

# 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.**

<b>Name:</b>	<b>Perm Number</b>

**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
<b>1</b> (5 pts)	13.7
<b>2</b> (6 pts)	$8 \times 10^{18}$
<b>3</b> (7 pts)	$9.8 \times 10^{-5}$
<b>4</b> (5 pts)	$K = \frac{[HI]^2[Cl_2]}{[HCl]^2}$
<b>5</b> (7 pts)	<input checked="" type="radio"/> Left <input type="radio"/> Right <input type="radio"/> At Equilibrium
<b>6</b> (6 pts) 3,3	HPO <sub>4</sub> <sup>2-</sup>
	H <sub>2</sub> O

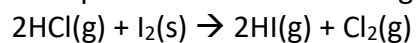
Challenge Problems				
Question (Points)	Answer			
<b>7</b> (14 pts) 9,1,1,1,1,1	[H <sub>2</sub> ] = 0.068 M	[I <sub>2</sub> ] = 0.181 M	[HI] = 0.827 M	
	Remove HI	<input type="radio"/> Reactants	<input checked="" type="radio"/> Products	<input type="radio"/> No Change
	Reduce V	<input type="radio"/> Reactants	<input type="radio"/> Products	<input checked="" type="radio"/> No Change
	Increase T	<input checked="" type="radio"/> Reactants	<input type="radio"/> Products	<input type="radio"/> No Change
	Add Ne	<input type="radio"/> Reactants	<input type="radio"/> Products	<input checked="" type="radio"/> No Change
	Add H <sub>2</sub>	<input type="radio"/> Reactants	<input checked="" type="radio"/> Products	<input type="radio"/> No Change
<b>8</b> (12 pts) 1,1,1,1,8	KBr	<input type="radio"/> Acid	<input type="radio"/> Base	<input checked="" type="radio"/> Neutral
	LiF	<input type="radio"/> Acid	<input checked="" type="radio"/> Base	<input type="radio"/> Neutral
	BaCl <sub>2</sub>	<input type="radio"/> Acid	<input type="radio"/> Base	<input checked="" type="radio"/> Neutral
	C <sub>5</sub> H <sub>5</sub> NHF	<input checked="" type="radio"/> Acid	<input type="radio"/> Base	<input type="radio"/> Neutral
	11.11			

Multiple Choice					
Question (Points)	Answer				
<b>9</b> (7 pts)	<input checked="" type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D	<input type="radio"/> E
<b>10</b> (6 pts)	<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D	<input checked="" type="radio"/> E
<b>11</b> (5 pts)	<input type="radio"/> A	<input checked="" type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D	<input type="radio"/> E
<b>12</b> (6 pts)	<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D	<input checked="" type="radio"/> E
<b>13</b> (6 pts)	<input checked="" type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D	<input type="radio"/> E
<b>14</b> (8 pts)	<input type="radio"/> A	<input type="radio"/> B	<input checked="" type="radio"/> C	<input type="radio"/> D	<input type="radio"/> E

## Fundamental Questions

- 1) 5 pts Calculate the pH of 0.25 M Ba(OH)<sub>2</sub>.
- 2) 6 pts Given the following equilibrium constants at 427°C
- $$\text{Na}_2\text{O(s)} \rightleftharpoons 2\text{Na(l)} + \frac{1}{2}\text{O}_2\text{(g)} \quad K_1 = 2 \times 10^{-25}$$
- $$\text{NaO(g)} \rightleftharpoons \text{Na(l)} + \frac{1}{2}\text{O}_2\text{(g)} \quad K_2 = 2 \times 10^{-5}$$
- $$\text{Na}_2\text{O}_2\text{(s)} \rightleftharpoons 2\text{Na(l)} + \text{O}_2\text{(g)} \quad K_3 = 5 \times 10^{-29}$$
- $$\text{NaO}_2\text{(s)} \rightleftharpoons \text{Na(l)} + \text{O}_2\text{(g)} \quad K_4 = 3 \times 10^{-14}$$
- Determine the value for the equilibrium constant for
- $$2\text{NaO(g)} \rightleftharpoons \text{Na}_2\text{O}_2\text{(s)}$$
- 3) 7 pts The pH of a 0.78 M solution of barbituric acid (HC<sub>4</sub>H<sub>3</sub>N<sub>2</sub>O<sub>3</sub>) is measured to be 2.06. Calculate the acid dissociation constant K<sub>a</sub> of barbituric acid. Round your answer to 2 significant digits.

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



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

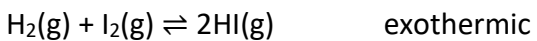
6a) 3 pts What is the conjugate base of  $\text{H}_2\text{PO}_4^-$ ?

6b) 3 pts What is the conjugate acid of  $\text{NaOH}$ ?

### Challenge Problems

- 7a) 9 pts The equilibrium constant  $K$  for the reaction
- $$\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$$
- is 54.3 at 430°C. At the start of the reaction there are 0.713 mole of  $\text{H}_2$ , 0.984 mole of  $\text{I}_2$ , and 0.886 mole of  $\text{HI}$  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.



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 $\text{H}_2$	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 <sub>2</sub>	Acid	Base	Neutral
C <sub>5</sub> H <sub>5</sub> NHF	Acid	Base	Neutral

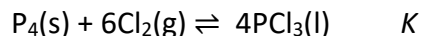
8b) 8 pts What is the the pH of 0.10 M NaCN?

## Multiple Choice

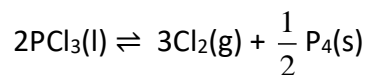
9) 7 pts The acids  $\text{HC}_2\text{H}_3\text{O}_2$  and  $\text{HF}$  are both weak, but  $\text{HF}$  is a stronger acid than  $\text{HC}_2\text{H}_3\text{O}_2$ .  $\text{HCl}$  is a strong acid. Order the following according to base strength.

- a.  $\text{C}_2\text{H}_3\text{O}_2^- > \text{F}^- > \text{H}_2\text{O} > \text{Cl}^-$
- b.  $\text{F}^- > \text{C}_2\text{H}_3\text{O}_2^- > \text{H}_2\text{O} > \text{Cl}^-$
- c.  $\text{C}_2\text{H}_3\text{O}_2^- > \text{F}^- > \text{Cl}^- > \text{H}_2\text{O}$
- d.  $\text{Cl}^- > \text{F}^- > \text{C}_2\text{H}_3\text{O}_2^- > \text{H}_2\text{O}$
- e. None of the above

10) 6 pts Given:



Calculate the equilibrium constant for the following reaction.



- 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  $K_p$  values were collected for a system.

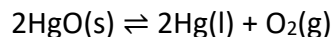
$$K_p = 6.8 \times 10^{-4} \quad T = 25^\circ \text{C}$$

$$K_p = 1.9 \times 10^{-4} \quad T = 400^\circ \text{C}$$

Is the reaction endothermic or exothermic?

- a. Endothermic
- b. Exothermic

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



- a.  $K = RTK_p$
- b.  $K = (RT)^2 K_p$
- c.  $K_p = (RT)^2 K$
- d.  $K_p = K$
- e. None of the above

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

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

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.  $6.6 \times 10^{-4} \text{ M}$
- b.  $2.1 \times 10^{-4} \text{ M}$
- c.  $4.3 \times 10^{-8} \text{ M}$
- d.  $2.0 \times 10^{-5} \text{ M}$
- e. None of the above