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# Chemistry

Curriculum Guide

Scranton School District

Scranton, PA



## **Chemistry**

### **Prerequisite:**

- Biology, concurrent with Algebra II

This is a college preparatory chemistry course that is taken usually in grade 11. It is taken with or after Algebra II. This course prepares students for the first semester of a typical college course by covering chemical concepts and problem-solving skills. These concepts include but are not limited to measurements and calculations, the mole, atomic structure and the arrangement of electrons in atoms, the periodic law, chemical bonding, chemical formulas and chemical compounds, chemical equations and reactions, stoichiometry, gases, and solutions. This class meets six periods a week, including one double period for chemistry lab. Students are required to complete experiments and write lab reports.

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Year-at-a-glance

<b>Subject: Chemistry</b>	<b>Grade Level: 11</b>	<b>Date Completed: 06-01-15</b>
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**1<sup>st</sup> Quarter**

Topic	Resources	Anchors
<b>Introduction to Chemistry</b>	<p><b>Approved textbook</b></p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p><b>CHEM.A.1.1.1</b>  <b>CHEM.A.1.1.2</b>  <b>CHEM.A.1.2.2</b>  <b>CHEM.B.1.2.2</b>  <b>CC.3.5.11-12.H</b>  <b>CC.3.5.11-12.C</b>  <b>CC.3.6.11-12.A</b></p>
<b>Measurements and Calculations</b>	<p><b>Approved textbook</b></p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p><b>CHEM.A.1.1.3</b></p>
<b>The Atom</b>	<p><b>Approved textbook</b></p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p><b>CHEM.A.2.1.1</b>  <b>CC.3.5.11-12.A</b></p>
<b>Chemical Names and Formulas</b>	<p><b>Approved textbook</b></p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p><b>CHEM.A.1.1.5</b>  <b>CC.3.5.11-12.E</b></p>

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2<sup>nd</sup> Quarter

Topic	Resources	Anchors
The Mole Concept	Approved textbook  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	CHEM.B.1.1.1 CHEM.A.2.1.2
Percentage Composition	Approved textbook  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	CHEM.B.1.2.3
Empirical Formula	Approved textbook  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	CHEM.B.1.2.1
Molarity	Approved textbook  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	CHEM.A.1.2.4 CHEM.A.1.2.3

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<b>Chemical Reactions and Balancing Equations</b>	<b>Approved textbook</b>  <b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b>	<b>CHEM.B.2.1.3</b> <b>CHEM.B.2.1.4</b> <b>CHEM.B.2.1.5</b> <b>CC.3.5.11-12.I</b>
<b>Stoichiometry</b>	<b>Approved textbook</b>  <b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b>	<b>CHEM.B.2.1.2</b>

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**3<sup>rd</sup> Quarter**

Topic	Resources	Anchors
<b>Limiting Reactants</b> <b>Electromagnetic Spectrum</b>	<b>Approved textbook</b>  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	<b>CHEM.B.2.1.1</b> <b>CHEM.A.2.2.4</b> <b>CC.3.5.11-12.F</b>
<b>Electron Configuration and The Quantum Model of The Atom</b>	<b>Approved textbook</b>  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	<b>CHEM.A.2.2.1</b> <b>CHEM.A.2.2.3</b> <b>CC.3.5.11-12.G</b>
<b>Periodic Law</b>	<b>Approved textbook</b>  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software	<b>CHEM.A.2.2.2</b> <b>CHEM.A.2.3.1</b> <b>CHEM.A.2.3.2</b> <b>CC.3.5.11-12.B</b>

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4<sup>th</sup> Quarter

Topic	Resources	ANCHOR
Chemical Bonding	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>CHEM.B.1.3.1 CHEM.B.1.3.2 CHEM.B.1.3.3 CHEM.B.1.4.1 CHEM.A.1.2.5 CHEM.A.1.1.4 CC.3.5.11-12.D CHEM.A. 1.2.1</p>
Lewis Structures	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>CHEM.B.1.4.2 CC.3.5.11-12.J</p>
Behavior of Gases	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>CHEM.B.2.2.1 CHEM.B.2.2.2 CC.3.5.11-12.C</p>
Acids and Bases (teacher may substitute any suitable college prep topic)	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	Not applicable
Final Exam Review		

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General Topic	Academic Standard(s)	Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time
<p>Properties and Changes in Matter</p> <p>Classification of Matter</p> <p>Introduction to The Elements</p> <p>Scientific Method</p>	<p>CHEM.A.1.1.1 CHEM.A.1.1.2 CHEM.A.1.2.2 CHEM.B.1.2.2 CC.3.5.11-12.H CC.3.6.11-12.A</p>	<p>Classify physical or chemical changes within a system in terms of matter and/or energy.</p> <p>Classify observations as qualitative and/or quantitative.</p> <p>Differentiate between homogeneous and heterogeneous mixtures (e.g., how such mixtures can be separated).</p> <p>Apply the law of definite proportions to the classification of elements and compounds as pure substances.</p> <p>Evaluate hypotheses, data, analysis, and conclusions in a science or technical text, verifying when possible and corroborating or challenging conclusions with other sources of</p>	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>Teacher prepared tests, quizzes, lab reports</p>	<p>15 days</p>



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		<p>information.</p> <p>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>Write arguments focused on discipline specific content.</p>			
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<b>Measurements and Calculations</b>	<b>CHEM.A.1.1.3</b>	<b>Utilize significant figures to communicate the uncertainty in a quantitative observation.</b>	<b>Approved textbook</b>  <b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b>	<b>Teacher prepared tests, quizzes, lab reports</b>	<b>15 days</b>
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<p><b>Atomic Theory</b></p> <p><b>Atomic Structure</b></p>	<p><b>CHEM.A.2.1.1</b> <b>CC.3.5.11-12.A</b></p>	<p><b>Describe the evolution of atomic theory leading to the current model of the atom based on the works of Dalton, Thomson, Rutherford, and Bohr.</b></p> <p><b>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>8 days</b></p>
<p><b>Chemical Names and Formulas</b></p>	<p><b>CHEM.A.1.1.5</b> <b>CC.3.5.11-12.E</b></p>	<p><b>Apply a systematic set of rules (IUPAC) for naming compounds and writing chemical formulas (e.g., binary covalent, binary ionic, ionic compounds containing polyatomic ions).</b></p> <p><b>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher-prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports, etc.</b></p>	<p><b>7 days</b></p>

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<b>The Mole Concept</b>	<b>CHEM.A.2.1.2 CHEM.B.1.1.1 CHEM.B.1.2.3</b>	<b>Differentiate between the mass number of an isotope and the average atomic mass of an element.</b>  <b>Apply the mole concept to representative particles (e.g., counting, determining mass of atoms, ions, molecules, and/or formula units).</b>  <b>Relate the percent composition and mass of each element present in a compound.</b>	<b>Approved textbook</b>  <b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b>	<b>Teacher prepared tests, quizzes, lab reports</b>	<b>15 days</b>
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<p><b>Empirical Formula</b></p>	<p><b>CHEM.B.1.2.1</b></p>	<p><b>Determine the empirical and molecular formulas of compounds.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>8 days</b></p>
<p><b>Molarity</b></p>	<p><b>CHEM.A.1.2.4 CHEM.A.1.2.3</b></p>	<p><b>Describe various ways that concentration can be expressed and calculated (e.g., molarity, percent by mass, percent by volume).</b></p> <p><b>Describe how factors (e.g., temperature, concentration, surface area) can affect solubility.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>7 days</b></p>

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<p><b>Chemical Reactions and Balancing Equations</b></p>	<p>CHEM.B.2.1.3 CHEM.B.2.1.4 CHEM.B.2.1.5 CC.3.5.11-12.I</p>	<p>Classify reactions as synthesis, decomposition, single replacement, double replacement, or combustion.</p> <p>Predict products of simple chemical reactions (e.g., synthesis, decomposition, single replacement, double replacement, combustion).</p> <p>Balance chemical equations by applying the Law of Conservation of Matter.</p> <p>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>Teacher prepared tests, quizzes, lab reports</p>	<p>10 days</p>
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<b>Stoichiometry</b>	<b>CHEM.B.2.1.2</b>	<b>Use stoichiometric relationships to calculate the amounts of reactants and products involved in a chemical reaction.</b>	<b>Approved textbook  Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b>	<b>Teacher prepared tests, quizzes, lab reports</b>	<b>5 days</b>
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<p><b>Limiting Reactants</b></p>	<p><b>CHEM.B.2.1.1</b></p>	<p><b>Describe the roles of limiting and excess reactants in chemical reactions.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>5 days</b></p>
<p><b>Electromagnetic Spectrum</b></p>	<p><b>CHEM.A.2.2.4 CC.3.5.11-12.F</b></p>	<p><b>Relate the existence of quantized energy levels to atomic emission spectra.</b></p> <p><b>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>10 days</b></p>



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<p><b>Electron Configuration and The Quantum Model of The Atom</b></p>	<p><b>CHEM.A.2.2.1 CHEM.A.2.2.3 CC.3.5.11-12.G</b></p>	<p><b>Predict the ground state electronic configuration and/or orbital diagram for a given atom or ion.</b></p> <p><b>Explain the relationship between the electron configuration and the atomic structure of a given atom or ion (e.g., energy levels and/or orbitals with electrons, distribution of electrons in orbitals, shapes of orbitals).</b></p> <p><b>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>15 days</b></p>
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<p>Periodic Law</p>	<p>CHEM.A.2.2.2 CHEM.A.2.3.1 CHEM.A.2.3.2 CC.3.5.11-12.B</p>	<p>Predict characteristics of an atom or an ion based on its location on the periodic table (e.g., number of valence electrons, potential types of bonds, reactivity).</p> <p>Explain how the periodicity of chemical properties led to the arrangement of elements on the periodic table.</p> <p>Compare and/or predict the properties (e.g., electron affinity, ionization energy, chemical reactivity, electronegativity, atomic radius) of selected elements by using their locations on the periodic table and known trends.</p> <p>Determine the central ideas or conclusions of a text, summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p>	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>Teacher prepared tests, quizzes, lab reports</p>	<p>15 days</p>
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<p>Chemical Bonding</p> <p>Lewis Structures</p>	<p>CHEM.B.1.3.1 CHEM.B.1.3.2 CHEM.B.1.3.3 CHEM.B.1.4.1 CHEM.A.1.2.5 CHEM.A.1.1.4 CHEM. A.1.2.1 CHEM. B.1.4.2 CC.3.5.11-12.D CC.3.5.11-12.J</p>	<p>Explain how atoms combine to form compounds through ionic and covalent bonding.</p> <p>Classify a bond as being polar covalent, non-polar covalent, or ionic.</p> <p>Use illustrations to predict the polarity of a molecule.</p> <p>Recognize and describe different types of models that can be used to illustrate the bonds that hold atoms together in a compound (e.g., computer models, ball-and-stick models, graphical models, solid-sphere models, structural formulas, skeletal formulas, Lewis dot structures).</p>	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>Teacher prepared tests, quizzes, lab reports</p>	<p>15 days</p>
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		<p>Describe how chemical bonding can affect whether a substance dissolves in a given liquid.</p> <p>Relate the physical properties of matter to its atomic or molecular structure.</p> <p>Compare properties of solutions containing ionic or molecular solutes.</p> <p>Utilize Lewis Dot Structures to predict the structure and bonding in simple compounds.</p> <p>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context.</p> <p>Read and comprehend grade 11-12 science/ technical texts independently and proficiently.</p>	<p>Approved textbook</p> <p>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</p>	<p>Teacher prepared tests, quizzes, lab reports</p>	
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<p><b>Behavior of Gases</b></p>	<p><b>CHEM.B.2.2.1 CHEM.B.2.2.2 CC.3.5.11-12.C</b></p>	<p><b>Utilize mathematical relationships to predict changes in the number of particles, the temperature, the pressure, and the volume in a gaseous system (i.e., Boyle’s Law, Charles’s Law, Dalton’s Law of Partial Pressures, the Combined Gas Law, and the Ideal Gas Law).</b></p> <p><b>Predict the amounts of reactants and products involved in a chemical reaction using molar volume of a gas at STP.</b></p> <p><b>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</b></p>	<p><b>Approved textbook</b></p> <p><b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b></p>	<p><b>Teacher prepared tests, quizzes, lab reports</b></p>	<p><b>15 days</b></p>
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<b>Acids and Bases (or any suitable college preparatory topic)</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Approved textbook</b>  <b>Teacher selected laboratories supporting course content, appropriate videos, internet resources, teacher demos, probeware, teacher prepared notes and worksheets, software</b>	<b>Teacher prepared tests, quizzes, lab reports</b>	<b>5 days</b>
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<b>Review for comprehensive final exam</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Approved textbook</b> <b>Teacher prepared notes and/or worksheets</b>	<b>Not applicable</b>	<b>10 days</b>
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