# Chemistry AP  Unit 2 Outline: Chemical Bonding and Organic Chemistry

## Chapter 7: Atomic Structure and Periodicity

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---|---|---|---|---|---|
| 1 | Electromagnetic Radiation, Wavelength, Frequency, $c = \lambda\nu$, Planck's Constant, $\Delta E = h\nu$, Quantum Energy, Photons, $E = mc^2$, Duality of Light and Matter ($p = m\upsilon$), de Broglie's Equation $\left(\lambda = \frac{h}{m\upsilon}\right)$, Diffraction | 7.1 Electromagnetic Radiation (pg. 290 –292)<br>7.2 The Nature of Matter (pg. 292 – 297)<br>7.3 The Atomic Spectrum of Hydrogen (pg. 297 – 299) | | pg. 337 #39, 40<br><br>pg. 337 – 338 #41 to 50 | |
| 2 | Quantum (Wave) Mechanical Model, $E_n = \frac{-2.178 \times 10^{-18}\,\text{J}}{n^2}$, Ground vs. Excited States, Standing Wave, Schrödinger's Wave Function $\left(\hat{H}\psi = E\psi\right)$, Orbital, Heisenberg Uncertainty Principle, Probability Distribution, Radial Probability Distribution, Quantum Numbers, Principal Quantum Number ($n$), Angular Momentum Quantum Nymber ($l$), Magnetic Quantum Number ($m_l$), Subshells ($s$, $p$, $d$, $f$, and $g$ orbitals) | 7.4 The Bohr Model (pg. 299 –304)<br>7.5 The Quantum Mechanical Model of an Atom (pg. 304 – 307)<br>7.6 Quantum Numbers (pg. 307 – 309) | | pg. 338 #51 to 58<br><br>pg. 339 #65<br><br>pg. 338 #61 to 64 | |
| 3 | Nodal Surfaces or Nodes, Degeneration, Electron Spin, Electron Spin Quantum Number, Pauli Exclusion Principle, Polyelectronic Atoms, Penetration Effect, Shielding Electrons | 7.7 Orbital Shapes and Energies (pg. 309 – 310)<br>7.8 Electron Spin and the Pauli Principle (pg. 310 – 312)<br>7.9 Polyelectronic Atoms (pg. 312 – 314) | | pg. 339 #67, 68<br><br>pg. 339 #69, 79 | |
| 4 | Dmitri Mendeleev, Aufbau Principle, Hund's Rule, Valence $e^-$ vs. Core $e^-$, Transition Metals ($d$ orbitals), Lanthanide and Actinide Series ($f$ orbitals), Main Group or Representative Elements ($s$ and $p$ orbitals), Electron Configurations, Ionization Energy, First and Second Ionization Energies ($I_1$ and $I_2$), Electron Affinity, Atomic Radius | 7.10 The Histrory of the Periodic Table (pg. 314 – 317)<br>7.11 The Aufbau Principle and the Periodic Table (pg. 317 – 324)<br>7.12 Periodic Trends in Atomic Properties (pg. 324 – 330) | | pg. 339 #71 to 75, 77, 81, 83<br><br>pg. 339 – 340 #85 to 91, 93 to 99, 101 | |
| 5 | **Chapter 7 Quiz**<br>**(October 1, Monday)** | | | | |
| 6 | **Lab #4: Quantitative Spectroscopy**<br>**(September 26, Wednesday)** | | | **Lab #4 Report**<br>**(October 5, Friday)** | |

## Chapter 8 & 9: Bonding: General Concepts & Covalent Bonding: Orbitals

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---|---|---|---|---|---|
| 1 | Bond Energy, Ionic Bonding and Compounds, Bond Length, Covalent Bonding, Polar Covalent Bond, Electronegativity, Bond Polarity (Dipolar and Dipole Moment) | 8.1: Types of Chemical Bonds (pg. 348 – 352)<br>8.2: Electronegativity (pg. 352 – 354)<br>8.3: Bond Polarity and Dipole Moments (pg. 354 – 357) | | pg. 402 – 403 #1, 21 to 27<br>pg. 403 #17 | |
| 2 | Predicting Formulas of Ionic Compounds, Ion Size, Isoelectronic Ions, Lattice Energy, Covalent Chemical Bonding Model, Single, Double and Triple Bonds, Bond Energy and Enthalpy | 8.4: Ions: Electron Configurations and Sizes (pg. 357 – 362)<br>8.5: Formation of Binary Ionic Compounds (pg. 362 – 366)<br>8.8: The Covalent Chemical Bond: A Model (pg. 367 – 370) | | pg. 403 – 404 #29 to 38<br>pg. 404 #39, 41, 43, 45 | |
| 3 | Localized Electron (LE) Model, Lone Pairs, Bonding Pairs Lewis Structures, Duet Rule, Octet Rule, Exceptions to the Octet Rule, Resonance, Resonance Structures, Odd-Electron Molecules, Formal Charge | 8.9: The localized Electron Bonding Model (pg. 374)<br>8.10: Lewis Structures (pg. 375 – 379)<br>8.11: Exceptions to the Octet Rule (pg. 380 – 383)<br>8.12: Resonance (pg. 383 – 388) | | pg. 404 – 405 #47 to 53, 55, 59<br>pg. 405 #61, 62<br>pg. 405 #63, 64<br>pg. 405 – 406 #65 to 76 | |
| 4 | Molecular Structure, Valence Shell Electron Pair Repulsion (VSEPR) Model, Linear, Trigonal Planar, Tetrahedral, V-Shaped, Trigonal Pyramid, Trigonal Bipyramid, Octahedral and Square Planar Structures | 8.13: Molecular Structure: The VSEPR Model (pg. 389 – 400) | | pg. 406 – 407 #77, 79 to 91, 93 | |
| 5 | Hybridization, Hybrid Orbitals ($sp^3$, $sp^2$, $sp$, $dsp^3$, $d^2sp^3$), Sigma ($\sigma$) and Pi ($\pi$) Bonds, Summary of the LE Model | 9.1: Hybridization and the Localized Electron Model (pg. 413 – 426) | | pg. 441 – 442 #11 to 14, 19 to 23 | |
| 6 | **Chapters 8 and 9 Quiz (October 18, Thursday)** | | | | |

## Chapter 22: Organic and Biological Molecules

| Classes | Topics | Suggested Reading | ✓ | Assignments | ✓ |
|---|---|---|---|---|---|
| 1 | Hydrocarbons, Saturated and Unsaturated Bonds, Alkanes, Normal (Straight Chained or Unbranched) Hydrocarbons, Structural and Stereo Isomerism, Nomenclature of Alkanes, Alkyl Groups, Reactions of Alkanes (Combustion, Substitution, Dehydrogenation), Halogen Derivatives, Cyclic Alkanes | 22.1: Alkanes: Saturated Hydrocarbons (pg. 1044 –1052) | | pg. 1091 – 1092 #23 to 30 | |
| 2 | Alkenes, *cis-trans* Isomerism, Alkynes, Addition, Hydrogenation, Halogenation, Aromatic Hydrocarbons | 22.2: Alkenes and Akynes (pg. 1052 – 1055)<br>22.3: Aromatic Hydrocarbons (pg. 1055 – 1057) | | pg. 1092 #31 to 34, 37, 39 to 48, 62<br>pg. 1092 #35, 36, 38, 61, 63 | |
| 3 | Hydrocarbon Derivatives, Functional Groups, Alcohols (Primary, Secondary and Tertiary), Ethers, Aldehydes, Ketones, Carboxylic Acids, Esters, Esterification, Amines | 22.4: Hydrocarbon Derivatives (pg. 1057 – 1064) | | pg. 1093 – 1094 #51 to 53, 55 to 60, 65, 66, 67, 69 | |
| 4 | Polymers, Free Radical, Monomer, Addition and Condensation Polymerization, Copolymer, Polyester, Polyvinyl Chloride (PVC) | 22.5: Polymers (pg. 1064 – 1073) | | pg. 1096 #71, 72, 75 | |
| 5 | **Lab #5: Molecular Models (October 26, Friday)** | | | **Lab #5 Report (November 2, Friday)** | |
| 6 | **Unit 2 Test (November 6, Tuesday)** | | | | |