

SCH 4U1: Unit 3 - Chemical Systems and Equilibrium

Big Ideas

- Chemical systems are dynamic and respond to changing conditions in predictable ways.
- Applications of chemical systems at equilibrium have significant implications for nature and industry.

Learning Goals

By the end of this unit, I will be able to...

Date	Learning Goal
	1. Describe what dynamic equilibrium is with regards to chemical processes
	2. Outline the conditions for equilibrium
	3. Determine the equilibrium concentrations for reactants and products in a chemical reaction by using ICE tables
	4. Use the quadratic equation method and approximation rule for solving equilibrium concentrations
	5. Calculate the reaction quotient (Q) to determine which direction a chemical equilibrium is headed
	6. Describe Le Chatelier's Principle and determine how an equilibrium will respond to "stresses"
	7. Identify all strong acids and bases and how they dissociate/ionize in solution
	8. Predict the products between the following reactants - Acid + Metal - Acid + Base - Acid + Carbonate - Acid + Amine
	9. Distinguish between the Bronsted-Lowry and Arrhenius Theory of acids and bases
	10. Identify the conjugate acid and base pairs for an acid and base reaction
	11. Calculate the pH of solution for a reaction between a strong acid and a strong base
	12. Calculate the pH, pOH, $[H_3O^+]$ and $[OH^-]$ for a given acid or base solution
	13. Calculate the acid dissociation constant (K_a), pH at equilibrium, % dissociation and equilibrium concentrations of a weak acid solution
	14. Determine the equilibrium concentrations for a polyprotic acid
	15. Calculate the base dissociation constant (K_b), pH/pOH at equilibrium, % ionization and equilibrium concentrations of a weak base solution
	16. Outline the components of a buffer and describe how a buffer solution prevents changes in pH

	17. Distinguish between an equivalence point and endpoint in a titration
	18. Be able to recognize a strong acid/strong base, strong acid/weak base, weak acid/strong base titration curve
	19. Create a titration curve based on data from the titration of a weak acid and weak base (lab)
	20. Experimentally determine the K_a of a weak acid and K_b of a weak base from a titration curve
	21. Calculate the solubility of salts at equilibrium using the solubility product constant (K_{sp})
	22. Calculate the solubility product constant (K_{sp}) given the solubility concentrations of salts at equilibrium