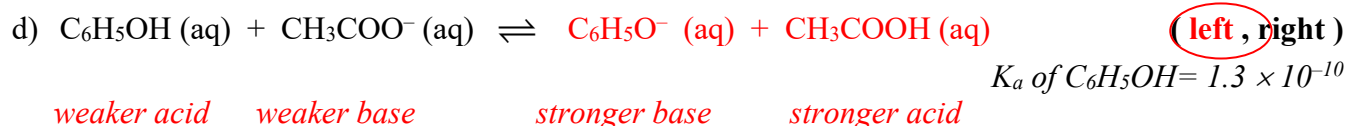
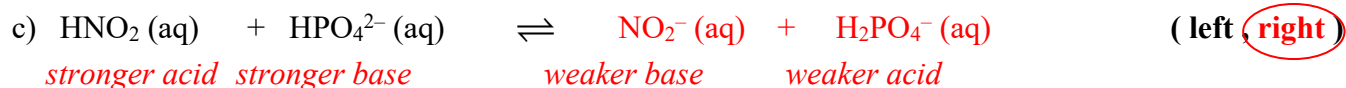
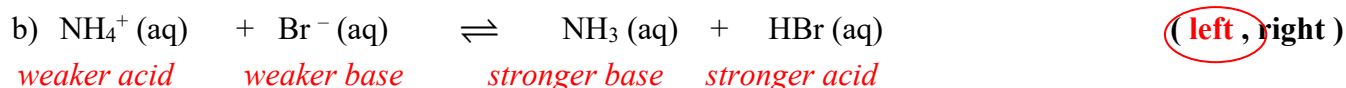
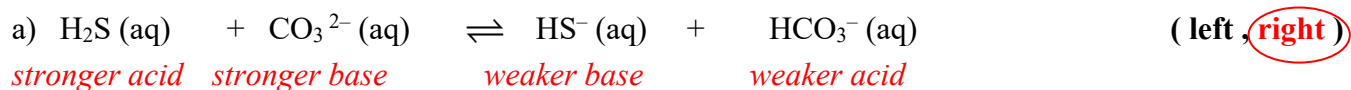


- 1) For each of the following reactions, finish the reactions if needed, then use the K_a values in Chart H to predict whether the equilibrium lies to the left or to the right. To help explain your decision, label substances as “weaker acid”, “stronger acid”, “weaker base”....



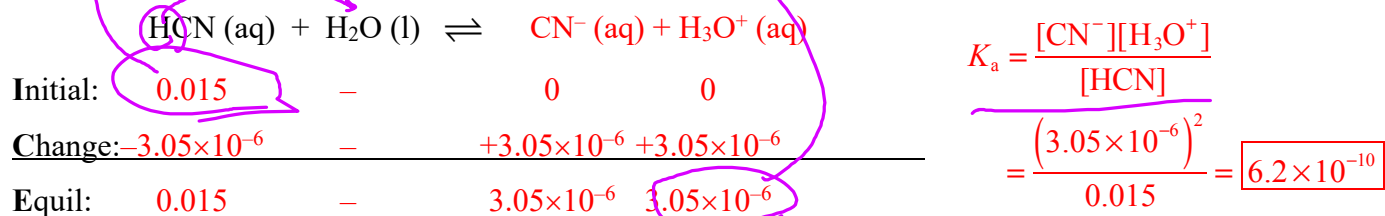
- 2) H_3PO_4 which contains three hydrogen atoms per molecule is a weak acid, whereas HCl , which contains only one hydrogen atom per molecule, is a strong acid. Explain why.
Strengths of acids depend on how easily the acid loses an H^+ . The $\text{H}-\text{Cl}$ bond is more polar than the $\text{O}-\text{H}$ bond in H_3PO_4 , so it is a stronger acid. The number of H's has no effect.

- 3) Based on the information given in Chart H, rank the acids HF , H_2S , HNO_3 and CH_3COOH from strongest to weakest, then identify the following:

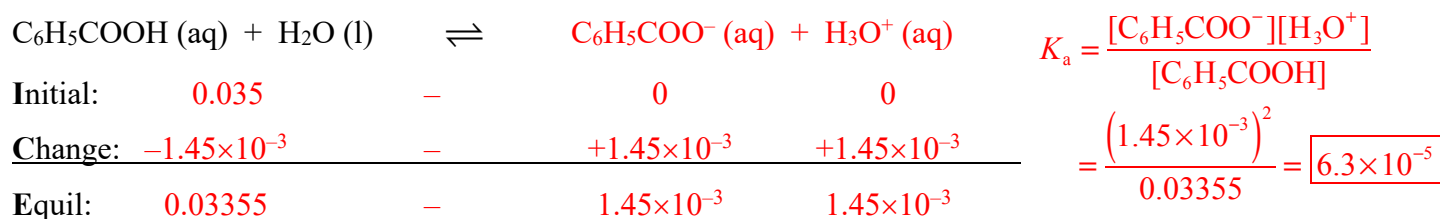
Ranking: Strongest acid $\text{HNO}_3 > \text{HF} > \text{CH}_3\text{COOH} > \text{H}_2\text{S}$ weakest acid

- a) strongest acid: HNO_3
 b) weakest acid: H_2S
 c) strongest conjugate base produced by the acids listed: HS^-
 d) weakest conjugate base produced by the acids listed: NO_3^-
- 4) Explain why the conjugate base of a strong acid is a *very* weak base and the conjugate acid of a strong base is a *very* weak acid.
A strong acid has a weak bond to the H^+ , so easily loses it. The base thus has no tendency to bond to the H^+ since the bond formed would be weak and easily broken. A strong base forms a strong bond to the H^+ , so the bond is too strong for the conjugate acid formed to lose it, and it would be quickly gained back if lost.

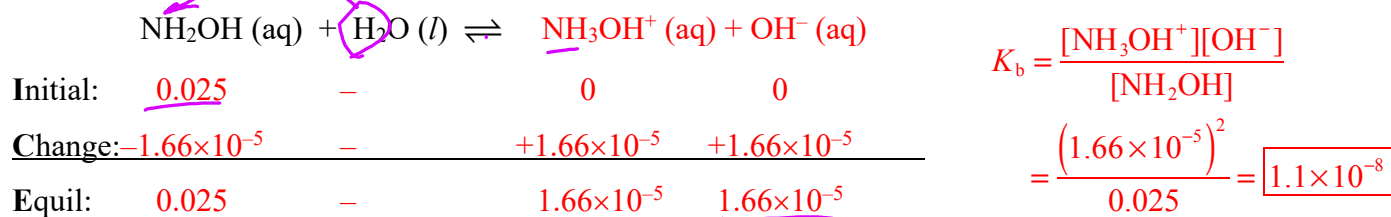
- 5) A 0.015 M solution of hydrogen cyanide (HCN, otherwise known as cyanic acid) has a hydronium ion (H_3O^+) concentration equal to 3.05×10^{-6} M. Complete the reaction, then write the K_a expression for HCN and determine its value.



- 6) A 0.035 M solution of benzoic acid, $\text{C}_6\text{H}_5\text{COOH}$, has a hydronium ion (H_3O^+) concentration equal to 1.45×10^{-3} M. Complete the reaction, then write the K_a expression for HCN and determine its value.



- 7) A 0.025 M solution of hydroxylamine (NH_2OH) has a hydroxide ion concentration equal to 1.66×10^{-5} M. Complete the reaction (this is not ionic—the H^+ from H_2O becomes attached to the N), then write the K_b for this weak base and determine its value.



- 8) A 0.20 M solution of ethylamine ($\text{CH}_3\text{CH}_2\text{NH}_2$) has a hydroxide ion concentration equal to 0.0103 M. Complete the reaction, then write the K_b for this weak base and determine its value.

