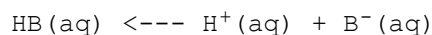


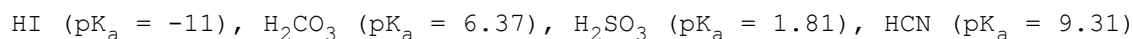
CHEM 281(01) SPRING 2003. HOMEWORK 7. CHAPTER 8.

- Figure out the driving force for following reactions.
 - $3\text{NaOH} + \text{H}_3\text{PO}_4 \rightarrow \text{Na}_3\text{PO}_4 + 3\text{H}_2\text{O}$
 - $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow \text{H}_2\text{O} + \text{CO}_2(\text{g}) + 2\text{NaCl}$
 - $\text{NH}_4\text{Cl} + \text{NaOH} \rightarrow \text{NH}_3(\text{g}) + \text{H}_2\text{O} + \text{NaCl}$
 - $\text{Na}_2\text{SO}_4 + \text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbSO}_4(\text{s}) + 2\text{NaNO}_3$
 - $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
- Identify the conjugate acid/base pairs in following reactions.
 - $\text{HF}(\text{aq}) + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+(\text{aq}) + \text{F}^-(\text{aq})$
 - $\text{H}_2\text{O}(\text{l}) + \text{NH}_3(\text{aq}) \rightarrow \text{OH}^-(\text{aq}) + \text{NH}_4^+(\text{aq})$
 - $\text{H}_2\text{Fe}(\text{CO})_4 + \text{CH}_3\text{OH} \rightarrow [\text{FeH}(\text{CO})_4]^- + \text{CH}_3\text{OH}_2^+$
 - $\text{NH}_3 + \text{H}_2\text{S} \rightarrow \text{NH}_4^+ + \text{HS}^-$
- Calculate ΔG^0 for autoprotolysis of H_2O and NH_3 using values of $K_w = 1 \times 10^{-14}$ and $K_{\text{am}} = 1 \times 10^{-33}$. Which compound is the stronger acid?
- 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.

- Arrange the following compounds in order of increasing acidity:



- Explain the trend shown by following binary acids in water:

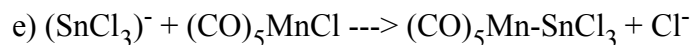
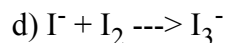
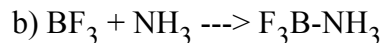
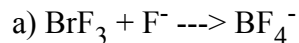
| | | | | |
|---------------|-----------------|------------------|-----|-----|
| | HF | HCl | HBr | HI |
| $\text{p}K_a$ | +3 | -7 | -9 | -11 |
| | NH ₃ | H ₂ O | HF | |
| $\text{p}K_a$ | +33 | +14 | +3 | |

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

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



10. Explain why Na^+ prefers F^- to I^- where as Cu^+ prefers I^- to F^- .

11. 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 _____.

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

AgCl

AgF

$\text{R}_3\text{SiNC} \rightarrow \text{R}_3\text{SiCl} \rightarrow \text{R}_3\text{SiF}$

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

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

14. Propose routes for following preparations.

a) C_2H_2 from CaC_2 b) $\text{P}(\text{CH}_3)_3$ from PCl_3

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

$\text{BF}_3 < \text{BCl}_3 < \text{BBr}_3$

$\text{SiI}_4 < \text{SiBr}_4 < \text{SiCl}_4 < \text{SiF}_4$

16. Explain the role of Al_2Cl_6 as a Lewis acid in Friedel Craft Acylation of benzene.