

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

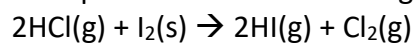
Challenge Problems				
Question (Points)	Answer			
7 (14 pts) 9,1,1,1,1,1	[H ₂] = 0.068 M	[I ₂] = 0.181 M	[HI] = 0.827 M	
	Remove HI	☐ Reactants	☒ Products	☐ No Change
	Reduce V	☐ Reactants	☐ Products	☒ No Change
	Increase T	☒ Reactants	☐ Products	☐ No Change
	Add Ne	☐ Reactants	☐ Products	☒ No Change
	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 ₅ H ₅ NHF	☒ 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
- $$\begin{array}{ll} \text{Na}_2\text{O(s)} \rightleftharpoons 2\text{Na(l)} + \frac{1}{2}\text{O}_2\text{(g)} & K_1 = 2 \times 10^{-25} \\ \text{NaO(g)} \rightleftharpoons \text{Na(l)} + \frac{1}{2}\text{O}_2\text{(g)} & K_2 = 2 \times 10^{-5} \\ \text{Na}_2\text{O}_2\text{(s)} \rightleftharpoons 2\text{Na(l)} + \text{O}_2\text{(l)} & K_3 = 5 \times 10^{-29} \\ \text{NaO}_2\text{(s)} \rightleftharpoons \text{Na(l)} + \text{O}_2\text{(g)} & K_4 = 3 \times 10^{-14} \end{array}$$
- 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 (HC₄H₃N₂O₃) 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?



- 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 primarily run to the left, right, or is the reaction at equilibrium?

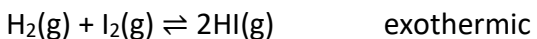
- 6a) 3 pts What is the conjugate base of H_2PO_4^- ?

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

Challenge Problems

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



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
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LiF	Acid	Base	Neutral
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BaCl ₂	Acid	Base	Neutral
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C ₅ H ₅ NHF	Acid	Base	Neutral
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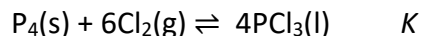
8b) 8 pts What is the the pH of 0.10 M NaCN?

Multiple Choice

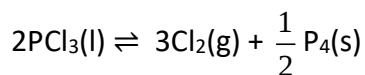
- 9) 7 pts The acids $\text{HC}_2\text{H}_3\text{O}_2$ and HF are both weak, but HF is a stronger acid than $\text{HC}_2\text{H}_3\text{O}_2$. HCl is a strong acid. Order the following according to base strength.

- 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.

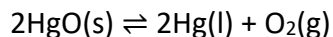
$$K_p = 6.8 \times 10^{-4} \quad T = 25^\circ \text{C}$$

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

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

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