# Chemistry AP  Unit 5 Outline: Chemical Kinetics and Equilibria

## Chapter 12: Chemical Kinetics

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---|---|---|---|---|---|
| 1 | Chemical Kinetics, Irreversible Reaction, Reaction Rate $\left(Rate = \frac{\Delta[\mathrm{A}]}{\Delta t}\right)$, Instantaneous Rate, Rate Law or Differential Rate Law ($Rate = k[\mathrm{A}]^n$), Rate Constant ($k$), Order ($n$), Integrated Rate Law, Initial Rates, Overall Reaction Order | 12.1: Reaction Rates (pg. 555 to 561)<br>12.2: Rate Laws: An Introduction (pg. 561 to 563)<br>12.3 Determining the Form of the Rate Law (pg. 563 to 567) | | pg. 598 #17 and 18<br><br>pg. 598–599 #19 to 26 | |
| 2 | Integrated Rate Laws, (1st, 2nd, and zero orders), First-Order Rate Laws ($\ln[\mathrm{A}] = -kt + \ln[\mathrm{A}]_0$ or $\ln\left(\frac{[\mathrm{A}]_0}{[\mathrm{A}]}\right) = kt$), Half Life of First Order Reaction $\left(t_{1/2} = \frac{\ln(2)}{k}\right)$, Second-Order Rate Laws $\left(\frac{1}{[\mathrm{A}]} = kt + \frac{1}{[\mathrm{A}]_0}\right)$, Half Life of Second Order Reaction $\left(t_{1/2} = \frac{1}{k[\mathrm{A}]_0}\right)$, Zero Order Rate Laws ($[\mathrm{A}] = -kt + [\mathrm{A}]_0$), Half Life of Zero Rate Laws $\left(t_{1/2} = \frac{[\mathrm{A}]_0}{2k}\right)$, Pseudo-First-Order Rate Law | 12.4: The Integrated Rate Law (pg. 568 to 578) | | pg. 599–601 #27 to 44 | |
| 3 | Reaction Mechanism, Intermediate, Elementary Step, Molecularity, Unimolecular, Bimolecular, Termolecular Steps, Rate-Determining Step | 12.5: Rate Laws: A Summary (pg. 578 to 79)<br>12.6: Reaction Mechanisms (pg. 579 to 582) | | pg. 601–602 #45 to 48 | |
| 4 | Collision Model, Activation Energy, Activated Complex (Transition State), Molecular Orientations, Steric Factor, Arrhenius Equation, Frequency Factor, Enzymes, Catalyst, Homogeneous Catalyst, Heterogeneous Catalyst, Adsorption, Desorption | 12.7: A Model of Chemical Kinetics (pg. 582 to 588)<br>12.8: Catalysis (pg. 588 to 595) | | pg. 602 #49 to 58<br><br>pg. 603 #61 and 62 | |
| 5 | **Lab #10: Chemical Kinetics (February 27, Wednesday)** | | | **Lab Report #10 Due: March 18, Tuesday** | |
| 6 | **Chapter 12 Quiz (February 28, Thursday)** | | | | |

## Chapter 13: Chemical Equilibrium

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---|---|---|---|---|---|
| 1 | Chemical Equilibrium, Properties of Chemical Equilibrium, Law of Mass Action, Equilibrium Expression, Equilibrium Constant ($K$ or $K_C$), Equilibrium Position, | 13.1: The Equilibrium Condition (pg. 609 to 613)<br>13.2: The Equilibrium Constant (pg. 613 to 617) | | pg. 645 #15 and 17<br>pg. 645–646 #19 to 26 | |
| 2 | Equilibrium Expressions of Partial Pressures ($K_P$), Homogeneous Equilibria, Heterogeneous Equilibria | 13.3: Equilibrium Expressions Involving Pressures (pg. 617 to 620)<br>13.4: Heterogeneous Equilibria (pg. 620 to 622) | | pg. 646 #27 and 30<br><br>pg. 646 #31 to 34 | |
| 3 | Applications of Equilibrium (The Extent of a Reaction, Reaction Quotient, $Q$, Calculating Equilibrium Pressures and Concentrations – ICE Box) | 13.5: Applications of Equilibrium Constant (pg. 622 to 631) | | pg. 646 #35 to 46 | |
| 4 | Special Cases: Treating Systems that have Small Equilibrium Constants, Le Châtelier's Principle (Effects of a Change in Concentration, Pressure, and Temperature) | 13.6: Solving Equilibrium Problems (pg. 631 to 636)<br>13.7: Le Châtelier's Principle (pg. 636 to 642) | | pg. 647–648 #47 to 56<br>pg. 648–649#57 to 64 | |
| 5 | Free Energy and Pressures and Equilibrium ($\Delta G = \Delta G° + RT \ln (Q)$ and $\Delta G° = -RT \ln (K)$), $w_{max} = \Delta G$, Reversible and Irreversible Processes | 16.7: The Dependence of Free Energy on Pressure (pg. 806 to 810)<br>16.8: Free Energy and Equilibrium (pg. 810 to 814)<br>16.9: Free Energy and Work (pg. 814 to 816) | | pg. 821 #51 and 52<br><br>pg. 821–822 #53 to 61 | |
| 6 | **Lab #11: Determination of Equilibrium Constant (March 10, Monday)** | | | **Lab Report #11 Due: March 18, Tuesday** | |
| 7 | **Unit 5 Test (March 18, Tuesday)** | | | | |