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.

<u>Big Idea 2</u>: 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.

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

<u>Big Idea 6</u>: 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.

<u>Science Practice 2</u>: 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.

Year-at-a-glance

Subject: AP Chemistry II	Grade Level 11 or 12	Date Completed: 06-01-15
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1st Quarter

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

2nd Quarter

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

3rd Quarter

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

4th Quarter

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

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

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

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

2. adding H ⁺ or OH ⁻ to buffer systems	<u> </u>		
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)	Big Idea 1	The chemical	Approved textbook	Teacher	5 days
A. Types of Matter - Elements, Compounds,		elements are		prepared	
Mixtures	Science	fundamental	Teacher selected	tests, quizzes,	
B. Measurement	Practices	building materials	laboratories	lab reports	
1. metric, SI, and conventional units	1,2,3,4,5,6,7	of matter, and all	supporting course		
2. significant figures		matter can be	content,		
3. precision and accuracy		understood in	appropriate videos,		
C. Properties of Matter		terms of	internet resources,		
1. intensive and extensive properties		arrangements of	teacher demos,		
2. chemical and physical properties		atoms. These atoms	probeware, teacher		
II. Atoms, Molecules, and Ions		retain their identity	prepared notes and		
A. Development of Modern Atomic Theory		in chemical	worksheets,		
1. John Dalton		reactions.	software, AP review		
2. law of conservation of mass			book		
3. law of constant composition					
4. law of multiple proportions					
B. Components of the Atom					
1. electrons (Thomson)					
protons (Rutherford)					
3. neutrons					
4. atomic number					
5. mass number					
6. isotopes					
nuclear stability and radioactivity					
C. Molecules and Ions					
 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)					

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

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 2. writing and balancing chemical equations 3. mass relationships in balanced equations 4. limiting reactants and theoretical yield 5. experimental yield; percent yield A. Atomic Masses 1, atomic mass and amu Science Practices Science Practices 1,2,3,4,5,6,7 Matter can be understood in terms 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	I. Stoichiometry (Review)	Big Ideas	The chemical	Approved textbook	Teacher	5 days
3. mass relationships in balanced equations 4. limiting reactants and theoretical yield 5. experimental yield; percent yield 7. experimental yield; percent yield 7. experimental yield; percent yield 8. reactions. 9. Changes in matter involve the rearrangement and/or reorganization of atoms and/or the	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	1,3 Science Practices	elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity	Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and	prepared tests, quizzes,	5 days
	 writing and balancing chemical equations mass relationships in balanced equations limiting reactants and theoretical yield 		retain their identity in chemical reactions. Changes in matter involve the rearrangement and/or reorganization of atoms and/or the	prepared notes and worksheets, software, AP review		

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

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

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

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

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

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

I. Organic Chemistry	Big Idea 2	Chemical and	Approved textbook	Teacher	10 days
A. Hydrocarbons and Common Features		physical properties		prepared	
B. Alkanes (Saturated)	Science	of materials can be	Teacher selected	tests, quizzes,	
1. structural isomers	Practices	explained by	laboratories	lab reports	
2. nomenclature	1,2,3,4,5,6,7	the structure and	supporting course		
3. sources and uses of alkanes		the arrangement of	content,		
C. Alkenes and Alkynes (Unsaturated)		atoms, ions, or	appropriate videos,		
1. nomenclature		molecules and the	internet resources,		
D. Aromatics and Their Derivatives		forces between	teacher demos,		
1. nomenclature		them.	probeware, teacher		
2. derivatives of benzene			prepared notes and		
3. condensed ring structures			worksheets,		
E. Functional Groups			software, AP review		
1. alcohols			book		
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					

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

Final Exam Review	Big Ideas	The chemical	Approved textbook	Final Exam	10 days
	1,2,3,4,5,6	elements are	Ph		
	,,,,,,,,,,	fundamental	Teacher prepared		
	Science	building materials of	• •		
	Practices	matter, and all	review book		
	1,2,3,4,5,6,7	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.			

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	dynamic competition,
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