

Chemistry

Expectation	<i>Module, PLT activity</i>
Science as Inquiry	
The Abilities to Do Scientific Inquiry	
1. Write a testable question or hypothesis when given a topic (SI-H-A1)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
2. Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)	
3. Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
4. Conduct an investigation that includes multiple trials and record, organize, and display data appropriately (SI-H-A2)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
5. Utilize mathematics, organizational tools, and graphing skills to solve problems (SI-H-A3)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
6. Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
7. Choose appropriate models to explain scientific knowledge or experimental results (e.g., objects, mathematical relationships, plans, schemes, examples, role-playing, computer simulations) (SI-H-A4)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
8. Give an example of how new scientific data can cause an existing scientific explanation to be supported, revised, or rejected (SI-H-A5)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
9. Write and defend a conclusion based on logical analysis of experimental data (SI-H-A6) (SI-H-A2)	<i>Forest Ecology, The Nature of Plants Municipal Solid Waste, Composting</i>
10. Given a description of an experiment, identify appropriate safety measures (SI-H-A7)	
Understanding Scientific Inquiry	
11. Evaluate selected theories based on supporting scientific evidence (SI-H-B1)	<i>Forest Ecology, Saga of the Gypsy Moth Forest Ecology, Fire Management Municipal Solid Waste, Waste-to-Energy Municipal Solid Waste, Landfills Places We Live, Regional Community Issues Focus on Risk, Electromagnetic Fields Focus on Risk, Chlorine: Looking at Tradeoffs Focus on Risk, Plastics</i>
12. Cite evidence that scientific investigations are conducted for many different reasons (SI-H-B2)	<i>Forest Ecology, Saga of the Gypsy Moth Forest Ecology, Fire Management Municipal Solid Waste, Waste-to-Energy Municipal Solid Waste, Landfills Places We Live, Regional Community Issues Focus on Risk, Electromagnetic Fields Focus on Risk, Chlorine: Looking at Tradeoffs Focus on Risk, Plastics</i>
13. Identify scientific evidence that has caused modifications in previously accepted theories (SI-H-B2)	<i>Forest Ecology, Saga of the Gypsy Moth Forest Ecology, Fire Management Municipal Solid Waste, Waste-to-Energy Places We Live, Regional Community Issues Focus on Risk, Electromagnetic Fields Focus on Risk, Chlorine: Looking at Tradeoffs Focus on Risk, Plastics</i>

<p>14. Cite examples of scientific advances and emerging technologies and how they affect society (e.g., MRI, DNA in forensics) (SI-H-B3)</p>	<p><i>Focus on Forests, Tough Choices</i> <i>Forest Ecology, Saga of the Gypsy Moth</i> <i>Forest Ecology, Fire Management</i> <i>Municipal Solid Waste, Recycling and Economics</i> <i>Municipal Solid Waste, Waste-to-Energy</i> <i>Municipal Solid Waste, Landfills</i> <i>Municipal Solid Waste, Where Does Your Garbage Go?</i> <i>Forests of the World, Understanding the Effects of Forest Uses</i> <i>Focus on Risk, Communicating Risk</i> <i>Focus on Risk, Electromagnetic Fields</i> <i>Focus on Risk, Chlorine: Looking at Tradeoffs</i> <i>Focus on Risk, Plastics</i></p>
<p>15. Analyze the conclusion from an investigation by using data to determine its validity (SI-H-B4)</p>	<p><i>Forest Ecology, Understanding Fire</i> <i>Forests of the World, Seeking Sustainability</i> <i>Focus on Risk, Communicating Risk</i> <i>Focus on Risk, Weighing Options</i> <i>Focus on Risk, Decision Making</i> <i>Focus on Risk, Electromagnetic Fields</i> <i>Focus on Risk, Chlorine-Looking at Tradeoffs</i> <i>Focus on Risk, Plastics</i></p>
<p>16. Use the following rules of evidence to examine experimental results:</p> <p>(a) Can an expert's technique or theory be tested, has it been tested, or is it simply a subjective, conclusive approach that cannot be reasonably assessed for reliability?</p> <p>(b) Has the technique or theory been subjected to peer review and publication?</p> <p>(c) What is the known or potential rate of error of the technique or theory when applied?</p> <p>(d) Were standards and controls applied and maintained?</p> <p>(e) Has the technique or theory been generally accepted in the scientific community?</p> <p>(SI-H-B5) (SI-H-B1) (SI-H-B4)</p>	<p><i>Forest Ecology, Understanding Fire</i> <i>Forests of the World, Seeking Sustainability</i> <i>Focus on Risk, Risk Assessment: Tools of the Trade</i> <i>Focus on Risk, Communicating Risk</i> <i>Focus on Risk, Weighing Options</i> <i>Focus on Risk, Decision Making</i> <i>Focus on Risk, Electromagnetic Fields</i> <i>Focus on Risk, Chlorine-Looking at Tradeoffs</i> <i>Focus on Risk, Plastics</i></p>

Physical Science
Measurement and Symbolic Representation

<p>1. Convert metric system units involving length, mass, volume, and time using dimensional analysis (i.e., factor-label method) (PS-H-A1)</p>	
<p>2. Differentiate between accuracy and precision and evaluate percent error (PS-H-A1)</p>	
<p>3. Determine the significant figures based on precision of measurement for stated quantities (PS-H-A1)</p>	
<p>4. Use scientific notation to express large and small numbers (PS-H-A1)</p>	
<p>5. Write and name formulas for ionic and covalent compounds (PS-H-A2)</p>	
<p>6. Write and name the chemical formula for the products that form from the reaction of selected reactants (PS-H-A2)</p>	
<p>7. Write a balanced symbolic equation from a word equation (PS-H-A2)</p>	

Atomic Structure

<p>8. Analyze the development of the modern atomic theory from a historical perspective (PS-H-B1)</p>	
<p>9. Draw accurate valence electron configurations and Lewis dot structures for selected molecules, ionic and covalent compounds, and chemical equations (PS-H-</p>	

B1)	
10. Differentiate among <i>alpha</i> , <i>beta</i> , and <i>gamma</i> emissions (PS-H-B2)	
11. Calculate the amount of radioactive substance remaining after a given number of half-lives has passed (PS-H-B2)	
12. Describe the uses of radioactive isotopes and radiation in such areas as plant and animal research, health care, and food preservation (PS-H-B2)	
13. Identify the number of bonds an atom can form given the number of valence electrons (PS-H-B3)	
The Structure and Properties of Matter	
14. Identify unknowns as elements, compounds, or mixtures based on physical properties (e.g., density, melting point, boiling point, solubility) (PS-H-C1)	
15. Predict the physical and chemical properties of an element based only on its location in the periodic table (PS-H-C2)	
16. Predict the stable ion(s) an element is likely to form when it reacts with other specified elements (PS-H-C2)	
17. Use the periodic table to compare electronegativities and ionization energies of elements to explain periodic properties, such as atomic size (PS-H-C2)	
18. Given the concentration of a solution, calculate the predicted change in its boiling and freezing points (PS-H-C3)	
19. Predict the conductivity of a solution (PS-H-C3)	
20. Express concentration in terms of molarity, molality, and normality (PS-H-C3)	
21. Design and conduct a laboratory investigation in which physical properties are used to separate the substances in a mixture (PS-H-C4)	
22. Predict the kind of bond that will form between two elements based on electronic structure and electronegativity of the elements (e.g., ionic, polar, nonpolar) (PS-H-C5)	
23. Model chemical bond formation by using Lewis dot diagrams for ionic, polar, and nonpolar compounds (PS-H-C5)	
24. Describe the influence of intermolecular forces on the physical and chemical properties of covalent compounds (PS-H-C5)	
25. Name selected structural formulas of organic compounds (PS-H-C6)	
26. Differentiate common biological molecules, such as carbohydrates, lipids, proteins, and nucleic acids by using structural formulas (PS-H-C6)	
27. Investigate and model hybridization in carbon compounds (PS-H-C6)	
28. Name, classify, and diagram <i>alkanes</i> , <i>alkenes</i> , and <i>alkynes</i> (PS-H-C6)	
29. Predict the properties of a gas based on gas laws (e.g., temperature, pressure, volume) (PS-H-C7)	

30. Solve problems involving heat flow and temperature changes by using known values of specific heat and latent heat of phase change (PS-H-C7)	
Chemical Reactions	
31. Describe chemical changes and reactions using diagrams and descriptions of the reactants, products, and energy changes (PS-H-D1)	
32. Determine the concentration of an unknown acid or base by using data from a titration with a standard solution and an indicator (PS-H-D2)	<i>Municipal Solid Waste, Composting</i>
33. Calculate pH of acids, bases, and salt solutions based on the concentration of hydronium and hydroxide ions (PS-H-D2)	<i>Forest Ecology, Cast of Thousands</i>
34. Describe chemical changes by developing word equations, balanced formula equations, and net ionic equations (PS-H-D3)	
35. Predict products (with phase notations) of simple reactions, including acid/base, oxidation/reduction, and formation of precipitates (PS-H-D3)	
36. Identify the substances gaining and losing electrons in simple oxidation-reduction reactions (PS-H-D3)	
37. Predict the direction of a shift in equilibrium in a system as a result of stress by using LeChatalier's principle (PS-H-D4)	
38. Relate the law of conservation of matter to the rearrangement of atoms in a balanced chemical equation (PS-H-D5)	<i>Municipal Solid Waste, Composting</i>
39. Conduct an investigation in which the masses of the reactants and products from a chemical reaction are calculated (PS-H-D5)	
40. Compute percent composition, empirical formulas, and molecular formulas of selected compounds in chemical reactions (PS-H-D5)	
41. Apply knowledge of stoichiometry to solve mass/mass, mass/volume, volume/volume, and mole/mole problems (PS-H-D5)	
42. Differentiate between activation energy in endothermic reactions and exothermic reactions (PS-H-D6)	<i>Municipal Solid Waste, Composting</i>
43. Graph and compute the energy changes that occur when a substance, such as water, goes from a solid to a liquid state, and then to a gaseous state (PS-H-D6)	
44. Measure and graph energy changes during chemical reactions observed in the laboratory (PS-H-D6)	
45. Give examples of common chemical reactions, including those found in biological systems (PS-H-D7)	<i>Forest Ecology, The Nature of Plants Forest Ecology, Understanding Fire Municipal Solid Waste, Recycling and Economics Municipal Solid Waste, Composting Municipal Solid Waste, Landfills Focus on Risk, Risk Assessment: Tools of the Trade Focus on Risk, Communicating Risk Focus on Risk, Chlorine: Looking at Tradeoffs</i>

	<i>Focus on Risk, Plastics</i>
Forces and Motion	
46. Identify and compare intermolecular forces and their effects on physical and chemical properties (PS-H-E1)	
Interactions of Energy and Matter	
47. Assess environmental issues related to the storage, containment, and disposal of wastes associated with energy production and use (PS-H-G4)	<i>Municipal Solid Waste, Waste-to-Energy</i> <i>Forests of the World, Understanding the Effects of Forest Use</i> <i>Places We Live, Green Space</i> <i>Places We Live, Far-Reaching Decisions</i> <i>Focus on Risk, Risk Assessment: Tools of the Trade</i> <i>Focus on Risk, Electromagnetic Fields</i>