Honour Chemistry Unit 3 Outline: Quantum Theory, Periodicity and Chemical Bonding

Chapter 7: The Electronic Structure of Atoms

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Electromagnetic Radiation, Wavelength, Frequency, $c = \lambda\nu$ Plank's Quantum Theory and Planck's Constant, $\Delta E = h\nu$, Photoelectric Effect, Photons, $E = mc^2$, Duality of Light, Quantized Energy	7.1 Classical Physics to Quantum Theory (pg. 207–210) 7.2 The Photoelectric Effect (pg. 211–212)			
2	Diffraction, Emission and Absorption Spectrums, $E_n = \frac{-2.178\times10^{-18}\,J}{n^2}$, Duality of Matter ($p = m\upsilon$), de Broglie's Wavelength $\left(\lambda = \frac{h}{m\upsilon}\right)$	7.3 The Atomic Spectrum of Hydrogen (pg. 212–217) 7.4 The Dual Nature of the Electron (pg. 217–219)			
3	Heisenberg Uncertainty Principle, Standing Waves, Schrödinger's Wave Function $\left(\hat{H}\psi = E\psi\right)$, Probability Distribution, Atomic Orbital, Radial Probability Distributions, Quantum Mechanical Model	7.5 Quantum Mechanics (pg. 219–220)		**Video & Worksheet**: *Atom – The Clash of Titans (BBC)* **Video**: *The Uncertain Principle (BBC)*	
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. 221–222)		pg. 240–241 #48, 57, 58, 61 to 64, 66 to 68, 70	
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. 226–228, 230–236)		***Ch 7 Worksheet – Electrons in Atoms*** pg. 241 #71, 72, 76, 77, 80, 82 to 84, 86 to 89, 91, 92 (even)	
6	**Activity 3: Flame Tests and Emission Spectroscopy** **(B Block: January 20, Thursday) (D Block: January 21, Friday)**			***Activity #3 Due:*** ***(B & D Blocks: Jan 31, Mon)***	

Chapter 8: Periodic Table

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Dmitri Mendeleev, Main Group or Representative Elements (s and p orbitals), Transition Metals (d orbitals), Lanthanide and Actinide Series (f 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. 272 #1, 3, 4 pg. 272–273 #7, 11, 13, 15, 16, 18 to 20, 22 to 26, 28, 30, 32	
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. 273–274 #34, 36, 38, 40, 42 to 48 pg. 274 #49 to 52, 54 pg. 274 #57 to 62	
3	**Activity 4: Periodic Trends and Properties of Elements** **(B & D Blocks: January 31, Monday)**			***Activity #4 Due:*** ***(B Block: Feb 15, Tuesday)*** ***(D Block: Feb 14, Monday)***	
4	***Chapter 7 & 8 Quiz*** ***(B Block: February 3, Thursday) (D Block: February 4, Friday)***	***Chapter 7 & 8 Homework Due*** ***(B Block: February 3, Thursday)*** ***(D Block: February 4, Friday)***		*Chapter 8 Periodic Trends MC*	

Chapter 9: Chemical Bonding I: The Covalent Bond

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Lewis Structures, Ionic Bonding and Predicting Ionic Compounds, Properties of Ionic Compounds	9.1: Lewis Dot Symbols (pg. 280) 9.2: The Ionic Bond (pg. 281 – 282)		pg. 306 #1 and 5 pg. 306–307 #7, 9, 10, 13, 16, 18, 20	
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. 285 – 286) 9.5: Electronegativity (pg. 287 – 290)		pg. 307 #29 and 30 pg. 307 #32, 34, 35, 37, 38	
3 & 4	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. 291 – 293) 9.9: Exceptions to the Octet Rule (pg. 298 – 301)		pg. 307 #41 pg. 308 #55, 57, 61 to 64	
5	Resonance, Resonance Structures, Formal Charge	9.7 & 9.8: Formal Charges & the Concept of Resonance (pg. 293 – 298)		pg. 307–308 #40, 42, 43, 44, 49 to 54	

Chapter 10: Chemical Bonding II: Molecular Geometry

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. 313 – 332) 10.2: Dipole Moments (pg. 332 – 324)		pg. 349–350 #2 to 5, 7 to 12 pg. 350 #14, 15. 20 to 22	
	Chapters 9 and 10 Quiz (Take-Home) **(B Block: February 15, Tuesday)** **(D Block: February 14, Monday)**	***Chapter 9 & 10 Homework Due*** ***(B Block: March 3, Thursday)*** ***(D Block: March 2, Wednesday)***		***Ch 9 & 10 Take-Home Quiz Due:*** ***(B Block: February 17, Thurs)*** ***(D Block: February 16, Wed)***	

Chapter 12: Intermolecular Forces

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Intermolecular Forces, van der Waals Forces (Dipole-Dipole Forces, London Dispersion Forces), Ion-Dipole Forces, Hydrogen Bonding, Properties of Covalent Crystalline Solids and Molecular Crystalline Solids	12.2: Intermolecular Forces (pg. 392 to 397) 12.4: Bonding in Solids (pg. 407 to 408)		pg. 418–422 #2, 3, 6 to 10, 12 to 19, 31, 32. 63, 64, 101; pg. 448 #9	
2	**Lab #6: Molecular Models** **(B Block: February 17, Thursday)** **(D Block: February 16, Wednesday)**			***Lab #6 Report Due*** ***(B Block: March 3, Thursday)*** ***(D Block: March 2, Wednesday)***	
3	**Unit 3 Test** **(B Block: March 8, Tuesday)** **(D Block: March 9, Wednesday)**	***Chapter 12 Homework Due*** ***(B Block: March 8, Tuesday)*** ***(D Block: March 9, Wednesday)***			