frac{[HI]^2[Cl_2]}{[HCl]^2}$
5 (7 pts)	● Left ○ Right ○ At Equilibrium
6 (6 pts) 3,3	HPO_4^{2-}
	H_2O

Challenge Problems				
Question (Points)	**Answer**			
7 (14 pts) 9,1,1,1,1,1	$[H_2]$ = 0.68 M	$[I_2]$ = 0.181 M	[HI] = 0.827 M	
	Remove HI	○ Reactants	● Products	○ No Change
	Reduce V	○ Reactants	○ Products	● No Change
	Increase T	● Reactants	○ Products	○ No Change
	Add Ne	○ Reactants	○ Products	● No Change
	Add H_2	○ Reactants	● Products	○ No Change
8 (12 pts) 1,1,1,1,8	KBr	○ Acid	○ Base	● Neutral
	LiF	○ Acid	● Base	○ Neutral
	$BaCl_2$	○ Acid	○ Base	● Neutral
	C_5H_5NHF	● Acid	○ Base	○ Neutral
	11.11			

Multiple Choice	
Question (Points)	**Answer**
9 (7 pts)	● A ○ B ○ C ○ D ○ E
10 (6 pts)	○ A ○ B ○ C ○ D ● E
11 (5 pts)	○ A ● B ○ C ○ D ○ E
12 (6 pts)	○ A ○ B ○ C ○ D ● E
13 (6 pts)	● A ○ B ○ C ○ D ○ E
14 (8 pts)	○ A ○ B ● C ○ D ○ E

Fundamental Questions

1) *5 pts* Calculate the pH of 0.25 M $Ba(OH)_2$.

2) *6 pts* Given the following equilibrium constants at 427°C

$Na_2O(s) \rightleftharpoons 2Na(l) + \frac{1}{2}O_2(g)$ $K_1 = 2 \times 10^{-25}$

$NaO(g) \rightleftharpoons Na(l) + \frac{1}{2}O_2(g)$ $K_2 = 2 \times 10^{-5}$

$Na_2O_2(s) \rightleftharpoons 2Na(l) + O_2(l)$ $K_3 = 5 \times 10^{-29}$

$NaO_2(s) \rightleftharpoons Na(l) + O_2(g)$ $K_4 = 3 \times 10^{-14}$

Determine the value for the equilibrium constant for

$2NaO(g) \rightleftharpoons Na_2O_2(s)$

3) *7 pts* The pH of a 0.78 M solution of barbituric acid ($HC_4H_3N_2O_3$) is measured to be 2.06. Calculate the acid dissociation constant K_a of barbituric acid. Round your answer to 2 significant digits.

4) *5 pts* What is the equilibrium expression for the following reaction?

$$2HCl(g) + I_2(s) \rightarrow 2HI(g) + Cl_2(g)$$

5) *7 pts* If the equilibrium constant K for the reaction A(aq) ⇌ 2B(aq) is 22 at a given temperature, and if [A] = 0.10 M and [B] = 2.0 M in a reaction mixture at that temperature, will the reaction primary run to the left, right, or is the reaction at equilibrium?

6a) *3 pts* What is the conjugate base of $H_2PO_4^-$?

6b) *3 pts* What is the conjugate acid of NaOH?

Challenge Problems

7a) *9 pts* The equilibrium constant K for the reaction

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$$

is 54.3 at 430°C. At the start of the reaction there are 0.713 mole of H_2, 0.984 mole of I_2, and 0.886 mole of HI in a 2.40 L reaction chamber. Calculate the concentrations of the gases at equilibrium.

7b) *5 pts* When the equilibrium is disturbed, in which direction will the reaction proceed? Circle the correct answer.

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g) \qquad \text{exothermic}$$

Remove HI	Reactants	Products	No Change
Reduce the volume	Reactants	Products	No Change
Increase the temperature	Reactants	Products	No Change
Add Ne	Reactants	Products	No Change
Add H_2	Reactants	Products	No Change

8a) *4 pts* Determine the acid base properties of the following salts. Circle the correct answer.

KBr	Acid	Base	Neutral
LiF	Acid	Base	Neutral
$BaCl_2$	Acid	Base	Neutral
C_5H_5NHF	Acid	Base	Neutral

8b) *8 pts* What is the the pH of 0.10 M NaCN?

Multiple Choice

9) *7 pts* The acids $HC_2H_3O_2$ and HF are both weak, but HF is a stronger acid than $HC_2H_3O_2$. HCl is a strong acid. Order the following according to base strength.

a. $C_2H_3O_2^- > F^- > H_2O > Cl^-$
b. $F^- > C_2H_3O_2^- > H_2O > Cl^-$
c. $C_2H_3O_2^- > F^- > Cl^- > H_2O$
d. $Cl^- > F^- > C_2H_3O_2^- > H_2O$
e. None of the above

10) *6 pts* Given:

$P_4(s) + 6Cl_2(g) \rightleftharpoons 4PCl_3(l)$ K

Calculate the equilibrium constant for the following reaction.

$2PCl_3(l) \rightleftharpoons 3Cl_2(g) + \frac{1}{2} P_4(s)$

a. $1/K^2$
b. $1/K$
c. $K^{1/2}$
d. $-K^{1/2}$
e. $1/K^{1/2}$

11) *5 pts* The following Kp values were collected for a system.

$K_P = 6.8 \times 10^{-4}$ $T = 25^\circ C$
$K_P = 1.9 \times 10^{-4}$ $T = 400^\circ C$

Is the reaction endothermic of exothermic?

a. Endothermic
b. Exothermic

12) *6 pts* What is the relationship between K and K_p for the reaction below?

$2HgO(s) \rightleftharpoons 2Hg(l) + O_2(g)$

a. $K = RTK_P$
b. $K = (RT)^2K_P$
c. $K_P = (RT)^2K$
d. $K_P = K$
e. None of the above

13) *6 pts* Which of the following indicates the most acidic solution?

a. $[H^+] = 0.3$ M
b. $[OH^-] = 0.5$ M
c. pOH=5.9
d. pH = 1.2
e. $[H^+] = 1.0 \times 10^{-4}$ M

14) *8 pts* The pH of a 0.10 M solution of a weak base is 9.82. What is the K_b for this base?

a. 6.6×10^{-4} M
b. 2.1×10^{-4} M
c. 4.3×10^{-8} M
d. 2.0×10^{-5} M
e. None of the above