

# Essential Questions

The following 8 essential questions are used throughout this planning guide.

1. How is science a human endeavor?
  - a. Science in the historical perspective.
  - b. Science and technology
2. How do scientists work to gather, analyze, communicate and validate data to form and change models?
  - a. Inquiry
  - b. Data collection and analysis (including significant digits, units, measurement tools, etc.)
  - c. Communication of results
  - d. Scientific collaboration and validation
3. How does the structure of an atom determine its properties?
  - a. Development of atomic theory
  - b. Subatomic particles
  - c. Isotopes
  - d. Electron configurations
  - e. Periodic Trends
  - f. Atomic structure as related to bonding
4. How does the structure of a compound or molecule determine its properties?
  - a. Physical and chemical properties
  - b. Writing chemical formulas
  - c. Lewis-Dot
  - d. VSEPR
  - e. Intermolecular Forces
  - f. Organic chemistry
5. How does matter undergo changes and how do we use chemical equations?
  - a. Physical, chemical changes
  - b. Writing chemical equations
  - c. Types of reactions
  - d. Moles
  - e. Stoichiometry
  - f. Electrochemistry
6. How do matter and energy interact?
  - a. Phase change
  - b. Kinetic molecular theory
  - c. Gas Laws
  - d. Properties of light

- e. Excitation and relaxation
  - f. Thermodynamics
7. How are mixtures different from pure substances?
- a. Elements, compounds and mixtures
  - b. Solution formation
  - c. Precipitation reactions
  - d. Concentrations
  - e. Electrolytes
  - f. Colligative Properties
8. What are the characteristics and reactions of acids and bases?
- a. Define acids and bases
  - b. pH scale and calculations
  - c. Neutralization reactions
  - d. Titrations

## Chapter 1: Scientists' Tools

### Essential questions:

- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?

**Note on Chapter 1:** If you prefer to break this chapter up and complete it as necessary to really embrace the “Need to Know” format rather than covering all the preliminary information before diving in and using it, you cover the sections right before the background information is needed:

**Section 1.1, 1.2 & 1.3** can be covered at the very beginning of the year—introducing students to basic lab technique and what science is all about.

**Sections 1.4, 1.5 and 1.6** can be covered before they are needed. The first time that calculation are completed is in Section 3.3 (Density)—before this, there is no need to understand unit conversions and significant digits. These skills are also need in Section 3.6 & 3.7 (Moles & Gas Laws) and should be covered before then.

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
1-1: Doing Science	<ul style="list-style-type: none"> <li>• Describe scientific processes</li> <li>• Distinguish between independent and independent variable and constants</li> <li>• Distinguish between prediction and hypothesis</li> <li>• Distinguish between accuracy and precision</li> <li>• Distinguish between theory and law</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Introductory Activity Reading Guide Practice Questions PowerPoint Section Quiz
1-2: Observations & Measurements	<ul style="list-style-type: none"> <li>• Distinguish between qualitative observation and quantitative observation (measurements).</li> <li>• Explain proper descriptors to use in observations</li> <li>• Define SI units</li> <li>• Discuss uncertainty in measurement</li> </ul>	2-3 short periods 1.5 block periods	2 short periods 1 block period	Reading Guide Practice Questions PowerPoint Lab 1.2A Lab 1.2B Section Quiz
1-3: Designing Your Own Labs	<ul style="list-style-type: none"> <li>• Familiarize the student with the process of designing their own labs</li> </ul>	3 short periods 1.5 block periods	2 short periods 1 block periods	Reading Guide PowerPoint Learning Activity (TE) Lab 1.3
1-4: Converting Units	<ul style="list-style-type: none"> <li>• Explain and practice calculations using dimensional analysis</li> </ul>	3 short periods 1.5 block periods	1-2 short periods 1 block period	Reading Guide Practice Questions PowerPoint Section Quiz

1-5: Significant Digits	<ul style="list-style-type: none"> <li>Explain and practice using significant digits</li> </ul>	1 short period 0.5 block periods	0.5 short period 0.25 block period	Reading Guide Practice Questions A & B PowerPoint Section Quiz
1-6: Scientific Notation	<ul style="list-style-type: none"> <li>Explain and practice using scientific notation</li> </ul>	1 short period 0.5 block period	0.5 short period 0.25 block period	Reading Guide Practice Questions PowerPoint Section Quiz
Review		1 short period 0.5 block period	1 short period 0.5 block period	Chapter review questions
Exam		1 short period 0.5 block period	1 short period 0.5 block period	ExamView Exam
<b>TOTAL</b>		<b>13-14 short periods</b> <b>7 block periods</b>	<b>9-10 short periods</b> <b>5 block periods</b>	

## Chapter 2: Antacids

### Essential questions:

- How do antacids work?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?
- How are mixtures different from pure substances?
- How does matter undergo changes and how do we use chemical equations?
- What are the characteristics and reactions of acids and bases?

**Note on Chapter 2:** If you wish, this chapter can be split into two smaller units to reduce the load on students. Sections 2.1-2.5 can be completed as “What chemicals are important to antacids” and Sections 2.6-2.8 can be completed as “How do antacids react”. This would allow you to take 2 shorter tests rather than one longer one.

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
2-1: Types of Matter	<ul style="list-style-type: none"> <li>• Define and distinguish between pure substance (elements and compounds) and mixtures (homogeneous and heterogeneous)</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Introductory Activity Reading Guide Practice Questions PowerPoint Demo Learning Activity Section Quiz
2-2: Naming Chemicals	<ul style="list-style-type: none"> <li>• Explain and practice nomenclature rules in naming chemicals: binary ionic, multi-valent ionic, polyatomic ionic and covalent</li> </ul>	3 short periods 1.5 block periods	2 short periods 1 block period	Reading Guide Practice Questions PowerPoint Worksheet Section Quiz
2-3: Writing Chemical Formulas	<ul style="list-style-type: none"> <li>• Explain and practice nomenclature rules for writing chemical formulas: binary ionic, multi-valent ionic, polyatomic ionic and covalent</li> </ul>	2-3 short periods 1-1.5 block periods	1-2 short periods 1 block periods	Reading Guide Practice Questions PowerPoint Worksheet Section Quiz
2-4: Writing &	<ul style="list-style-type: none"> <li>• Define and distinguish between acids and</li> </ul>	2 short periods	1 short periods	Reading Guide

Naming Acids & Bases	bases <ul style="list-style-type: none"> <li>Explain and practice nomenclature rules for naming and writing acids and bases</li> </ul>	1 block periods	0.5 block period	Practice Questions PowerPoint Worksheet Section Quiz
2-5: Characteristics of Acids & Bases	<ul style="list-style-type: none"> <li>Investigate characteristics of acids and bases</li> <li>Distinguish between strong and weak acids/bases</li> <li>Distinguish between concentration and strong</li> <li>Explain the pH scale and use of indicators</li> </ul>	1.5 short period 1 block periods	1.5 short period 1 block period	Reading Guide Practice Questions PowerPoint Lab 2-5 Section Quiz
2-6: Chemical Reactions	<ul style="list-style-type: none"> <li>Define components of a chemical reaction</li> <li>Practice converting from word equations to formula equations</li> <li>Define and predict products for double replacement and neutralization reactions</li> </ul>	2 short period 1 block period	1 short period 0.5 block period	Reading Guide Practice Questions A & B PowerPoint Section Quiz
2-7: Conservation of Mass	<ul style="list-style-type: none"> <li>Use the Law of Conservation of mass to explain need for balanced equations</li> </ul>	2 short periods 1 block period	1 short period 0.5 block period	Reading Guide Practice Questions PowerPoint Lab 2-7 Worksheet Section Quiz
2-8: Speeding up a Chemical Reaction	<ul style="list-style-type: none"> <li>Explain Collision Theory and relate theory to variables that affect the rate of a reaction</li> <li>Define and explain catalysts role in a reaction</li> </ul>	2-3 short periods 1.5 block period	2 short periods 1 block period	Reading Guide Practice Questions PowerPoint Lab 2-8 Section Quiz
Final Project 2: Most Effective Antacid	<ul style="list-style-type: none"> <li>Acid/base reactions and use of indicators.</li> <li>Evaluating household products.</li> <li><u>Designing a lab skills</u>: Selecting appropriate technology (type of indicator), choosing dependent variable, determining criteria to decide which is best.</li> </ul>	2-3 short periods 1.5 block periods	2 short periods 1 block period	Lab
Review		2 short period 1 block period	1 short period 0.5 block period	Chapter review questions
Exam		1 short period 0.5 block period	1 short period 0.5 block period	ExamView Exam

<b>TOTAL</b>	<b>20-22 short periods 11.5-12 block periods</b>	<b>14-14.5 short periods 8 block periods</b>	
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## Chapter 3: Airbags

### Essential questions:

- How do airbags work?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?
- How does matter undergo changes and how do we use chemical equations?
- How do matter and energy interact?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
3-1: States of Matter	<ul style="list-style-type: none"> <li>• Distinguish between states of matter</li> <li>• Explain characteristics of different states of matter</li> <li>• Explain changes in states of matter</li> </ul>	1 short period 0.5 block period	0.5 short period 0.25 block period	Intro Activity Reading Guide Practice Questions PowerPoint Demo Section Quiz
3-2: Properties of Matter	<ul style="list-style-type: none"> <li>• Distinguish between chemical and physical properties</li> <li>• Distinguish between extensive and intensive properties</li> </ul>	1 short periods 0.5 block periods	0.5 short periods 0.25 block period	Reading Guide Practice Questions PowerPoint Demo Section Quiz
3-3: Density	<ul style="list-style-type: none"> <li>• Define and calculate density</li> </ul>	2-3 short periods 1-1.5 block periods	2 short periods 1 block periods	Reading Guide Practice Questions PowerPoint Lab 3-3 2 Demos Worksheet Section Quiz
3-4: Changes	<ul style="list-style-type: none"> <li>• Distinguish between chemical and physical changes</li> </ul>	2 short periods 1 block periods	2 short periods 1 block period	Reading Guide Practice Questions PowerPoint Lab Section Quiz

3-5: Gas Behavior	<ul style="list-style-type: none"> <li>Define pressure and atmospheric pressure</li> <li>Qualitatively relate properties of gases: volume, pressure, temperature, number of particles</li> <li>Define Kinetic Molecular Theory</li> <li>Distinguish between real and ideal gases</li> </ul>	2 short period 1 block periods	1 short period 0.5 block period	Reading Guide Practice Questions PowerPoint Demo Section Quiz
3-6: Counting Molecules	<ul style="list-style-type: none"> <li>Define a mole and Avogadro's number</li> <li>Define and calculate molecular mass</li> <li>Define molecular mass and atomic mass as mass for one mole of particles</li> <li>Perform calculations between number of particles, moles and masses</li> </ul>	3 short period 1.5 block period	2 short period 1 block period	Reading Guide Practice Questions A, B & C PowerPoint Worksheet Demo Section Quiz
3-7: Gas Laws	<ul style="list-style-type: none"> <li>Introduce pressure units</li> <li>Define and perform calculations with gas laws (Boyles, Charles, Avogadro's, Combined, Ideal)</li> <li>Define standard temperature and pressure</li> </ul>	3 short periods 1.5 block period	2 short period 1 block period	Reading Guide Practice Questions A & B PowerPoint Lab 2-7 Worksheet Section Quiz
Final Project 3: Reactions in Airbags	<ul style="list-style-type: none"> <li>Observe chemical and physical process resulting in the production of a gas.</li> <li>Evaluate different processes for effectiveness based on criteria for a "good" airbag.</li> <li>Review writing chemical formulas and equations.</li> <li><u>Lab skills:</u> Taking observations</li> </ul>	2 short periods 1 block periods	2 short periods 1 block period	Lab
Review		2 short period 1 block period	1 short period 0.5 block period	Chapter review questions
Exam		1 short period 0.5 block period	1 short period 0.5 block period	ExamView Exam
<b>TOTAL</b>		<b>19-20 short periods 9.5-10 block periods</b>	<b>14 short periods 7 block periods</b>	

## Chapter 4: Glow in The Dark

### Essential questions:

- How Glow in the Dark works?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of an atom determine its properties?
- How do matter and energy interact?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
4-1	<ul style="list-style-type: none"> <li>• Provide a history of atomic theory development</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Intro Activity Reading Guide Practice Questions PowerPoint Section Quiz
4-2	<ul style="list-style-type: none"> <li>• Determine the number of protons, neutrons and electrons in an atom</li> <li>• Distinguish between properties of protons, neutrons and electrons</li> <li>• Define isotopes</li> <li>• Differentiate between mass number and average atomic mass</li> <li>• Lab 4.2—investigate manners in which average atomic mass may be calculated</li> <li>• Calculate weighted average atomic masses</li> </ul>	3-4 short periods 1.5-2 block periods	2 short periods 1 block period	Reading Guide Practice 4-2A Lab 4-2 Practice 4-2B Worksheet PowerPoint Section Quiz
4-3	<ul style="list-style-type: none"> <li>• Define principal energy level, sublevel and orbitals</li> <li>• Write electron configurations using Aufbau's principal, Pauli Exclusion principal and Hund' rule in boxes and arrows notation, spectroscopic notation and noble gas notation</li> </ul>	2-3 short periods 1-1.5 block periods	2 short periods 1 block period	Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
4-4	<ul style="list-style-type: none"> <li>• Explain how the modern periodic table was developed</li> <li>• Define group names on the periodic table</li> <li>• Connect the periodic table with electron</li> </ul>	2-3 short periods 1-1.5 block periods	2 short periods 1 block period	Reading Guide Practice Questions Lab 4-4 PowerPoint Section Quiz

	configurations			
4-5	<ul style="list-style-type: none"> <li>Define and use periodic trends: atomic radius, ionization energy and electron affinity</li> </ul>	3-4 short periods 1.5-2 block periods	2 short periods 1 block period	Reading Guide Practice Questions Worksheet Lab 4-5 PowerPoint Section Quiz
4-6	<ul style="list-style-type: none"> <li>Define visible light as one form of electromagnetic radiation</li> <li>Define and inter-relate wave properties</li> <li>Explain quantization of light</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Reading Guide Practice Questions PowerPoint Section Quiz
4-7	<ul style="list-style-type: none"> <li>Explain processes of absorption and relaxation</li> <li>Relate absorption and relaxation to colors of light</li> <li>Distinguish between different light-producing processes</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Reading Guide Practice Questions Lab 4-7 Learning activity Demo PowerPoint Section Quiz
Chapter Final Project	<ul style="list-style-type: none"> <li>Research a type of light producing reaction.</li> <li>Write a cited research paper.</li> <li>Prepare a poster presentation with pertinent information in a visually pleasing manner.</li> </ul>	Research may be done in or out of class time. Project creation (poster and or paper) may also be done in or out of class time.	Research may be done in or out of class time. Project creation (poster and or paper) may also be done in or out of class time.	Research project
Review		1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test		1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>15-19 short periods 7.5-9.5 block periods Plus time for research and project if given class time</b>	<b>13 short periods 6.5 block periods Plus time for research and project if given class time</b>	

## Chapter 5: Soap

### Essential questions:

- How does soap allow oil and water to mix?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
5-1	<ul style="list-style-type: none"> <li>• Distinguish between four types of bonding: ionic, polar covalent, non-polar covalent and metallic</li> <li>• Describe characteristics of the four types of bonding</li> <li>• Lab 5.1—use characteristics of bond types to identify unknown substances</li> </ul>	3-4 short period 1.5-2 block period	3-4 short period 1.5-2 block period	Intro Activity Reading Guide Practice Questions Lab 5-1 PowerPoint Section Quiz
5-2	<ul style="list-style-type: none"> <li>• Identify number of valence electrons in an atom using the periodic table</li> <li>• Draw Lewis-dot structures for atoms, ionic compounds, covalent compounds and polyatomic ions</li> <li>• Introduce ideas of isomers and exceptions to the octet rule</li> </ul>	3-4 short periods 1.5-2 block periods	3 short periods 1.5 block period	Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
5-3	<ul style="list-style-type: none"> <li>• Lab 5.3—use models to determine molecular geometry using the concept of VSEPR theory</li> </ul>	2 short periods 1 block periods	2 short periods 1 block period	Reading Guide Practice Questions Worksheet Lab 5-3 PowerPoint Section Quiz
5-4	<ul style="list-style-type: none"> <li>• Examine the trend of electronegative on the periodic table</li> <li>• Use electronegativities to determine polarity of bonds</li> </ul>	2-3 short periods 1-1.5 block periods	2 short periods 1 block period	Reading Guide Practice Questions Worksheet

	<ul style="list-style-type: none"> <li>Use polarity of bonds and molecular geometry to determine polarity of molecule</li> </ul>			PowerPoint Section Quiz
5-5	<ul style="list-style-type: none"> <li>Distinguish between intermolecular forces and intramolecular forces</li> <li>Distinguish between three types of intermolecular forces: London Dispersion Forces, Dipole Interactions and Hydrogen Bonding</li> <li>Identify which intermolecular forces are present based upon Lewis-dot structures, molecular geometry and polarity of bonds and molecules.</li> </ul>	2 short periods 1 block periods	2 short periods 1 block period	Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
5-6	<ul style="list-style-type: none"> <li>Explain the effects of intermolecular forces on properties such as melting point, boiling point, evaporation, viscosity, solubility and surface tension</li> <li>Use the intermolecular forces of water to explain how it can function as the important molecule that it is</li> <li>Explain how soap uses intermolecular forces to allow oil and water to mix.</li> <li>Lab 5.6—Investigate the effect of intermolecular forces on energy change during evaporation</li> </ul>	3 short period 1.5 block period	2 short period 1 block period	Reading Guide Practice Questions Lab 5-6 Demo Learning Activity PowerPoint Section Quiz
Chapter Final Project	<ul style="list-style-type: none"> <li>Observe the reaction between a fat and an ionic compound to produce a soap.</li> <li>Evaluate the properties and effectiveness of three types of soap.</li> <li>Use the concepts of bonding and intermolecular forces to explain how soaps work.</li> <li>Lab skills: measuring volumes, using a hot water bath, filtering a heterogeneous mixture, taking observations</li> </ul>	2 short period 1 block period	2 short period 1 block period	Lab
Review		1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test		1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>19-22 short periods</b>	<b>18-19 short periods</b>	

	<b>9.5-11 block periods</b>	<b>9-9.5 block periods</b>	
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## Chapter 6: Sports Drinks

### Essential questions:

- What's in my sports drink?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?
- How are mixtures different from pure substances?
- What are the characteristics and reactions of acids and bases?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
6-1	<ul style="list-style-type: none"> <li>• Explain the process of dissolving</li> <li>• Explain how ionic substances produce electrolytes in water</li> <li>• Distinguish between unsaturated, saturated and supersaturated solutions</li> </ul>	3-4 short period 1.5-2 block period	3-4 short period 1.5-2 block period	Intro Activity Reading Guide Practice Questions Lab 6-1 PowerPoint Section Quiz
6-2	<ul style="list-style-type: none"> <li>• Calculate concentrations in percent concentration and molarity, as well as converting between the two.</li> <li>• Calculate concentration of electrolytes based on amount of ionic compound dissolved</li> <li>• Lab 6.2—determine the concentration of an unknown sample of ionic compound</li> </ul>	4-5 short periods 2-2.5 block periods	3-4 short periods 1.5-2 block period	Reading Guide Practice Questions Worksheet Lab 6-2 PowerPoint Section Quiz
6-3	<ul style="list-style-type: none"> <li>• Calculate pH or concentration of hydronium ion from the other value</li> <li>• Explain connection between strength of acid/base and pH</li> <li>• Calculate concentration of hydroxide ion or hydronium ion from the other value</li> </ul>	2 short periods 1 block periods	2 short periods 1 block period	Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
6-4	<ul style="list-style-type: none"> <li>• Predict products in a precipitation reaction (double replacement reaction)</li> </ul>	2-3 short periods 1-1.5 block periods	2 short periods 1 block period	Reading Guide Practice Questions Lab 6-4

	<ul style="list-style-type: none"> <li>• Explain why some ionic compounds are very soluble while others are only slightly soluble</li> <li>• Lab 6.4—observe various combinations of anions and cations to formulate simply solubility rules</li> <li>• Utilize solubility rules to determine which ionic compound will dissolve and which will precipitate</li> </ul>			PowerPoint Section Quiz
6-5	<ul style="list-style-type: none"> <li>• Perform stoichiometry calculations using the mole ratio from the balanced equation, beginning and/or ending with moles, mass or molarity</li> <li>• Explain the use of titrations and indicators to determine concentration utilizing stoichiometry</li> <li>• Lab 6.5A—determine the concentration of an unknown acidic sample through titration</li> </ul>	6 short periods 1 block periods	6 short periods 3 block period	Reading Guide Practice Questions Worksheet Intro to 6.5 Lab Lab 6.5A Lab 6.5B PowerPoint Section Quiz
6-6	<ul style="list-style-type: none"> <li>• Understand the concept of limiting reactant</li> <li>• Perform limiting reactant calculations</li> <li>• Lab 6.6—Observe the solutions after a limiting reactants with acids and bases.</li> </ul>	2-3 short period 1-1.5 block period	2 short period 1 block period	Reading Guide Practice Questions Lab 6-6 Learning Activity PowerPoint Section Quiz
6-7	<ul style="list-style-type: none"> <li>• Lab 6.7—investigate how dissolved substances affect the freezing point of a solvent</li> <li>• Define vapor pressure</li> <li>• Explain how solutes affect the following colligative properties: vapor pressure, boiling point and freezing point</li> <li>• Differentiate between the effect an electrolyte versus a non-electrolyte has on colligative properties</li> </ul>	2-3 short period 1-1.5 block period	2 short period 1 block period	Reading Guide Practice Questions Lab 6-6 Learning Activity PowerPoint Section Quiz
Final Project 6	<ul style="list-style-type: none"> <li>• Use principles of Stoichiometry, Limiting reactants, Converting units to determine reaction quantities</li> <li>• Observe a reaction with stoichiometry ratios and compare to reaction with one reactant in excess</li> </ul>	2 short period 1 block period	2 short periods 1 block period	Lab

	<ul style="list-style-type: none"> <li>Observe a reaction in an aqueous environment</li> <li><u>Lab skills</u>: Using a balance and measuring cup to accurately measure reactants, taking observations</li> </ul>			
Review		2 short period 1 block period	2 short period 1 block period	Review Questions
Test		1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>27-31 short periods</b> <b>13.5-15.5 block</b> <b>periods</b>	<b>27 short periods</b> <b>13.5 block periods</b>	

## Chapter 7: Hot and Cold Packs

### Essential questions:

- How do hot and cold packs work?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?
- How does matter undergo changes and how do we use chemical equations?
- How do matter and energy interact?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
7-1	<ul style="list-style-type: none"> <li>• Define exothermic and endothermic</li> <li>• Define system and surroundings</li> </ul>	1 short periods 0.5 block period	0.5 short period 0.25 block period	Introductory Activity Reading Guide Practice Questions PowerPoint Section Quiz
7-2	<ul style="list-style-type: none"> <li>• Define heat, energy and enthalpy</li> <li>• Define units for energy</li> <li>• Define and discuss heat capacity</li> <li>• Use heat capacity in calculations</li> <li>• Define calorimetry</li> <li>• Perform calorimetry calculations</li> </ul>	3-4 short periods 1.5-2 block periods	2-3 short periods 1-1.5 block periods	Reading Guide Practice Questions 7-2A Lab 7-2 Practice Questions 7-2B Worksheet PowerPoint Section Quiz
7-3	<ul style="list-style-type: none"> <li>• Explain why temperature doesn't change while changes in state occur</li> <li>• Define heat of fusion and heat of vaporization and use them in calculations</li> <li>• Discuss heating curves</li> <li>• Calculation enthalpy changes throughout a heating curve</li> </ul>	3-4 short periods 1.5-2 block periods	2-3 short periods 1-1.5 block periods	Reading Guide Practice Questions Worksheet Lab 7.3 PowerPoint Section Quiz
7-4	<ul style="list-style-type: none"> <li>• Define enthalpy of formation</li> </ul>	3-4 short periods	2-3 short periods	Reading Guide

	<ul style="list-style-type: none"> <li>Define enthalpy of reaction</li> <li>Calculation enthalpy of reactions using enthalpies of formation</li> <li>Perform stoichiometry calculations using enthalpy of reaction</li> </ul>	1.5-2 block periods	1-1.5 block periods	Practice Questions Worksheet Lab 7-4 PowerPoint Section Quiz
7-5	<ul style="list-style-type: none"> <li>Define Hess's Law</li> <li>Use Hess's Law for enthalpy of reaction calculations</li> </ul>	2 short periods 1 block periods	1 short periods 0.5 block period	Reading Guide Practice Questions PowerPoint Section Quiz
Final Project 7	<ul style="list-style-type: none"> <li>Using calorimetry to determine which chemical produces the most cost-effective product</li> </ul>	2-3 short period 1-1.5 block period	2-3 short period 1-1.5 block period	Lab
Review	<ul style="list-style-type: none"> <li></li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test	<ul style="list-style-type: none"> <li></li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>17-20 short periods</b> <b>8.5-10 block periods</b>	<b>12.5-15.5 short periods</b> <b>6.25-7.75 block periods</b>	

## Chapter 8: Chemistry in Industry

### Essential questions:

- How is chemistry used to make a company more profitable?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does matter undergo changes and how to we use chemical equations?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
8-1	<ul style="list-style-type: none"> <li>• Define reversible reactions</li> <li>• Define dynamic equilibrium</li> <li>• Use collision theory to discuss how equilibrium is established</li> </ul>	1 short periods 0.5 block period	0.5 short period 0.25 block period	Introductory Activity Reading Guide Practice Questions PowerPoint Section Quiz
8-2	<ul style="list-style-type: none"> <li>• Define equilibrium constant and equilibrium constant expression</li> <li>• Write an equilibrium constant expression from a chemical equation</li> <li>• Explain why pure solids and liquids are not included in equilibrium constant expressions</li> <li>• Calculate equilibrium constants</li> <li>• Discuss the meaning of the magnitude of equilibrium constants</li> <li>• Discuss how equilibrium constants change with temperature</li> </ul>	2 short periods 1 block periods	1-2 short periods 0.5-1 block periods	Reading Guide Practice Questions Worksheet Lab 8-2 PowerPoint Section Quiz
8-3	<ul style="list-style-type: none"> <li>• Define reaction quotient</li> <li>• Calculate reaction quotients</li> <li>• Use reaction quotients to determine if a system is at equilibrium</li> </ul>	1-2 short periods 0.5-1 block periods	1 short periods 0.5 block periods	Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
8-4	<ul style="list-style-type: none"> <li>• Define Le Chatelier's Principle</li> <li>• Use Le Chatelier's principle to explain a shift</li> </ul>	1 short periods 0.5 block periods	1 short periods 0.5 block periods	Reading Guide Practice Questions Lab 8-4

	<p>in a system after changing concentrations of reactants or products, temperature or pressure</p> <ul style="list-style-type: none"> <li>• Discuss what types of changes in a system at equilibrium produce no shift</li> </ul>			PowerPoint Section Quiz
8-5	<ul style="list-style-type: none"> <li>• Discuss environmental concerns: waste disposal/storage, renewable/nonrenewable resources; water usage and purity; air pollution; ozone changes; greenhouse gases/global warming</li> </ul>	1 short periods 0.5 block periods	1 short periods 0.5 block period	Reading Guide Practice Questions PowerPoint Section Quiz
Final Project 8	<ul style="list-style-type: none"> <li>• Using Le Chatelier's principle and the addition or removal of heat to determine if a reaction is endo or exothermic</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Lab
Review	<ul style="list-style-type: none"> <li>•</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test	<ul style="list-style-type: none"> <li>•</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>9-10 short periods 4.5-5 block periods</b>	<b>7.5-8.5 short periods 3.75-4.25 block periods</b>	

## Chapter 9: Forensic Chemistry

### Essential questions:

- How is chemistry used to solve crimes?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?
- How does matter undergo changes and how do we use chemical equations?
- How are mixtures different from pure substances?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
9-1	<ul style="list-style-type: none"> <li>• Use energetics of solubility to discuss things that will and won't dissolve in water</li> <li>• Use equil to define the solubility product of a compound</li> <li>• Write solubility reactions and <math>K_{sp}</math> expressions</li> <li>• Calculate <math>K_{sp}</math> values</li> <li>• Use <math>K_{sp}</math> and reaction quotient (Q) to determine if a particular solution will precipitate</li> <li>• Writing precipitation double replacement reactions</li> <li>• Using solubility rules for qualitative and quantitative analysis</li> </ul>	5-6 short periods 2.5-3 block period	5-6 short period 2.5-3 block period	Introductory Activity Reading Guide Practice Questions Worksheet Lab 9.1 A Lab 9.2 B PowerPoint Section Quiz
9-2	<ul style="list-style-type: none"> <li>• Understand chromatography concepts: mobile and stationary phases and role molecular size and intermolecular forces plays in solute migration</li> <li>• Define and calculate retention factors (Rf)</li> <li>• Define and investigate different forms of chromatography: paper, thin-layer, gas, high pressure liquid</li> </ul>	5-6 short periods 2.5-3 block period	5-6 short period 2.5-3 block period	Reading Guide Practice Questions Lab 9-2 A Lab 9-2 B PowerPoint Section Quiz
9-3	<ul style="list-style-type: none"> <li>• Define/calculate percent composition</li> <li>• Define/ calculate empirical formulas</li> </ul>	5-6 short periods 2.5-3 block period	5-6 short period 2.5-3 block period	Reading Guide Practice Questions 9-3A

	<ul style="list-style-type: none"> <li>Define/ calculate molecular formulas</li> <li>Define hydrate</li> <li>Define/calculate hydrate formulas</li> </ul>			Lab 9-3 A Practice Questions 9-3B Lab 9-3 B Worksheet PowerPoint Section Quiz
Final Project 9	•	May be completed outside of class time	May be completed outside of class time	Creative Writing
Review	•	1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test	•	1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>17-20 short periods 8.5-10 block periods</b>	<b>17-20 short periods 8.5-10 block periods</b>	

## Chapter 10: Batteries

### Essential questions:

- How do batteries work?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does matter undergo changes and how do we use chemical equations?
- How do matter and energy interact?
- What are the characteristics and reactions of acids and bases?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
10-1	<ul style="list-style-type: none"> <li>• Define oxidation and reduction</li> <li>• Define and calculate oxidation numbers</li> <li>• Identify species reduced and oxidized in a chemical equation</li> <li>• Define and identify reducing and oxidizing agent</li> </ul>	4 short periods 2 block period	2 short period 1 block period	Introductory Activity Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
10-2	<ul style="list-style-type: none"> <li>• Define and write single-replacement reactions as one type of redox reaction</li> <li>• Define the metal activity series</li> <li>• Use the activity series to determine if a single replacement reaction will take place</li> <li>• Writing half-reactions for a redox reaction</li> <li>• Balancing redox reactions in acidic and basic solutions</li> </ul>	6 short periods 3 block period	4 short period 2 block period	Reading Guide Practice Questions Lab 10-2 Worksheet PowerPoint Section Quiz
10-3	<ul style="list-style-type: none"> <li>• Define voltaic/galvanic cell</li> <li>• Explain and use line notation for describing a cell</li> <li>• Define standard reduction potential and identify it as an intensive property</li> <li>• Use standard reduction potential to calculate cell potential</li> <li>• Discuss cell potential in non-standard</li> </ul>	4 short periods 2 block period	2 short period 1 block period	Reading Guide Practice Questions Lab 10-3 Worksheet PowerPoint Section Quiz

	conditions <ul style="list-style-type: none"> <li>• Define and discuss concentration cells</li> <li>• Define electrolysis and electrolytic cells</li> <li>• Calculate minimum potential needed to cause electrolysis</li> </ul>			
Final Project 10	•	May be completed outside of class time	May be completed outside of class time	Research & Presentation
Review	•	2 short period 1 block period	1 short period 0.5 block period	Review Questions
Test	•	1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>17 short periods</b> <b>8.5 block periods</b>	<b>10 short periods</b> <b>5 block periods</b>	

## Chapter 11: Polymers

### Essential questions:

- What are polymers?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of a compound or molecule determine its properties?
- How does matter undergo changes and how do we use chemical equations?
- How do matter and energy interact?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
11-1	<ul style="list-style-type: none"> <li>• Define organic molecule and hydrocarbon</li> <li>• Define alkane, alkene and alkyne</li> <li>• Discuss properties of hydrocarbons and associate properties with structure</li> <li>• Use organic nomenclature to name and write hydrocarbons</li> <li>• Discuss, name and draw organic isomers</li> </ul>	2 short periods 1 block period	2 short period 1 block period	Introductory Activity Reading Guide Practice Questions Worksheet PowerPoint Section Quiz
11-2	<ul style="list-style-type: none"> <li>• Define organic functional group</li> <li>• Define, give nomenclature rules for, and discuss properties as a function of structure for the following organic functional groups: hydrocarbon side-chains, hydroxyls, halogens, ethers, amines, carbonyls, aromatic rings</li> </ul>	4 short periods 2 block period	4 short period 2 block period	Reading Guide Practice Questions Lab 11-2 PowerPoint Section Quiz
11-3	<ul style="list-style-type: none"> <li>• Define polymer and monomer</li> <li>• Contrast thermoset and thermoplastic polymers</li> <li>• Define polymerization reactions (addition and condensation reactions)</li> <li>• Discuss properties of polymers as a function of their structures</li> <li>• Discuss polymers in biological applications</li> </ul>	2 short periods 1 block period	2 short period 1 block period	Reading Guide Practice Questions Lab 11-3 PowerPoint Section Quiz
Final Project 11	<ul style="list-style-type: none"> <li>• Relating the properties of a polymer to the</li> </ul>	4-6 short periods	4-6 short period	

	ratio of reactants mixed. <ul style="list-style-type: none"> <li>• <u>Lab skills</u>: mixing accurate quantities, evaluating the performance of a product</li> <li>• <u>Inquiry lab skills</u>: experimental design (varying a “recipe” based upon performance of a previous experiment)</li> </ul>	2-3 block period	2-3 block period	
Review	•	1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test	•	1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>14-16 short periods 7-8 block periods</b>	<b>14-16 short periods 7-8 block periods</b>	

## Chapter 12: Nuclear

### Essential questions:

- What are polymers?
- How is science a human endeavor?
- How do scientists work to gather, analyze, communicate and validate data to form and change models?
- How does the structure of an atom determine its properties?
- How does matter undergo changes and how do we use chemical equations?
- How do matter and energy interact?

Section	Objectives	General Chemistry Pacing Suggestions	Honors Chemistry Pacing Suggestions	Activities
12-1	<ul style="list-style-type: none"> <li>• Give brief history of discovery of radiation</li> <li>• Define nuclear radiation</li> <li>• Define types of radioactive decay: alpha, beta and gamma radiation</li> <li>• Show how to write nuclear reaction equations</li> <li>• Define half-life</li> </ul>	2 short periods 1 block period	2 short period 1 block period	Introductory Activity Reading Guide Practice Questions Lab 12-1 Worksheet PowerPoint Section Quiz
12-2	<ul style="list-style-type: none"> <li>• Show effects of radiation on the body—both harmful and helpful</li> <li>• Describe carbon dating</li> <li>• Describe and differentiate between nuclear fission and fusion</li> </ul>	1 short periods 0.5 block period	1 short period 0.5 block period	Reading Guide PowerPoint Section Quiz
Final Project 12	<ul style="list-style-type: none"> <li>•</li> </ul>	Can be done outside of class	Can be done outside of class	
Review	<ul style="list-style-type: none"> <li>•</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	Review Questions
Test	<ul style="list-style-type: none"> <li>•</li> </ul>	1 short period 0.5 block period	1 short period 0.5 block period	ExamView Assessment Questions
<b>TOTAL</b>		<b>5 short periods 2.5 block periods</b>	<b>5 short periods 2.5 block periods</b>	