**AP Chemistry Syllabus**

**Unit 3: Chapters 7 to 10**

**PLEASE NOTE:** Each individual assignment in the problem set should be done on its own piece of paper to get full credit. Don’t merge them together.

 The days are approximate and are subject to change.

DAY TOPIC

 1 Chapter 7: Atomic Structure and Periodicity

 Introduction to the Chapter

 Read Sections Chapter 7: Get to at least section 5

 2 Chapter 7: Atomic Structure and Periodicity

 7.1: Electromagnetic Radiation

 Description of EM Radiation

 Types of EM Radiation

 Parts of a Wave

 Speed of Light c = λ ν (nu)

 7.2: The Nature of Matter

 Planck’s Work

 E = h v

 The Photoelectric Effect

 Einstein & E = mc2

 de Broglie equation: λ = h / m v

 finds the wavelength of a particle

3 Chapter 7: Atomic Structure and Periodicity

 7.3 The Atomic Spectrum of Hydrogen

 Continuous Spectra v. Line Spectrum

 Quantum nature of Energy

 7.4 The Bohr Model

 How/Why it is still useful

 Energy in an Energy Level

 Rydberg Equation

4 Chapter 7: Atomic Structure and Periodicity

 7.4 Continue with the Bohr Model and problems

 7.5 The Quantum Mechanical Model of the Atom

 The hard core mathematical look of the location of the electrons in an atom

 For us, the most important aspect to take from this section is:

 An orbital is defined as the location where an electron will be found 90 % of the time.

 The atomic radii is a the ‘average’ distance of an electron.

 All of this leads us to quantum numbers

 The Heisenberg Uncertainty Principle

5 Chapter 7: Atomic Structure and Periodicity

 7.6 Quantum Numbers

 Quantum Number Basics

 Name, Definition, Symbol, Value

 7.7 Orbital Shapes and Energies

 Descriptions and images of different types of

 Orbitals. Only resp. for s and p

 7.8 Electron Spin and the Pauli Principle

 7.9 Polyelectronic Atoms

6 Chapter 7: Atomic Structure and Periodicity

 7.10 The History of the Periodic Table

 Dobreiner, Newland, Meyer

 Dmitri Ivanovich Mendeleev

 He accurately predicted properties

 7.11 The Aufbau Principle and the Periodic Table

 Aufbau Process

 Hund’s Rule

 Briefly go over exceptions

 Organization of the Periodic Table

7 Chapter 7: Atomic Structure and Periodicity

 7.12 Periodic Trends in Atomic Properties

 How the chart is organized to help determine trends in properties

 Ionization Energy & Successive IE

 with calculations

 Electron Affinity, Atomic Radii, Ionic Radii, Electronegativity, Formula Weight

 7.13 The Properties of a Group: The Alkali Metals

8 Chapter 8: Bonding: General Concepts

 8.1 Types of Chemical Bonds

 Ionic – Polar Covalent Bond – Covalent Bond

 Sharing vs. Transfer

 Bond Energy and Bond Length

 Coulomb’s Law: Energy between ions

 Figure 8:1 and how bond length >> low energy

 How to write partial charges

 8.2 Electronegativity (En)

 Definition and general facts

 8.3 Bond Polarity and Dipole Moments

 How to use E­n to find polarity

 How Symmetric Polar bonds results in

 Non-polarity

 8.4 Ions: Electron Configurations and Sizes

 How size changes vs. charge

 Size of isoelectronic ions

 8.5 Energy Effects in Binary Ionic Compounds

 Lattice Energy Diagrams

9 Chapter 8: Bonding: General Concepts

 8.6 Partial Ionic Character of Covalent Bonds

 Reflection of Electronegativity Differences

 8.7 The Covalent Chemical Bond: A Model

 The idea of sharing an electron

 What is a ‘MODEL’

 8.8 Covalent Bond Energies and Chemical Reactions

 Bond Energy Calculations

10 Chapter 8: Bonding: General Concepts

 8.9 The Localized Electron Bonding Model

 Introduction to VSEPR, Lewis structures

 8.10 Lewis Structures

 How to draw a proper Lewis Diagram

 Octet Rule

 8.11 Exceptions to the Octet Rule

 Electron Deficient and Expanded Octets

11 Chapter 8: Bonding: General Concepts

 8.12 Resonance

 When does it apply

 Formal Charge

 8.13 Molecular Structure: The VSEPR Model

 Introduce VSEPR and its concepts

12 Chapter 8: Bonding: General Concepts

 8.13 Molecular Structure: The VSEPR Model

 Go over each shape.

 Refer to worksheet as this is done

 Bond angles in the various VSEPR shapes

13 Chapter 9: Covalent Bonding: Orbitals

 9.1 Hybridization and the Localized Electron Model

 Different hybrid orbitals

 Characteristics of each hybrid orbital

 How and why hybridization happens

 9.2 The Molecular Orbital Model

 How MO differ from AO

 Sigma and Pi Bonds

 Bonding and Anti-Bonding Orbitals

 Molecular Bonding Diagrams

 9.3 Bonding in Homonuclear Diatomic Molecules

 Using standard MO models

 Paramagnetism v. Diamagnetism

14 Chapter 9: Covalent Bonding: Orbitals

 9.4 Bonding in Heteronuclear Diatomic Molecules

 How the MO diagram doesn’t change

 9.5 Combining the Localized Electron and Molecular Orbital Models

 A look at the Benzene Molecule

 9.6 Photoelectron Spectroscopy

 How to read a diagram.

15 Chapter 10: Liquids and Solids

 10.1 Intermolecular Forces

 Dipole – Dipole Forces

 Hydrogen Bonding

 How Hydrogen Bonding affects Physical Prop.

 London Dispersion Forces

 Characteristics of each type

 10.2 The Liquid State

 Surface Tension and Capillary Action

 Viscosity

 10.3 An Intro. To Structures and Types of Solids

 Crystalline vs. Amorphous Solids

 Main Types of Crystal Shapes

 Bragg Equation and Diagram

16 Chapter 10: Liquids and Solids

 10.4 Structure and Bonding in Metals

 Different Types of Packing in Unit Cells

 How to ‘Count’ Atoms in a Crystal

 How to Determine Density

 General Bonding in Metals: Sea of Electrons

 Alloys

 10.5 Carbon and Silicon: Network Atomic Solids

 Graphite vs. Diamond

 Silicates and Different Types of Glass

 Ceramics

 Semiconductors: p & n type

17 Chapter 10: Liquids and Solids

 10.6 Molecular Solids

 Strong Covalent Bonds Affect Their Properties

 10.7 Ionic Solids

 Number of Ions in a Unit Cell

 10.8 Vapor Pressure and Changes of State

 Define Equilibrium Vapor Pressure

 How to Calculate Vapor Pressure

 Define BP as VP at Equilibrium

18 Chapter 10: Liquids and Solids

 10.8 Vapor Pressure and Changes of State

 Continue with Problem Solving

 Heat of Fusion

 Heating Curve

 How to solve Heating Curve Problems

 10.9 Phase Diagrams

 How to read a Phase Diagram.

19 Problem Set Work

Problem Set: Black Book

Set Assignment

1 Ch. 7 p. 330 / 37– 40, 43 – 46

2 Ch. 7 p. 331 / 53 – 70 odd

3 Ch. 7 p. 332 / 75 – 79, 86 – 88

4 Ch. 7 p. 333 / 99 – 109 odd p. 335 / 135 – 168 any 5

5 Ch. 8 p. 393 / 27 – 36 p. 394 / 39 – 46 odd

6 Ch. 8 p. 395 / 58 – 69 odd

7 Ch. 8 p. 396 / 79 – 83 p. 397 / 95 – 102 odd

8 Ch. 8 p. 399 / 129 – 157 any 6

9. Ch. 9 p. 431 / 17 – 29 all

10. Ch. 9 p. 433 / 43 – 48 odd

11 Ch. 10 p. 488 / 33 – 42 odd p. 488 / 45 – 60

12 Ch. 10 p. 489 / 67 – 69, 83, 85, 86

13 Ch. 10 p. 491 / 87 – 106

14 Ch. 10 p. 494 / 115 – 143 any 6

Problem Set: White Book

Set Assignment

1 Ch. 7 p. 342 / 39 – 42, 47 - 50

2 Ch. 7 p. 343 / 57 – 74 odd

3 Ch. 7 p. 345 / 81 – 85, 92 – 94

4 Ch. 7 p. 346 / 105 – 116 odd, p. 347 / 135 – 180 any 5

5 Ch. 8 p. 405 / 27 – 36 p. 406 / 41 – 48 odd

6 Ch. 8 p. 407 / 60 – 72 odd

7 Ch. 8 p. 408 / 81 – 85 p. 409 / 99 – 106 odd

8 Ch. 8 p. 411 / 127 – 164 any 6

9 Ch. 9 p. 445 / 17 – 29 all

10 Ch. 9 p. 447 / 45 – 52 odd

11 Ch. 10 p. 500 / 35 – 42 odd p. 501 / 47 – 62 odd

12 Ch. 10 p. 502 / 69 – 71, 85, 87, 88

13 Ch. 10 p. 504 / 89 – 108 odd

14 Ch. 10 p. 506 / 109 – 149 any 6