AP Chemistry Curriculum Map Jeri Fontaine June 2013				
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 0: **Review** Safety, Measurement and Calculations, Matter, Stoichiometry *Chapter 1 – 3* ***12 days***	**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. LO: 1.1, 1.2, 1.3, 1.4, 1.14, 1.17, 1.18, 2.1, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 Essential Questions How can we ensure our safety and that of those around us in lab? Why must we use certain units, and how can we convert between units? What is the difference between accuracy and precision? How can we show accuracy in	• Lab safety • Units of measure • Answers are only as accurate as the least accurate measurement. • Classification of matter • History of the development of the atomic theory • Atomic theory • Nomenclature • Chemical equations represent chemical change • The Law of conservation of mass • Mole concept **Activity:** **Guided Inquiry: Representing Chemical Equations and Stoichiometry(College Board)** **Laboratory:** **Stoichiometry of a Chemical Reaction** **Investigation 7:** **Using the Principle That Each Substance Has Unique Properties to Purify a Mixture: An Experiment in Applying**	• Application of good lab practices • Use dimensional analysis and significant figures • Explain atomic structure and historical experimental evidence (Dalton, Thompson, Rutherford, Curies, Millikan, Einstein, Bohr) • Apply chemical nomenclature • Write and balance chemical equations • Convert stoichiometric quantities including molar volumes, mole ratios, molar mass • Apply concepts of limiting reagents, percent composition, empirical and molecular formula determination, average atomic mass, relative atomic mass	Safety quiz Summer Assignment Test: Ch 1 & 2 Test: Ch 3 Guided Inquiry: Representing Chemical Equations and Stoichiometry (College Board) Lab: Stoichiometry of a Chemical Reaction Investigation 7: Using the Principle That Each Substance Has Unique Properties to Purify a Mixture: An Experiment in Applying Green Chemistry to Purification (College Board)

	our answers? What is the basic structure of matter? What chemical symbols are used in the language of chemistry? How can matter change? How can a chemical equation qualitatively and quantitatively represent a chemical reaction? How can we determine chemical quantities in a chemical reaction?	**Green Chemistry to Purification (College Board)**		
	Standards			Resources
	5.1.12.A.2 Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. 5.1.12.B.2 Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. 5.2.12.B.3 Empirical evidence is used to construct and defend arguments. 5.1.12.C.1 Reflect on and revise understandings as new evidence emerges 5.1.12.C.2 Use data representations and new models to revise predictions and explanations 5.1.12.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. 5.2.12.A.1 Electrons, protons and neutrons are parts of the atom and have measurable properties, including mass and, in the case of protons and electrons, charge. The nuclei of atoms are composed of protons and neutrons. A kind of force that is only evident at nuclear distances holds the particles of the nucleus together against the electrical repulsion between the protons. 5.2.12.B.3 Balance chemical equations by applying the law of conservation of mass. 5.3.12 B.1 When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data.			Safety video Safety rules Copy of lab equipment with names Lab notebook setup Chapter 1-3 notes Textbook - Chapter 1-3 Guided Inquiry: Representing Chemical Equations and Stoichiometry (College Board) Lab: Stoichiometry of a Chemical Reaction (Flinn) Investigation 7: Using the Principle

				That Each Substance Has Unique Properties to Purify a Mixture: An Experiment in Applying Green Chemistry to Purification (College Board)
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 1 Gases Chapter 5 5 days	**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. LO: 1.3, 1.4, 2.4, 2.5, 2.6, 2.12, 2.15, 3.4, 5.2 **Essential Questions** What are the properties of gases? How do gases behave? How can we predict gas behavior? How can we determine amounts of reactants and products in a chemical reaction?	• Kinetic molecular theory (KMT) • Charles Law, Boyles Law, Gay-Lussac's Law, Dalton's Law, • Combined Gas Law, Ideal Gas Law • Avogadro's hypothesis • Gas stoichiometry • Intermolecular forces • Heat of vaporization, heat of fusion, heat capacity • Vapor pressure **Laboratory:** **Investigation 7 Continued: Using the Principle That Each Substance Has Unique Properties to Purify a Mixture: An Experiment in Applying Green Chemistry to Purification (continued)**	• Describe gases and their behavior • Solve gas law problems • Interconvert moles, grams, and atoms/molecules • Describe the KMT qualitatively • Explain the a and b factors of the Van der Waals equation and write (but not solve!) the Van der Waals equation for the behavior of real gases • Describe the differences between real and ideal gases	Ch 5 Test Homework Sets 1, 2 Investigation 7: Using the Principle That Each Substance Has Unique Properties to Purify a Mixture: An Experiment in Applying Green Chemistry to Purification (College Board)

	Standards			Resources
	5.1.12 A.3 Engage in collaboration, peer review, and accurate reporting of findings. 5.1.12 B.1 Select and use appropriate instrumentation to design and conduct investigations. 5.1.12.B.1 Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. 5.1.12.A.b Interpretation and manipulation of evidence-based models are used to build and critique arguments/explanations. 5.1.12.B.aLogically designed investigations are needed in order to generate the evidence required to build and refine models and explanations. 5.3.12 B.1 When performing mathematical operations with measured quantities, express answers to reflect the degree of precision and accuracy of the input data. 5.1.12.B.cEmpirical evidence is used to construct and defend arguments. 5.3.12 D.1 Construct and interpret graphs of data to represent inverse and non-linear relationships, and statistical distributions. 5.2.12.C.1 Use the kinetic molecular theory to describe and explain the properties of solids, liquids, and gases. 5.2.12.A.2 Account for the differences in the physical properties of solids, liquids, and gases. 5.2.12.C.a Gas particles move independently and are far apart relative to each other. The behavior of gases can be explained by the kinetic molecular theory. The kinetic molecular theory can be used to explain the relationship between pressure and volume, volume and temperature, pressure and temperature, and the number of particles in a gas sample. There is a natural tendency for a system to move in the direction of disorder or entropy.			Textbook Chapter 5 Notes Chapter 5 Investigation 7: Using the Principle That Each Substance Has Unique Properties to Purify a Mixture: An Experiment in Applying Green Chemistry to Purification (College Board)
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 2 Aqueous Reactions and Properties of Solutions Chapter 4, 13 15 Days	**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. LO: 1.20, 2.1, 2.2, 3.7, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16. 6.17. 6.28, 6.19, 6.20	• Classifications of reactions • Writing, balancing and predicting products of chemical reactions • A solution is composed of a solute and a solvent. • Molarity or molality describe concentrations • Strength is a measure of ionization • A nonelectrolyte cannot conduct electricity, and	• Demonstrate knowledge of solution stoichiometry including strong, weak and non electrolytes • Molarity calculations • Application of memorized solubility rules in writing precipitation reactions • Calculations involving acid-base titration • Balancing redox equations by the half-reaction method and describing oxidation and reduction • Identifying and explaining the changes in precipitation, acid-base, and redox reactions.	Ch 4, 13 Test Homework Sets 1, 2, 3 Laboratories: Guided Inquiry: Separating a Synthetic Pain Relief Mixture (Flinn) Guided Inquiry: Identification by Precip Rxns

	Essential Questions How can we predict the products of a reaction? How can we classify reactions? What is a solution? What are the properties of solutions? What factors affect solubility? What is a net ionic equation?	electrolyte can. • Pressure, temperature, composition and amount of solute affect solubility • A net ionic equation represents the particles that take place in a reaction, and do not include any spectator ions. **Laboratory:** **Guided Inquiry: Separating a Synthetic Pain Relief Mixture (Flinn)** **Guided Inquiry: Identification by Precip Rxns** **Guided Inquiry: Quantitative Redox Titration**	• Performing a quantitative redox titration	Guided Inquiry: Quantitative Redox Titration
	Standards			**Resources**
	5.2.12.A.5 Describe the process by which solutes dissolve in solvents. 5.2.12.B.2 Describe oxidation and reduction reactions, and give examples of oxidation and reduction reactions that have an impact on the environment, such as corrosion and the burning of fuel. 5.2.12.B.3 Balance chemical equations by applying the law of conservation of mass.			Textbook Chapters 4, 13
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 3 Kinetics Ch 16 13 Days	**Big Idea 4:** Rates of chemical reactions are determined by details of the molecular collisions. LO: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9 **Essential Questions** What factors affect reaction rates? How can we determine the rate	• Reaction rates • Rate laws • Determining a rate law • Order of a reaction • Graphical methods for zero, first, and second order rate laws • Half life • Factors that affect reaction rates	• List the factors that influence the rate of a chemical reaction. • Use experimental data to determine the rate law, determine the order of the reaction, and to define proper units for the constant. • Compare and contrast zero, first, and second order reactions in terms of the plot needed to give a straight line, the relationship of the rate constant to the slope of the straight line, and the half-life of the reaction.	Ch 16 Test Homework Sets 1, 2, 3 Laboratory: Investigation 10: How Long Will That Marble Statue Last? (College Board)

	of a reaction? What determines if a collision between particles will result in a chemical reaction? How is a reaction mechanism determined? What are the advantages of using a catalyst, and what types of catalysts are there?	• Collision theory • Activation energy • Reaction mechanisms • Catalysts **Laboratory:** **Investigation 10: How Long Will That Marble Statue Last? (College Board)** **Guided Inquiry: Kinetics of Crystal Violet Fading (Flinn)**	• Interpret data from a first order reaction to determine its half-life. • Solve problems involving activation energy and the Arrhenius equation. Interpret the Boltzmann distribution law in light of reaction rates. • Use experimental data to postulate a reaction mechanism. • Interpret how changing the conditions of the reaction (i.e., temperature, pressure, concentration, and addition of a catalyst) affect both the rate and the rate constant of the reaction. • Discuss the role of a catalyst in the rate and mechanism of a reaction; distinguish between a homogeneous and a heterogeneous catalyst.	Guided Inquiry: Kinetics of Crystal Violet Fading (Flinn)
	Standards			**Resources**
	5.2.12.D5 Model the change in rate of a reaction by changing a factor			Ch 16 Notes Investigations 10, 11

Unit	Big Ideas, Learning Objectives & Essential Questions	Content	Skills	Assessment
Unit 4 Equilibrium Ch 17 12 days	**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. LO: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10 **Essential Questions** What is equilibrium? How can we tell if a system is in equilibrium?	• The nature of equilibrium • The law of mass action • Equilibrium constants • K_c and K_p • ICE tables • Conversion between K_c and K_p • LeChatelier's Principle **Activity: Guided Inquiry: Acid-Base Neutralization Reactions (College Board)**	• Describe the meaning of physical and chemical equilibrium. • Write the law of mass action for any system at equilibrium. • Show the relationship between Kc and Kp. • Solve problems involving concentrations and equilibrium constants. • Understand the meaning of equilibrium constant and reaction quotient (Q). • Interpret the position of equilibrium from the size of the equilibrium constant. • Use Le Chatelier's principle to predict the direction a system in equilibrium will shift	Ch 17 Test Homework Sets 1, 2, 3 Activity: Guided Inquiry: Acid-Base Neutralization Reactions (College Board) Laboratory: Application of LeChatelier's Principle

	How can we determine the concentrations of species during a reaction? What factors can disturb a system that is in equilibrium? How will a system at equilibrium respond to a stress?	**Laboratory: Application of LeChatelier's Principle (Flinn)**	in order to re-establish equilibrium. • Know that temperature, pressure, and concentration will shift the position of equilibrium. • Explain how the change in the equilibrium constant with change in temperature is related to the enthalpy change in the reaction. • Describe the effect that a catalyst will have on an equilibrium system.	(Flinn)
	Standards			**Resources**
				Ch 17 Notes

Unit	Big Ideas, Learning Objectives & Essential Questions	Content	Skills	Assessment
Unit 5 Acid Base Equilibrium, Hydrolysis, Buffers, Titrations Ch 18, 19 27 days	**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. LO: 1.20, 2.1, 2.2, 3.3, 3.7, 6.1, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16. 6.17. 6.28, 6.19, 6.20, 6.21, 6.22, 6.23 **Essential Questions** How can we classify acids and bases? What is a buffer, and how does it work? What determines the strength of an acid or a base? What is pH? pOH? How can we determine the pH	• Acid-base concepts Arrhenius, Bronsted-Lowry, Lewis • Strengths • pH and pOH • K_a and K_b • Autoionization of water, K_w • pH of strong and weak acids and bases • Acid-base titration curves • Indicators • Common ion Effect • Buffers • Solubility product, K_{sp} **Laboratories:** **1. Guided Inquiry: Preparation and Standardization of a Base**	• Distinguish between the various modem theories of acids and bases. • Explain what is meant by the autoionization of water and use the water constant, Kw. • Define pH, pOH, pK, Ka, Kb, ionization constant, and percent ionization. • Convert from $[H_30+]$ or $[OH^{1-}]$ to pH or pOH. • Use the concept of conjugate acid-base pairs to predict reaction products. • Define and give examples of amphiprotic species. • Identify strong and weak electrolytes. • Explain the relationship between the strength of an acid and its conjugate base. • Explain the factors that determine strength of binary acids and oxyacids. • Recognize salts that undergo hydrolysis and write a reaction for the ion with water. • Predict whether a salt solution is acidic,	Ch 18 Test Ch 19 Test Ksp Quiz Homework Ch 18 Sets 1, 2, 3 Ch 19 Sets 1, 2, 3 Laboratories: 1. Guided Inquiry: Preparation and Standardization of a Base 2. Guided Inquiry: Analyzing a Phosphoric acid solution 3. Inv. 15: To What Extent do Common

	of a solution? How do concentrations effect the pH of a solution? How does pH change as an acid and a base react? How can you determine if a titration has reaches the end point? What is the common ion effect? Howe can we determine concentrations of a system that involves common ions? What are buffers? How does a buffer affect the change in concentrations during a reaction? How does solubility affect reaction concentrations?	**2. Guided Inquiry: Analyzing a Phosphoric acid solution** **3. Inv. 15: To What Extent do Common Household Products Have Buffering Activity? (College Board)** **4. Indicator lab**	basic, or neutral. • Write balanced equations and net ionic equations involving acids, bases, and salts. • Recognize Lewis acid-base reactions. • Perform a titration using a pH sensor to determine a titration curve. • Determine the ionization constant and solution concentration from the titration curve. • Pick a suitable indicator for a titration. • Solve problems using the concentration and amount of weak acids or bases and equilibrium constants to determine the pH of a solution or to produce a titration curve. • Write solubility product expressions for slightly soluble compounds. • Solve problems involving: (a) solubility product constants from solubility; (b) molar solubility from Ksp; (c) concentrations of substances necessary to produce a precipitate; (d) concentrations of ions involved in simultaneous equilibrium. • Explain the common-ion effect on molar solubility.	Household Products Have Buffering Activity? (College Board) 4. Indicator lab
	Standards			**Resources**
	5.2.12.A.6 Relate the pH scale to the concentrations of various acids and bases			Ch 18, 19 Notes Laboratories

Unit	Big Ideas, Learning Objectives & Essential Questions	Content	Skills	Assessment
Unit 6 Thermochemistry and Thermodynamics	**Big Idea 5:** The laws of thermodynamics describe the essential role of energy and explain and predict the	• Energy • Specific heat • The first law of	• Learn the meaning of the following thermodynamic terms: enthalpy, ΔH, exothermic, endothermic, system,	Ch 6 Test Ch 20 Test Homework Ch 6 Sets 1, 2, 3

Ch 6, 20 17 Days	direction of changes in matter. LO: 2.15, 3.11, 5.3, 5.4, 5.5, 5.6, 5.7, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 6.25 **Essential Questions** What is energy? What is the difference between temperature and heat? Why are some reactions spontaneous, while others are not?	thermodynamics • Enthalpy of reaction • Calorimetry • Enthalpy of formation • Hess's law • Enthalpy changes and stoichiometry • Spontaneous processes and state functions • Entropy and the Second Law of Thermodynamics • Entropy changes in chemical reactions • Gibbs Free energy • Free energy and temperature • Three laws of thermodynamics • Free energy and equilibrium **Laboratory:** **Designing a Hand Warmer (Flinn)** **Laboratory: Guided Inquiry: Solubility and Thermodynamics**	surroundings, universe, heat of formation, heat of reaction, calorimetry, heat, calorie, joule, standard molar enthalpy of formation, molar heat of combustion. • Solve calorimetry problems involving $q = mc_p\Delta T$. • Draw potential energy diagrams in terms of enthalpy changes. • Use Hess's Law to solve for heat of reaction. • Use stoichiometric principles to solve heat problems. • Define spontaneity and apply it to identifying spontaneous processes. • Explain what is meant by a state function. • Discuss the laws of thermodynamics (in order). • Define internal energy, PV work, enthalpy, entropy, and free energy. • Use Hess's law to solve problems of energy, entropy, and free energy. • Define the terms exothermic, endothermic, exergonic, and endogonic. • Explain the relationship among enthalpy, entropy and free energy. • Understand the relationship between free energy change and equilibrium constants. • Solve problems using enthalpy, entropy, free energy and equilibrium constants and reaction quotients.	Ch 20 Sets 1, 2, 3 Laboratory Designing a Hand Warmer (Flinn) Laboratory: Guided Inquiry: Solubility and Thermodynamics
	Standards			**Resources**
	5.2.12.C.2 Account for any trends in the melting points and boiling points of various compounds 5.2.12.D.2 Describe the potential commercial applications of exothermic and endothermic reactions			Ch 6, 20 Notes Investigation 12 Laboratory
Unit	**Big Ideas, Learning Objectives & Essential**	**Content**	**Skills**	**Assessment**

	Questions			
Unit 7 Electrochemistry Ch 21 9 days	**Big Idea 3:** Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons. LO: 3.2, 3.8, 3.12, 3.13, 5.15, 6.1 **Essential Questions** How do batteries produce electricity? How can we determine the cell potential? What is electroplating?	• Redox reactions • Oxidation vs reduction • Balancing redox • Galvanic and voltaic cells • Cell EMF under standard conditions • Free energy and redox • Cell EMF under nonstandard conditions • Electrolysis Laboratories: 1. Introduction to Electrochemistry 2. Electrochemical cells	• Use the half-reaction method to balance redox equations. • Define electrochemical terms: redox, anode, anion, cathode, cation, oxidizing agent, reducing agent, cell potential (EMF), electrode, etc. • Diagram simple voltaic cells using proper notation. • Use a table of Standard Reduction Potentials to compute cell potentials. • Use electrode potentials to determine cell potential and to predict spontaneity of a reaction. • Explain the relationship between and solve problems relating cell potential and free energy. • Determine cell potentials at nonstandard conditions. • Predict reaction products for both electrolytic and voltaic cells. • Establish the relationship between the free energy change, the cell potential, and the equilibrium constant. • Solve problems using the Nernst's equation. • Diagram simple electrolytic cells. • Distinguish between an electrolytic cell and a voltaic cell in terms of function and ΔG. • Explain electrolysis and its relationship to cell potential. • Solve problems relating time, current, and the amount of substance consumed or produced in an electrolysis reaction.	Ch 21 Test Homework Laboratories Introduction to Electrochemistry Electrochemical cells
	Standards			**Resources**
				Ch 21 Notes Laboratories

<table>
<tr><th>Unit</th><th>Big Ideas, Learning Objectives & Essential Questions</th><th>Content</th><th>Skills</th><th>Assessment</th></tr>
<tr><td rowspan="4">Unit 8
Atomic Theory and the Periodic Table

Ch 7, 8, 14

10 days</td><td>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.</td><td rowspan="3">• Wave nature of light
• Atomic models
• Evidence for the Atomic Theroy
• Quantum view of the atom
• Electron configurations
Aufbau
Hund’s rule
Pauli exclusion principle
• Periodic table and electron configs
• Periodic trends

Laboratory: Investigation 1: What is the Relationship Between Concentration and Transmitted Light? (College Board)</td><td rowspan="3">• Discuss the Bohr model of the atom, and compare it to the quantum mechanical model of the atom.
• Discuss the major differences in the classical mechanical model and the quantum mechanical model.
• Work problems involving quantum numbers and energies of electron transitions.
• Define and discuss the following terms or concepts: frequency, wavelength, energy level, Heisenberg uncertainty principle, Pauli Exclusion Principle, wave-particle duality of matter, wave function of electrons (Y), radial probability density, orbitals, Aufbau process, and Hund's rule.
• Write quantum numbers to define an orbital.
• Describe the shapes of the s, p, and d orbitals.
• Understand the basis for the periodic law, and apply it to periodic trends such as atomic radii, ionization energy, electron affinity, density, melting point, oxidation states, and electronegativity.
• Explain observed changes in successive ionization energies
• Write electron configurations, orbital filling diagrams, and electron dot diagrams for any element based on position in the Periodic Table.</td><td rowspan="3">Ch 7, 8, 14 Test
Homework
Ch 7 Set 1, 2
Ch 8 Set 1, 2
Ch 9 Set 1, 2

Laboratory:
Investigation 1: What is the Relationship Between Concentration and Transmitted Light? (College Board)</td></tr>
<tr><td>LO: 1.1, 1.17, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.12, 1.13, 1.15, 2.17, 3.5, 3.6</td></tr>
<tr><td>Essential Questions
What is an atom?
How do we know atoms exist?
What makes the elements different?
Why are some elements similar?
What is the relationship between an atom and its position on the periodic table?
What information can we gain from the periodic table?</td></tr>
<tr><td></td><td colspan="3">Standards</td><td>Resources</td></tr>
<tr><td></td><td colspan="3">5.2.12.A.3 Predict the placement of unknown elements on the periodic table based on their chemical and physical properties.
5.2.12.B.1 An atom’s electron configuration, particularly the outermost electrons, determines how the atom interacts</td><td>Ch 7, 8, 14 Notes
Investigation 1</td></tr>
</table>

	with other atoms. Chemical bonds are the interactions between atoms that hold them together in the molecules or between oppositely charged ions.			
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 9 Bonding and Molecular Geometry Ch 9, 10, 11 11 days	**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. LO: 1.7, 1.8, 1.15, 2.1, 2.17, 2.18, 2.21, 2.23, 2.24, 5.1, 5.8 **Essential Questions** How do atoms combine to form compounds? What is the difference between ionic, covalent and metallic bonds? Why do atoms form bonds? What are valence electrons? How can we represent the valence electrons? How can we represent the way that atoms are bonded together? How do we know what molecules and crystal lattices look like? What is VSEPR theory?	• Bonding: Metallic Covalent ionic • Energy associated with structures: Bond dissociation energy Lattice energy • Lewis structures • Types of covalent bonds • VSEPR theory • Resonance • Valence Bond theory • Hybridization • Electronegativity and Bond polarity • Molecular shapes • Polar and Nonpolar molecules Laboratory: Investigation 5: Guided Inquiry: Sticky Question – How do You Separate Molecules That are Attracted to One Another? (College Board) Qualitative Analysis and Chemical Bonding (Flinn)	• Draw Lewis structures for the common atoms, ions, and molecules. • Use periodic trends of electronegativity to predict bond type. • Describe how the Born-Haber Cycle is used to show the formation of an ionic bond. • Determine the amount of lattice energy in an ionic bond and how it relates to bond strength and physical properties of ionic compounds. • Distinguish between polar and nonpolar molecules. • Use electronegativity values and bonding concepts to determine oxidation states of atoms. Draw resonance structures. Assign formal charges • Use the VSEPR model to predict electron pair geometry and molecular geometry. • Relate VSEPR to hybridization. • Use hybridization to show the formation of sigma and pi bonds. • Compare and contrast Valence Bond theory with Molecular Orbital theory. • Name and draw the molecular orbitals resulting from overlap of orbitals to create bonding and antibonding orbitals • Draw molecular orbital energy level diagrams for all 1st and 2nd period homonuclear diatomic molecules and use it to predict stability, bond order, bond length, and magnetic properties. • Draw molecular orbital energy level	Ch 9, 10, 11 Test Homework Ch 9 Set 1, 2 Ch 10 Set 1, 2 Ch 11 Set 1, 2 Investigation 5

			diagrams for selected heteronuclear diatomic molecules.	
	Standards			**Resources**
	5.2.12.B.1 Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form.			Ch 9, 10, 11 Notes Investigation 5
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 10 Intermolecular forces, Liquids and Solids Ch 12 5 days	**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. LO: 1.11, 2.1, 2.3, 2.8, 2.9, 2.11, 2.13, 2.14, 2.15, 2.16, 2.19, 2.20, 2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28, 2.29, 2.30, 2.31, 2.32, 5.6, 5.9, 5.10, 5.11, 6.24 **Essential Questions** What is surface tension? Why do we say that opposites attract? Why do liquids flow? Why are solids rigid? Why are boiling and melting points constant?	• Molecular comparison of solids, liquids, and gases • Intermolecular forces London Dipole Hydrogen bonding • Bond and molecular polarity • Properties of liquids • Structures of solids • Phase change diagrams • Vapor pressure • Solution chemistry Saturated solution Unsaturated solutions Supersaturated solutions **Laboratory: Investigation 6 What's in That Bottle? (College Board)**	• Apply the kinetic-molecular theory to liquids and solids, in contrast to gases. • Describe the various types of intermolecular attractive forces and state the kinds of intermolecular forces expected for a given substance. • Explain the meaning of the terms viscosity, surface tension, and vapor pressure in terms of intermolecular forces and temperature. • Interpret heating curves as to melting point, boiling point, and specific heat. • Interpret phase diagrams and correctly define terms such as triple point, critical temperature, and critical pressure. • Discuss the phenomena of boiling, and be able to relate it to pressure. • Distinguish between crystalline and amorphous solids. • Use the unit cell information for calculation of ionic radii. • Use the concepts of intermolecular forces in discussing the dissolving process	Ch 12 Quiz Homework Sets 1, 2 Laboratory: Investigation 6: What's in That Bottle? (College Board)

	What is a solution? How much solute can be dissolved in a solution? What factors affect solubility?			
	Standards			**Resources**
	5.2.12.A.2 Account for the differences in the physical properties of solids, liquids and gasses. 5.2.12.C.2 Account for any tends in the melting points and boiling points of various compounds.			Ch 12 Notes Investigation 6
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Test Review 7 days		Units 1-10		Final Exam
				Resources Test Review Handouts Practice Exams
Unit	**Big Ideas, Learning Objectives & Essential Questions**	**Content**	**Skills**	**Assessment**
Unit 11 Organic Ch 15 20 days	**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. LO: 1.15, 1.19, 2.10, 2.11, 3.3, 5.11 **Essential Questions** What is organic chemistry? How do we name organic compounds? What are the functional groups?	• General Characteristics • Nomenclature • Structures of organic compounds • Functional groups • Isomerism • Synthesis reactions • Dehydration reactions • Chirality • Enantionmers **Laboratory: Synthesis of an Ester**	• Be able to describe how the bonding properties of carbon are related to various classes of organic compounds. • Identify different hydrocarbon structure as alkanes, alkenes, and alkynes. • Be able to name and draw structures of hydrocarbons and structural, positional and geometric isomers. • Be able to name and draw structures of different functional groups: alcohols, ethers, aldehydes, ketones, carboxylic acids, and esters. • Be able to name and draw structures for aromatic compounds: benzene and its derivatives. • Explain and predict the products for basic organic reaction patterns of combustion, addition, elimination, and substitution.	Organic Test Homework Laboratory: Synthesis of an Ester

	What are some common organic reactions? What is chirality? What are enantionmers? Why does chirality matter?		• Be able to write structural equations for simple organics reactions using patterns of combustion, addition, elimination and substitution.	
	Standards			**Resources**
	5.2.12.A.1 Use atomic models to predict the behaviors of atoms in interactions. 5.6.12 A.3Know that an atom's electron arrangement, particularly the outermost electrons, determines how the atom can interact with other atoms. 5.6.12 A.4Explain that atoms form bonds (ionic and covalent) with other atoms by transferring or sharing electrons. 5.6.12.A.7Recognize that the properties of matter are related to the structure and arrangement of their molecules and atoms, such as in metallic and nonmetallic crystals and carbon compounds.			Organic Notes Laboratory