

# Lecture 10.3 weak acid/base equilibria: Behind the scenes... H<sub>2</sub>O

Note Title

9/27/2011

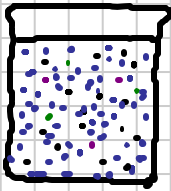
## Simultaneous Equilibria.



eq. 

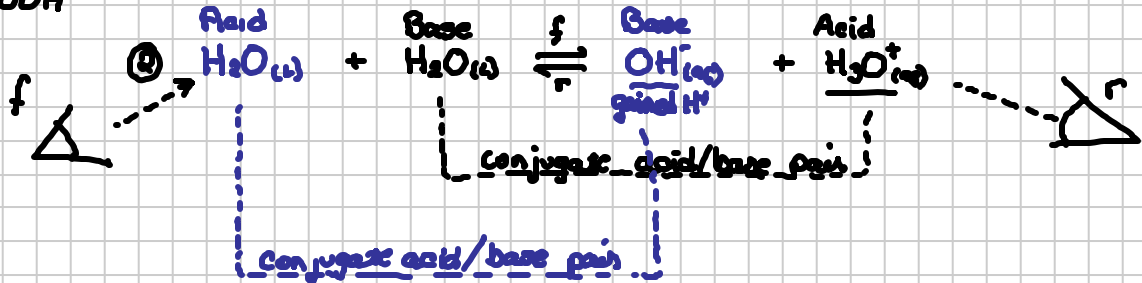






0.10M  
CH<sub>3</sub>COOH

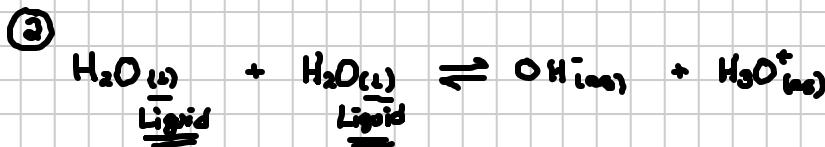
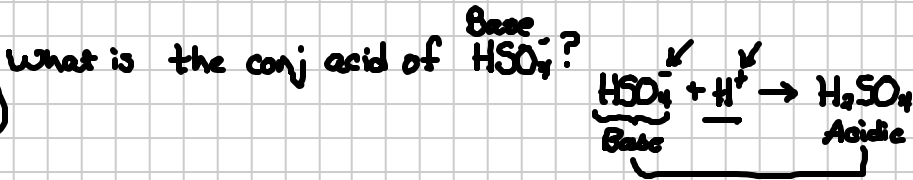
• H<sub>2</sub>O solvent, high concentration.



## Conjugate Acid/base

- 1 proton (H<sup>+</sup>) dif.

- Acid (Xtra proton)  
Base (remove proton)



Law of Mass action.  $K_w = [\text{OH}^-][\text{H}_3\text{O}^+] = 1.00 \times 10^{-14}$  ③ 25°C

$$[\text{OH}^-][\text{H}_3\text{O}^+] = 1.00 \times 10^{-14}$$

$$\log_{10}([\text{OH}^-][\text{H}_3\text{O}^+]) = \log_{10}(1.00 \times 10^{-14})$$

$$(-1) \log_{10}[\text{OH}^-] + \log_{10}[\text{H}_3\text{O}^+] = -14 \quad (-1)$$

$$\underbrace{-\log_{10}[\text{OH}^-]}_{\text{pOH}} + \underbrace{-\log_{10}[\text{H}_3\text{O}^+]}_{\text{pH}} = 14$$

$$\text{pOH} + \text{pH} = 14$$

$$\overset{\checkmark}{\text{pH}} = -\log [\overset{\checkmark}{\text{H}_3\text{O}^+}] \quad | \quad [\overset{\checkmark}{\text{H}_3\text{O}^+}] = 10^{-\overset{\checkmark}{\text{pH}}} \quad \text{🚩}$$

$$\overset{\checkmark}{\text{pOH}} = -\log [\overset{\checkmark}{\text{OH}^-}] \quad | \quad [\overset{\checkmark}{\text{OH}^-}] = 10^{-\overset{\checkmark}{\text{pOH}}}$$

$$\overset{\checkmark}{\text{pK}_{\text{irk}}} = -\log [\overset{\checkmark}{\text{K}_{\text{irk}}}] \quad | \quad [\overset{\checkmark}{\text{K}_{\text{irk}}}] = 10^{-\overset{\checkmark}{\text{pK}_{\text{irk}}}}$$

$$\overset{\checkmark}{\text{pK}_{\text{a}}} = -\log K_{\text{a}} \quad | \quad K_{\text{a}} = 10^{-\overset{\checkmark}{\text{pK}_{\text{a}}}}$$

$$\overset{\checkmark}{\text{pK}_{\text{w}}} = -\log K_{\text{w}} = 14 \quad | \quad K_{\text{w}} = 10^{-\overset{\checkmark}{\text{pK}_{\text{w}}}} = 10^{-14} = 100 \times 10^{-16}$$