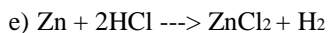
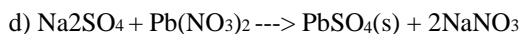
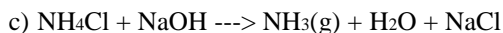
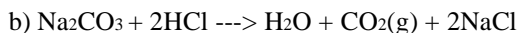
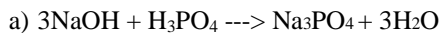
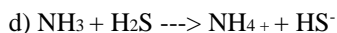
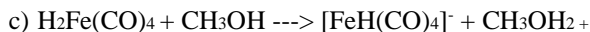
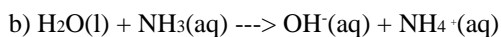
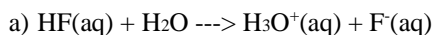


**CHEM 281(01) SPRING 2017. HOMEWORK 7. CHAPTER 4.**

1. Figure out the driving force for following reactions.

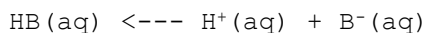


2. Identify the conjugate acid/base pairs in following reactions.



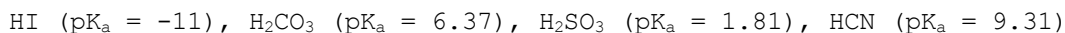
3. Calculate  $\Delta G^\circ$  for autoprotolysis of  $\text{H}_2\text{O}$  and  $\text{NH}_3$  using values of  $K_w = 1 \times 10^{-14}$  and  $K_{am} = 1 \times 10^{-33}$ . Which compound is the stronger acid?

4. A acid HB is dissociating according to the following equation in water.



A solution of HB was prepared by dissolving 1.00 mol of HB in 1 liter of water. After the equilibrium is established HB was found to be 20% dissociated. Calculate  $K_a$  and  $\text{p}K_a$  for the acid HB.

5. Arrange the following compounds in order of increasing acidity:



6. Explain the trend shown by following binary acids in water:

	HF	HCl	HBr	HI
pK <sub>a</sub>	+3	-7	-9	-11

	NH <sub>3</sub>	H <sub>2</sub> O	HF
pK <sub>a</sub>	+33	+14	+3

7. Which acids of the following pairs of acids is the stronger acid?

- a)  $[\text{Fe}(\text{OH}_2)_6]^{3+} / [\text{Fe}(\text{OH}_2)_6]^{2+}$
- b)  $\text{Al}(\text{OH}_2)_6^{3+} / \text{Ga}(\text{OH}_2)_6^{3+}$
- c)  $\text{Si}(\text{OH})_4 / \text{Ge}(\text{OH})_4$
- d)  $\text{HClO}_3 / \text{HClO}_4$
- e)  $\text{H}_2\text{CrO}_4 / \text{HMnO}_4$
- f)  $\text{H}_3\text{PO}_4 / \text{H}_2\text{SO}_4$
- g)  $\text{H}_2\text{SO}_4 / \text{H}_2\text{SeO}_4$
- h)  $\text{HIO}_4 / \text{HClO}_4$

8. Identify the Lewis acids and bases in following reactions:

- a)  $\text{BrF}_3 + \text{F}^- \rightarrow \text{BF}_4^-$
- b)  $\text{BF}_3 + \text{NH}_3 \rightarrow \text{F}_3\text{B-NH}_3$
- c)  $\text{FeCl}_3 + \text{Cl}^- \rightarrow \text{FeCl}_4^-$
- d)  $\text{I} + \text{I}_2 \rightarrow \text{I}_3^-$
- e)  $(\text{SnCl}_3)^- + (\text{CO})_5\text{MnCl} \rightarrow (\text{CO})_5\text{Mn-SnCl}_3 + \text{Cl}^-$

9. Explain why  $\text{Na}^+$  prefers  $\text{F}^-$  to  $\text{I}^-$  where as  $\text{Cu}^+$  prefers  $\text{I}^-$  to  $\text{F}^-$ .

10. Consider the Lewis acids  $(\text{CH}_3)_3\text{Al}$  and  $(\text{CH}_3)_3\text{Ga}$  and the Lewis bases  $(\text{CH}_3)_3\text{N}$ ,  $(\text{CH}_3)_3\text{P}$ , and  $(\text{CH}_3)_3\text{As}$ .

$(\text{CH}_3)_3\text{Al}$  will react most favorably with.

$(\text{CH}_3)_3\text{Ga}$  will react most favorably with.

11. Explain the reaction sequence given below in terms of hard and soft Lewis acid-base behavior:

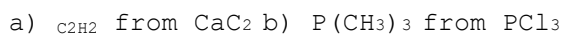


12. Which of the following elements form oxide polyanions and which forms oxide polycations? Al, As, Cu, Mo, Si, B, Ti

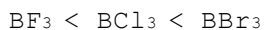
13. Explain why HF acid is used to make marks and dissolve glass.

14. Which of the following metal expected to be found in aluminosilicate minerals and which in sulfides? Cd, Rb, Cr, Pb, Sr, Pd

15. Propose routes for following preparations.



15. Explain the Lewis acidity observed in the following series:



16. Explain the role of  $\text{Al}_2\text{Cl}_6$  as a Lewis acid in Friedel Craft Acylation of benzene.