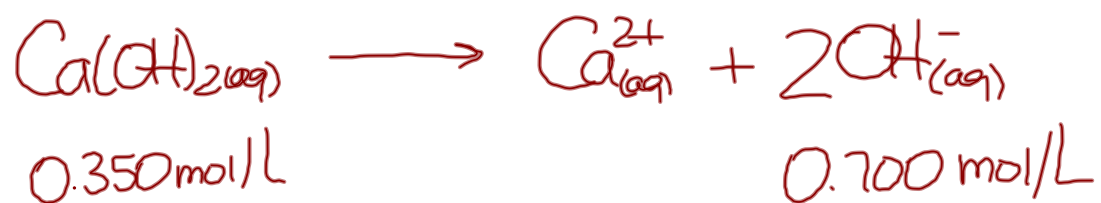


# Acid-Base Chemistry Review

- Acid-Base Concepts
- Water Equilibrium
- Calculating  $K_a$ ,  $K_b$  ( $K_a K_b = K_w$ )
- Predicting Acid-Base Equilibria

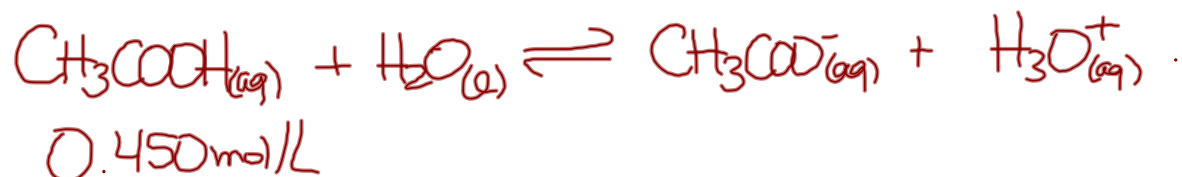
Calculate the pH of a 0.350 mol/L solution of calcium hydroxide.



$$\text{pOH} = -\log[\text{OH}^{-}]$$

$$\text{pH} + \text{pOH} = 14.00$$

Calculate the pH of a 0.450 mol/L solution of acetic acid.

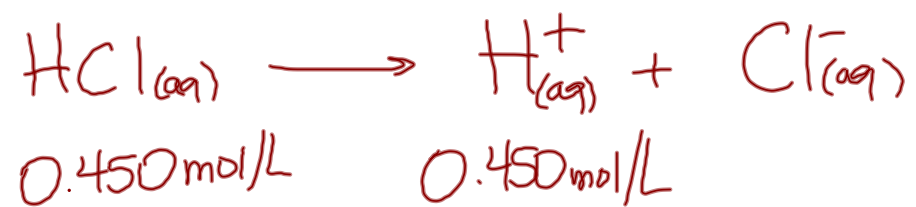


$$K_a = \frac{[\text{CH}_3\text{COO}^-_{(aq)}][\text{H}_3\text{O}^+_{(aq)}]}{[\text{CH}_3\text{COOH}_{(aq)}]}$$

$$K_a = \frac{[\text{H}_3\text{O}^+_{(aq)}]^2}{[\text{CH}_3\text{COOH}_{(aq)}]}$$

$$[\text{H}_3\text{O}^+_{(aq)}] = \sqrt{K_a [\text{CH}_3\text{COOH}_{(aq)}]}$$

Calculate the pH of a 0.450 mol/L solution of HCl.



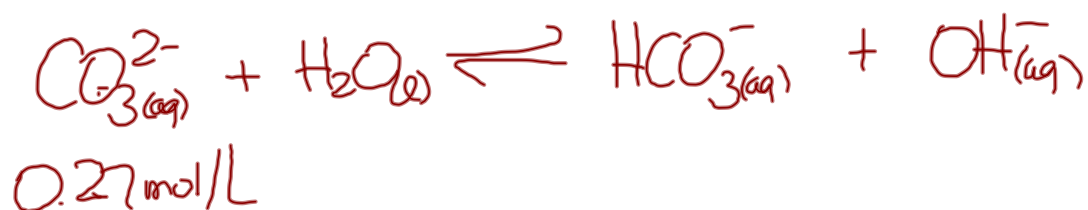
$$\text{pH} = -\log[\text{H}_3\text{O}^+_{(aq)}]$$

Use the five-step method to predict the following acid-base equilibria:

- Ammonium nitrate is added to a nitric acid solution.

- Methanoic acid is added to a sodium hydrogen carbonate solution.

Calculate the pH and hydronium ion concentration if a 0.227 mol/L solution of carbonate ions is added to water.



$$K_b = \frac{[\text{HCO}_3^{-}][\text{OH}^{-}]}{[\text{CO}_3^{2-}]}$$

$$K_b = \frac{[\text{OH}^{-}]^2}{[\text{CO}_3^{2-}]}$$

$$[\text{OH}^{-}] = \sqrt{K_b [\text{CO}_3^{2-}]}$$

$$K_a K_b = K_w$$

$$K_b = \frac{K_w}{K_a}$$