AP Chemistry II

Curriculum Guide

Scranton School District

Scranton, PA

AP Chemistry II

Prerequisite:

- Honors Chemistry
- Be in compliance with the SSD Honors and AP Criteria Policy

AP Chemistry II is offered in grades 11 or 12 for students who have successfully completed Chemistry Honors in grade 10. Students selecting AP Chemistry II should have a strong interest in the sciences and must possess excellent math ability. AP Chemistry II is the second part of a two year course designed to prepare students for the AP exam in Chemistry. The AP Chemistry II curriculum was written to include a brief review of concepts covered in Honors Chemistry and then quickly progress to cover material presented in the second semester of a college course in Chemistry. Topics include but are not limited to chemical equations and reactions, aqueous solutions and colligative properties, advanced bonding concepts, thermochemistry, rate of reaction, gaseous equilibria, acid-base equilibria, precipitation equilibria, spontaneity of a reaction, electrochemistry, nuclear reactions, and organic chemistry. The class meets seven periods each week. Students are required to complete weekly experiments and lab reports. The AP Chemistry course is designed around the six **"Big Ideas"** and seven **"Science Practices"** identified by the College Board in the AP Chemistry Curriculum Framework.

Big Idea 1: The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.

Big Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.

Big Idea 3: Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.

Big Idea 4: Rates of chemical reactions are determined by details of the molecular collisions.

Big Idea 5: The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.

Big Idea 6: Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.

Science Practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.

Science Practice 2: The student can use mathematics appropriately.

Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.

Science Practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question.

Science Practice 5: The student can perform data analysis and evaluation of evidence.

Science Practice 6: The student can work with scientific explanations and theories.

Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

Scranton School District
Curriculum Guide

Year-at-a-glance

Subject: AP Chemistry II	Grade Level 11 or 12	Date Completed: 06-01-15

1st Quarter

Topic	Resources	Big Ideas/Science Practices
Bonding	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Ideas 1, 2** **Science Practices 1,2,3,4,5,6,7**
Solutions, Reactions In Aqueous solutions, and Colligative Properties	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 2,3** **Science Practices 1,2,3,4,5,6,7**
Acids and Bases/Equilibria In Acid-Base Solutions	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Ideas 2, 3, 6** **Science Practices 1,2,3,4,5,6,7**
Review (Matter and Measurement and Atoms, Ions, Molecules)	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 1** **Science Practices 1,2,3,4,5,6,7**

2nd Quarter

Topic	Resources	Big Ideas/Science Practices
Precipitation Equilibria	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 6** **Science Practices 1,2,3,4,5,6,7**
Gaseous Equilibria	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 6** **Science Practices 1,2,3,4,5,6,7**
Rates of Reaction	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 4** **Science Practices 1,2,3,4,5,6,7**
Review (Stoichiometry)	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Ideas 1,3** **Science Practices 1,2,3,4,5,6,7**

3rd Quarter

Topic	Resources	Big Ideas/Science Practices
Thermochemistry	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Ideas 3,5** **Science Practices 1,2,3,4,5,6,7**
Spontaneity	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Ideas 3,5** **Science Practices 1,2,3,4,5,6,7**
Electrochemistry	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big ideas 3,5,6** **Science Practices 1,2,3,4,5,6,7**
Review (Gases)	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 2** **Science Practices 1,2,3,4,5,6,7**

4th Quarter

Topic	Resources	Big Ideas/Science Practices
Nuclear Chemistry	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 1,3** **Science Practices 1,2,3,4,5,6,7**
Liquids and Solids	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 2** **Science Practices 1,2,3,4,5,6,7**
Organic Chemistry	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Idea 1,2** **Science Practices 1,2,3,4,5,6,7**
Review (Electronic Structure and the Periodic Table)	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Big Ideas 1,2** **Science Practices 1,2,3,4,5,6,7**
Final Exam Review	**Teacher prepared review materials, approved textbook, AP review book**	**Big ideas 1,2,3,4,5,6** **Science Practices 1,2,3,4,5,6,7**

General Topic	Academic Standard(s)	Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time
I. Covalent Bonding **A. Writing Lewis Structures** **1. octet rule** **2. single, double, triple bonds** **3. resonance forms** **4. formal charge** **5. exceptions to the octet rule (electron-deficient molecules and expanded octets)** **B. Molecular Geometry** **1. VSEPR model** **2. orientation of electron pairs (up to 6 electron pairs)** **3. bond angles** **4. ball and stick models** **5. multiple bonds** **C. Polarity** **1. dipole** **2. polar and nonpolar covalent bonds and molecules** **D. Atomic Orbitals** **1. valence bond model** **2. hybrid orbitals** **3. sigma and pi bonds** **E. Molecular Orbital Theory**	**Big Ideas 1, 2** **Science Practices 1,2,3,4,5,6,7**	**The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.** **Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**13 days**

I. Solutions **A. Concentration Units** **1. molarity** **2. mole fraction** **3. ppm, ppb** **B. Principles of Solubility** **1. solute-solvent interactions** **2. temperature and solubility** **3. pressure and solubility** **a. Henry's Law** **C. Colligative Properties** **II. Reactions In Aqueous Solution** **A. Solutions** **1. molarity** **2. saturated, unsaturated, supersaturated** **B. Precipitation Reactions** **C. Net Ionic Equations** **D. Acid-Base Reactions** **1. strong and weak acids and bases** **2. titrations** **3. equivalence point** **E. Oxidation-Reduction Reactions** **1. oxidation numbers** **2. oxidizing agent, reducing agent** **3. balancing half-equations** **4. balancing redox equations**	**Big Ideas 2,3** **Science Practices 1,2,3,4,5,6,7**	**Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.** **Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**12 days**

I. Acids and Bases **A. Bronsted-Lowry model** **1. conjugate acids and bases** **B. Ion Product Constant of Water** **C. Arrhenius Model** **D. pH and pOH** **1. strong acids and bases** **E. Weak Acids and Equilibrium Constants** **1. percent ionization** **2. polyprotic weak acids** **F. Weak Bases and Equilibrium Constants** **1. molecules** **2. anions** **3. relationship between K_a and K_b** **G. Acid-Base Properties of Salt Solutions** **1. cations** **2. anions** **3. salts** **II. Equilibria in Acid-Base Solutions** **A. Buffers** **1. determining hydrogen ion concentration in buffer systems**	**Big Ideas 2, 3, 6** **Science Practices 1,2,3,4,5,6,7**	**Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.** **Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.** **Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**15 days**

2. adding H^+ or OH^- to buffer systems **3. buffer capacity** **B. Acid-Base Indicators** **1. end point** **C. Acid-Base Titrations** **1. strong acid - strong base** **2. weak acid -weak base** **3. weak acid - strong base** **4. strong acid – weak base** **5. equivalence point** **III. Complex Ions** **A. Composition of Complex Ions** **1. ligands** **2. coordination number** **3. Lewis acids and bases** **4. charges of complexes** **5. chelating agents** **6. geometric isomerism** **B. Electronic Structure of Complex Ions** **1. crystal field model** **2. transition metal cations** **3. color** **C. Formation Constants of Complex Ions**					

I. Matter and Measurements (Review) A. Types of Matter - Elements, Compounds, Mixtures B. Measurement 1. metric, SI, and conventional units 2. significant figures 3. precision and accuracy C. Properties of Matter 1. intensive and extensive properties 2. chemical and physical properties II. Atoms, Molecules, and Ions A. Development of Modern Atomic Theory 1. John Dalton 2. law of conservation of mass 3. law of constant composition 4. law of multiple proportions B. Components of the Atom 1. electrons (Thomson) 2. protons (Rutherford) 3. neutrons 4. atomic number 5. mass number 6. isotopes 7. nuclear stability and radioactivity C. Molecules and Ions 1. metals, nonmetals, metalloids 2. molecule 3. covalent bond 4. molecular and structural formulas 5. cations and anions 6. formula unit 7. ionic bond 8. polyatomic ions 9. naming compounds (ionic, binary molecular, acids)	Big Idea 1 Science Practices 1,2,3,4,5,6,7	The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.	Approved textbook Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book	Teacher prepared tests, quizzes, lab reports	5 days

I. Precipitation Equilibria **A. K_{sp} (solubility product constant)** **1. K_{sp} and equilibrium concentration of ions** **2. K_{sp} and precipitate formation** **3. K_{sp} and water solubility** **4. K_{sp} and common ion effect** **5. selective precipitation** **B. Dissolving Precipitates** **1. strong acid** **2. complex formation**	**Big Idea 6** **Science Practices 1,2,3,4,5,6,7**	**Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**10 days**
II. Gaseous Chemical Equilibrium **A. The N_2O_4-NO_2 Equilibrium System** **B. Equilibrium Constant Expression** **1. changing the chemical equation** **2. adding chemical equations** **3. heterogeneous equilibria** **C. Determination of K** **D. Applying the Equilibrium Constant** **1. reaction quotient** **2. equilibrium partial pressures** **E. Effect of Changes in Conditions on an Equilibrium System** **1. adding or removing gaseous reactant or product** **2. compressing or expanding the system** **3. changing temperature** **4. Le Chatelier's principle** **5. van't Hoff equation**	**Big Idea 6** **Science Practices 1,2,3,4,5,6,7**	**Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**15 days**

I. Rates of Reaction **A. Reaction Rate** **1. measurement of rate** **B. Reaction Rate and Concentration** **1. rate expression and rate constant** **2. order of reaction** **a. single reactant** **b. more than one reactant** **C. Reactant Concentration and Time** **1. first, zero, and second order reactions** **D. Models For Reaction Rate** **1. collision model** **2. activation energy** **3. transition-state model** **E. Reaction Rate and Temperature** **1. Arrhenius Equation** **F. Catalysis** **1. heterogeneous** **2. homogeneous** **G. Reaction Mechanisms**	**Big Idea 4** **Science Practices 1,2,3,4,5,6,7**	**Rates of chemical reactions are determined by details of the molecular collisions.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**15 days**

I. Stoichiometry (Review) **A. Atomic Masses** **1. atomic mass and amu** **2. isotopic abundances** **3. Avogadro's number** **B. The Mole (conversions)** **C. Mass Relationships in Chemical Formulas** **1. percent composition** **D. Mass Relations In Reactions** **1. chemical equations** **2. writing and balancing chemical equations** **3. mass relationships in balanced equations** **4. limiting reactants and theoretical yield** **5. experimental yield; percent yield**	**Big Ideas 1,3** **Science Practices 1,2,3,4,5,6,7**	**The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.** **Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**5 days**

I. Thermochemistry **A. Principles of Heat Flow** **1. system and surroundings** **2. state properties** **3. direction and sign of heat flow, magnitude of heat flow** **4. heat capacity** **5. specific heat** **B. Measurement of Heat Flow** **1. calorimeters (coffee-cup, bomb)** **C. Enthalpy** **D. Thermochemical Equations** **1. rules of thermochemistry** **2. heat of fusion and heat of vaporization** **3. Hess's Law** **E. Enthalpies of Formation** **1. calculating ΔH^0** **F. Bond Enthalpy** **G. First Law of Thermodynamics**	**Big Ideas 3,5** **Science Practices 1,2,3,4,5,6,7**	**Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.** **The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**10 days**

I. Spontaneity of Reaction **A. Spontaneous Process** **1. energy factor** **2. randomness factor** **B. Entropy** **1. solids, liquids, and gases** **2. increasing temperature** **3. standard molar enthalpies** **4. ΔS^0 for reactions (standard entropy Change)** **5. second law of thermodynamics** **C. Free Energy (G)** **1. Δ G and spontaneous reactions** **2. Gibbs-Helmholtz equation** **D. Standard Free Energy Change (ΔG^0)** **1. calculation at 25 ^{0}C and other temperatures** **E. Effect of Temperature, Pressure, and Concentration on Reaction Spontaneity** **F. Free Energy Change and the Equilibrium Constant** **G. Additivity of Free Energy Changes**	**Big Ideas 3,5** **Science Practices 1,2,3,4,5,6,7**	**Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.** **The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**15 days**

I. Electrochemistry **A. Voltaic Cells** **1. Zn-Cu^{2+} cell** **2. half-cells** **3. anode (oxidation)** **4. cathode (reduction)** **5. salt bridge** **B. Standard Voltages** **1. E^0 red and E^0 ox** **2. standard potentials** **3. Calculating E from E^0 red and E^0 ox** **4. Spontaneity of Redox Reactions** **C. Relationships between E^0, ΔG^0, and K** **1. $\Delta G^0 = - nFE^0$ (Faraday constant)** **2. $\Delta G^0 = - RTlnK$** **D. Effect of Concentration on Voltage** **1. Nernst Equation** **E. Electrolytic Cells** **F. Commercial Cells** **1. Electrolysis of $NaCl_{(aq)}$** **2. Primary Voltaic Cells** **3. Storable Voltaic Cells** **4. Fuel Cells**	**Big Ideas 3,5,6** **Science Practices 1,2,3,4,5,6,7**	**Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.** **The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.** **Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**15 days**

I. Gases (Review) **A. State of a gaseous substance (volume, quantity, temperature, pressure)** **1. units** **B. Ideal Gas Law** **C. Final and Initial State Problems** **D. Molar Mass and Density** **E. Stoichiometry and Gaseous Reactions** **F. Gas Mixtures** **1. mole fractions** **2. Dalton's law (partial pressures)** **3. wet gases** **G. Kinetic Theory of Gases** **H. Effusion of Gases (Graham's Law)** **I. Real Gases**	**Big Idea 2** **Science Practices 1,2,3,4,5,6,7**	**Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**5 days**

I. Nuclear Reactions **A. Radioactivity** **1. Modes of Decay** **a. alpha particle emission** **b. beta particle emission** **c. gamma radiation emission** **d. positron emission** **e. K-electron capture** **B. Rate of Radioactive Decay** **1. A = kN** **2. age of organic material** **C. Mass-Energy Relations** **1. $\Delta E = c^2 \Delta m$** **2. nuclear binding energy** **D. Nuclear Fission** **E. Nuclear Fusion** **F. Biological Effects of Radiation**	**Big Ideas 1, 3** **Science Practices 1,2,3,4,5,6,7**	**The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.** **Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**7 days**

I. Liquids and Solids **A. Liquid-Vapor Equilibrium** **1. vapor pressure** **2. vapor pressure vs. temperature** **3. Clausius-Clapeyron equation** **4. critical temperature and pressure** **B. Molecular Substances and Intermolecular Forces** **1. characteristics of molecular substances** **2. dispersion (London) forces** **3. dipole forces** **4. hydrogen bonds** **C. Network Covalent, Ionic, and Metallic Solids** **1. properties** **2. electron-sea model**	**Big Idea 2** **Science Practices 1,2,3,4,5,6,7**	**Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**8 days**

I. Organic Chemistry **A. Hydrocarbons and Common Features** **B. Alkanes (Saturated)** **1. structural isomers** **2. nomenclature** **3. sources and uses of alkanes** **C. Alkenes and Alkynes (Unsaturated)** **1. nomenclature** **D. Aromatics and Their Derivatives** **1. nomenclature** **2. derivatives of benzene** **3. condensed ring structures** **E. Functional Groups** **1. alcohols** **2. ethers** **3. aldehydes** **4. ketones** **5. carboxylic acids** **6. esters** **7. amines** **8. nomenclature** **F. Isomerism in Organics** **1. geometric (cis-trans) isomers** **2. optical isomers (enantiomers)** **a. chiral** **4. racemic isomers** **G. Organic Reactions** **1. addition reactions** **2. elimination and condensation reactions** **3. substitution reactions**	**Big Idea 2** **Science Practices 1,2,3,4,5,6,7**	**Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**10 days**

I. Electronic Structure and Periodic Table (Review) **A. The Wave Nature of Light** **1. wavelength** **2. frequency** **3. electromagnetic spectrum** **B. Particle Nature of Light** **1. photons** **C. Atomic Spectra** **D. The Hydrogen Atom** **1. Bohr model** **2. ground and excited states** **3. quantum mechanical model** **E. Quantum Numbers (n, l, m_l, m_s)** **1. Pauli Exclusion Principle** **F. Atomic Orbitals** **G. Electron Configuration** **1. ground-state configuration** **2. orbital-box notation** **a. Hund's Rule** **3. abbreviated configuration** **4. arrangements in ions** **H. The Periodic Table and Electron Configuration** **1. Groups and periods** **a. Main group elements** **b. transition elements** **c. lanthanides and actinides** **2. valence and oxidation numbers** **3. Mendeleev and Meyer** **II. Periodic Trends** **A. Atomic Radius** **B. Ionic Radius** **C. Ionization Energy** **D. Electronegativity**	**Big Idea 1,2** **Science Practices 1,2,3,4,5,6,7**	**The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.** **Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.**	**Approved textbook** **Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software, AP review book**	**Teacher prepared tests, quizzes, lab reports**	**5 days**

Final Exam Review	**Big Ideas 1,2,3,4,5,6** **Science Practices 1,2,3,4,5,6,7**	**The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.** **Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.** **Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.**	**Approved textbook** **Teacher prepared review materials, AP review book**	**Final Exam**	**10 days**

		Rates of chemical reactions are determined by details of the molecular collisions. **The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.** **Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations.**			