

Chemistry AP Unit 5 Outline: Chemical Kinetics and Equilibria

Chapter 13: Chemical Kinetics

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---------|--|---|---|--|---|
| 1 | Chemical Kinetics, Reaction Rate $\left(Rate = \frac{\Delta[A]}{\Delta t} \right)$, Average Rate and Instantaneous Rate, Determining Rates Using Pressure, Rate Constant (k), Relationship Between Molar Quantities and Reaction Rates | 13.1: The Rate of a Reaction (pg. 546 to 553) | | pg. 589 #1 to 3, 5 to 8 | |
| 2 | Rate Law, Differential Rate Law ($Rate = k[A]^n$), Integrated Rate Law, Order (n), Overall Reaction Order, Initial Rates, Methods of Initial Rates | 13.2: The Rate Law (pg. 553 to 557) | | pg. 589–590 #9 to 22; pg. 593–594 #72 and 87 | |
| 3 & 4 | Integrated Rate Laws, (1 st , 2 nd , and zero orders), First-Order Rate Laws $\left(\ln [A] = -kt + \ln [A]_0 \text{ or } \ln \left(\frac{[A]_0}{[A]} \right) = kt \right)$, Half Life of First Order Reaction $\left(t_{1/2} = \frac{\ln(2)}{k} \right)$, Second-Order Rate Laws $\left(\frac{1}{[A]} = kt + \frac{1}{[A]_0} \right)$, Half Life of Second Order Reaction $\left(t_{1/2} = \frac{1}{k[A]_0} \right)$, Zero Order Rate Laws ($[A] = -kt + [A]_0$), Half Life of Zero Rate Laws $\left(t_{1/2} = \frac{[A]_0}{2k} \right)$, Pseudo-First-Order Rate Law | 13.3: The Relation Between Reactant Concentration and Time (Integrated Rate Law) (pg. 557 to 567) | | pg. 590–591 #23 to 30; pg. 594–595 #88 and 94 | |
| 5 | Collision Model, Activation Energy, Activated Complex (Transition State), Temperature and Collision Frequency, Molecular Orientations and Steric Factor, Arrhenius Equation | 13.4: Activation Energy and Temperature Dependence of Rate Constants (pg. 568 to 575) | | pg. 590–591 #31 to 42; pg. 596 #109, 110, 112 | |
| 6 | Reaction Mechanism, Intermediate, Elementary Step, Molecularity, Unimolecular, Bimolecular, Termolecular Steps, Rate-Determining Step, Deduction and Conditions of Possible Reaction Mechanisms, Catalyst, Homogeneous Catalyst, Heterogeneous Catalyst, Adsorption, Desorption, Enzymes | 13.5: Reaction Mechanisms (pg. 575 to 581) 13.6: Catalysis (pg. 581 to 588) | | pg. 591–595 #43 to 49, 51 to 54, 68, 70, 73, 99 pg. 592–595 #55 to 58, 62, 64, 65, 80, 84, 92 | |
| 7 | Lab #11: Chemical Kinetics (February 25, Thursday) | | | Lab Report #11 Due: March 5, Friday | |
| 8 | Chapter 13 Quiz (March 1, Monday) | | | | |

Chapter 14: Chemical Equilibrium

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---------|--|--|---|---|---|
| 1 & 2 | Chemical Equilibrium, Properties of Chemical Equilibrium, Law of Mass Action, Equilibrium Expression, Equilibrium Constant (K), Homogeneous Equilibria, Equilibrium Expressions of Partial Pressures (K_p), Equilibrium Position, Heterogeneous Equilibria, Multiple Equilibria, Reverse Equilibrium Reactions and Multiplying Equilibrium Reactions | 14.1: The Concept of Equilibrium and the Equilibrium Constant (pg. 602 to 604) 14.2: Writing Equilibrium Constant Expressions (pg. 604 to 615) | | pg. 633 #1 to 4 pg. 633–635 #5 to 11, 13, 14, 16, 18, 20, 22 to 24, 26 to 28, 30 to 32; pg. 639 #92 | |
| 3 & 4 | Relationship Between Rate Constants and Equilibrium Constants and Expressions, Applications of Equilibrium (The Extent of a Reaction, Reaction Quotient, Q , Calculating Equilibrium Pressures and Concentrations – ICE Box) | 14.3: The Relationship Between Chemical Kinetics and Chemical Equilibrium (pg. 616 to 617) 14.4: What Does the Equilibrium Constant Tell Us? (pg. 617 to 623) | | pg. 635 #33 and 34 pg. 635–636 #37 to 48; pg. 637–641 #64, 70 to 78 (even), 82, 84, 108 | |
| 5 | Le Châtelier's Principle (Effects of a Change in Concentration, Pressure, and Temperature) | 14.5: Factors That Affect Chemical Equilibrium (pg. 623 to 630) | | pg. 636–640 #49 to 52, 56 to 62 (even), 65 to 69, 90, 98, 106 | |
| 6 | Free Energy and Pressures and Equilibrium ($\Delta G = \Delta G^\circ + RT \ln(Q)$ and $\Delta G^\circ = -RT \ln(K)$), $w_{\max} = \Delta G$, Reversible and Irreversible Processes | 18.6: The Dependence of Free Energy on Pressure (pg. 803 to 807) | | pg. 811–814 #21, 22, 24, 26 to 32, 49, 64, 66, 76, 80 | |
| 7 | Lab #12: Determination of Equilibrium Constant (March 12, Friday) | | | Lab Report #12 Due: March 19, Friday | |
| 8 | Unit 5 Test (March 17, Wednesday) | | | | |