Acid-Base Reactions

Chapter 18

Stomach Acidity & Academic Reactions

What is relative pH before & after reaction?

• Strong acid + strong base
  HCl + NaOH ---->

• Strong acid + weak base
  HCl + NH₃ --->

• Weak acid + strong base
  HOAc + NaOH --->

• Weak acid + weak base
  HOAc + NH₃ --->

Acid-Base Reaction

• Add 0.010 mol NaOH to 100. mL of 0.10 M HOAc.
• What is pH before reaction?
• What is Kmet for reaction?
• What is pH when reaction is done?

pH before Acid-Base Reaction

Add 0.010 mol NaOH to 100. mL of 0.10 M HOAc.
(a) What is pH before react? (b) What is Kmet for reaction?
(c) pH when reaction is complete?
HOAc + H₂O → OAc⁻ + H₃O⁺
K₁ = 1.8 x 10⁻⁵

[H₂O⁺] = [K₂ × 0.10]¹²
= 1.3 x 10⁻³
pH before adding NaOH = 2.87

K for Acid-Base Reaction

Add 0.010 mol NaOH to 100. mL of 0.10 M HOAc.
(a) What is pH before react? (b) What is Kmet for reaction?
(c) pH when reaction is complete?
HOAc + H₂O → OAc⁻ + H₃O⁺
K₁ = 1.8 x 10⁻⁵
OH⁻ + H₃O⁺ → 2 H₂O
K₂ = 1.0 x 10¹⁴

K₁ × K₂ = 1.8 x 10⁹
Reaction proceeds from completely left to right!
Add 0.010 mol NaOH to 100 mL of 0.10 M HOAc. What is $K_a$ for reaction? What is pH before reaction? When reaction is complete? Reaction: HOAc + OH$^-$ $\rightarrow$ OAc$^-$ + H$_2$O

After reaction solution contains only OAc$^-$ Therefore, solution is __________

Calculate pH of 0.10 OAc$^-$

$K_b = 5.6 \times 10^{-10}$

$[\text{OAc}^-] = 0.10 M$

$[\text{OH}^-] = 0.010 mol/L$ $[\text{H}_2\text{O}] = 0.10 M$

$\text{pOH} = 5.13$

$pH = 8.87$