

Chemistry AP Unit 2 Outline: Chemical Bonding and Organic Chemistry

Chapter 7: Quantum Theory and the Electronic Structure of Atoms

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Electromagnetic Radiation, Wavelength, Frequency, $c = \lambda \nu$ Planck's Quantum Theory and Planck's Constant, $\Delta E = h \nu$, Photoelectric Effect, Photons, $E = mc^2$, Duality of Light, Quantized Energy	7.1 From Classical Physics to Quantum Theory (pg. 268 – 272) 7.2 The Photoelectric Effect (pg. 272 – 274)		pg. 303 – 304 #2, 4, 8, 10, 12 pg. 304 #1 to 20 (even)	
2	Diffraction, Emission and Absorption Spectrums, $E_n = \frac{-2.178 \times 10^{-18} \text{ J}}{n^2}$, Duality of Matter ($p = m \nu$), de Broglie's Wavelength $\left(\lambda = \frac{h}{m \nu} \right)$	7.3 The Atomic Spectrum of Hydrogen (pg. 274 – 279) 7.4 The Dual Nature of the Electron (pg. 279 – 283)		pg. 304 – 305 #22 to 34 (even) pg. 305 #36 to 42 (even)	
3	Heisenberg Uncertainty Principle, Standing Waves, Schrödinger's Wave Function $(\hat{H}\psi = E\psi)$, Probability Distribution, Atomic Orbital, Radial Probability Distributions, Quantum (Wave) Mechanical Model	7.5 Quantum Mechanics (pg. 283 – 286)		pg. 305 #43 to 47	
4	Quantum Numbers, Principal Quantum Number (n), Angular Momentum Quantum Number (l), Magnetic Quantum Number (m_l), Electron Spin, Electron Spin Quantum Number (m_s), Orbital Shapes, Nodal Surfaces or Nodes, Subshells (s, p, d, f , and g orbitals), Orbital Energies of a Hydrogen Atom, Polyelectronic Atom, Electrons Correction Problem (Degeneration)	7.6 & 7.7 Quantum Numbers & Atomic Orbitals (pg. 286 – 292)		pg. 338 #48 to 70 (even)	
5	Pauli Exclusion Principle, Penetration (Tunneling) Effect, Aufbau (Building-Up) Principle, Orbital Diagrams, Hund's Rule, Electron Configurations and Exceptions, Valence Electrons versus Shielding (Core) Electrons	7.8 & 7.9 Electron Configuration & The Building-Up Principle (pg. 292 – 302)		pg. 306 #72 to 78 (even) pg. 306 #82 to 90 (even), 91, 92	
6	Lab #4: Quantitative Spectroscopy (September 29, Tuesday)			Lab #4 Report Due (October 9, Friday)	

Chapter 8: Periodic Relationships Among the Elements

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Dmitri Mendeleev, Main Group or Representative Elements (<i>s</i> and <i>p</i> orbitals), Transition Metals (<i>d</i> orbitals), Lanthanide and Actinide Series (<i>f</i> orbitals), Ground and Excited States, Electron Configurations, Electron Configurations of Ions (Representative Elements and Transition Metals)	8.1 Development of the Periodic Table (pg. 316) 8.2 Periodic Classification of the Elements (pg. 318 – 322)		pg. 348 #1 to 4 pg. 348 – 349 #11, 13, 15 to 20, 22, 23, 24 to 32 (even)	
2	Shielding Effect, Effective Nuclear Charge (Z_{eff}), Periodic Trends of Atomic and Ionic Radii, Isoelectronic Ions, Ionization Energy, First and Second Ionization Energies (I_1 and I_2), Periodic Trend in Ionization Energies, Electron Affinity, Periodic Trend of Electron Affinities	8.3 Periodic Variations in Physical Properties (pg. 322 – 329) 8.4 & 8.5 Ionization Energy & Electron Affinity (pg. 329 – 335)		pg. 348 #34 to 44 (even), 45 to 48 pg. 349 – 350 #49 to 52, 54, 56 pg. 350 #59 to 64	
3	Chapter 7 & 8 Quiz (October 7, Wednesday)				

Chapter 9: Chemical Bonding I: Basic Concepts

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Lewis Structures, Ionic Bonding and Predicting Ionic Compounds, Lattice Energy, Coulomb's Law, Comparing Lattice Energy, Molar Heat of Formation for Ionic Compounds using the Haber-Born Cycle	9.1: Lewis Dot Symbols (pg. 358) 9.2: The Ionic Bond (pg. 359 – 361) 9.3: Lattice Energy and Ionic Compounds (pg. 361 – 366)		pg. 390 #1 and 5 pg. 391 #7, 9, 10, 13, 15, 16, 18, 20 pg. 391 #21, 22, 24 to 26	
2	Covalent Bonds and Covalent Compounds, Chemical Bonding Model, Single Bonds, Lone Pairs, Bonding Pairs, Structural Formula, Double and Triple Bonds (Coordinate Covalent Bonds – Multiple Bonds), Bond Lengths, Polar Covalent Bond, Electronegativity, Periodic Trends of Electronegativity, Relative Bond Polarity	9.4: The Covalent Bond (pg. 366 – 369) 9.5: Electronegativity (pg. 369 – 372)		pg. 391 #30 to 32 pg. 392 #34, 36, 37, 39, 40	
3	Writing Lewis Dot Diagrams, Duet Rule, Octet Rule, Exceptions to the Octet Rule (Incomplete Octet and Expanded Octet), Odd-Electron Molecules	9.6: Writing Lewis Structures (pg. 372 – 374) 9.9: Exceptions to the Octet Rule (pg. 379 – 385)		pg. 392 #43 to 48 pg. 393 #57, 59, 63 to 66	
4	Resonance, Resonance Structures, Formal Charge Bond Energy and Enthalpy	9.7 & 9.8: Formal Charges & the Concept of Resonance (pg. 375 – 379) 9.10: Bond Enthalpy (pg. 385 – 389)		pg. 392 – 393 #42, 51 to 56 pg. 393 #69 to 72	

Chapter 10: Chemical Bonding II: Molecular Geometry and Hybridization of Atomic Orbitals

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Molecular Geometry, Valence Shell Electron Pair Repulsion (VSEPR) Model, Linear, Trigonal Planar, Tetrahedral, V-Shaped, Trigonal Pyramid, Trigonal Bipyramid, Octahedral and Square Planar Structures, Dipole Moments, Polar and Nonpolar Molecules	10.1: Molecular Geometry (pg. 400 – 408) 10.2: Dipole Moments (pg. 409 – 415)		pg. 442 #2, 4, 5, 8 to 14 pg. 442 – 443 #16, 17, 20 to 24	
2	Valence Bond Theory, Overlapping of Atomic Orbitals, Hybridization, Hybrid Orbitals (sp^3 , sp^2 , sp , dsp^3 , d^2sp^3), Sigma (σ) and Pi (π) Bonds	10.3: Valence Bond Theory (pg. 415 – 417) 10.4 & 10.5: Hybridization of Atomic Orbitals & in Molecules Containing Double and Triple Bonds (pg. 417 – 429)		pg. 443 #26 pg. 443 #30, 31, 34, 36, 38 to 44	
3	Chapters 9 and 10 Quiz (October 20, Tuesday)				

Chapter 24 & 25: Organic Chemistry and Synthetic Organic Polymers

Classes	Topics	Suggested Reading	✓	Assignments	✓
1 & 2	Organic Chemistry, Functional Groups, Hydrocarbons, Aliphatic and Aromatic 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, Alkenes, <i>cis-trans</i> Isomerism, Alkynes, Addition, Hydrogenation Reactions with Alkenes and Alkynes (Markovikov's Rule), Halogenation	24.1: Classes of Organic Compounds (pg. 1004) 24.2: Aliphatic Hydrocarbons (pg. 1004 – 1015)		pg. 1029 #1 and 2 pg. 1029 – 1030 #3 to 8, 11 to 18, 20, 23, 24, 26 to 28	
3	Aromatic Hydrocarbons, Nomenclature of Aromatic Compounds (ortho-, meta-, para-), Properties and Reactions with Aromatic Compounds	24.3: Aromatic Hydrocarbons (pg. 1017 – 1019)		pg. 1030 – 1031 #29 to 32	
4 & 5	Hydrocarbon Derivatives, Properties of Different Functional Groups and Reactions, Alcohols (Primary, Secondary and Tertiary), Ethers, Aldehydes, Ketones, Carboxylic Acids, Esters, Esterification, Amines	24.4: Chemistry of the Functional Groups (pg. 1020 – 1029)		pg. 1031 #34 to 42	
6	Polymers, Monomers, Dimers, Free Radical, Homopolymer, Atactic Polypropenes, Isotactic versus Syndiotactic Structures, Addition and Condensation Polymerizations, Copolymer, Polyester, Polyvinyl Chloride (PVC)	25.1 & 25.2: Properties of Polymers & Synthetic Organic Polymers (pg. 1040 – 1045)		pg. 1058 – 1059 #3, 4, 7 to 12	
7	Lab #5: Molecular Models (October 29, Thursday)			Lab #5 Report (Due: November 6, Friday)	
8	Unit 2 Test (November 4, Wednesday)				