

Main Objective	Lesson Objectives	State Standards	Assessments
<p>Lab Safety</p> <p>Review skills the students need in order to be safe during laboratory experiments</p>	<p>Review safety rules and procedures</p>	<p>A.12.1</p>	<p>Presentation of rules to peers Safety exam</p>
<p>Chapter 1</p> <p>Students will understand the importance of chemistry and the scientific method</p>	<p>1.1 Understand the importance of learning chemistry; define chemistry</p> <p>1.2 Understand scientific thinking; illustrate scientific thinking; describe the method scientists use to study nature</p> <p>1.3 Develop successful strategies for learning chemistry</p>	<p>B.12.1</p> <p>A.12.3, A.12.4, B.12.1</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 2</p> <p>Students will learn about the composition of matter, distinguish the difference between elements and compounds and mixtures and pure substances</p>	<p>2.1 Learn about the composition of matter; learn the difference between elements and compounds; define the three states of matter</p> <p>2.2 Distinguish between physical and chemical properties; distinguish between physical and chemical changes</p> <p>2.3 Distinguish between mixtures and pure substances; learn two methods of separating mixtures</p>	<p>A.12.4, C.12.3, C.12.4, D.12.1, D.12.5, D.12.11</p> <p>A.12.4</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 3</p>	<p>3.1 Learn about the relative abundances of the elements, the names of some elements, the symbols of elements</p> <p>3.2 Learn about Dalton's theory of atoms; understand and illustrate the Law of constant composition;</p>	<p>D.12.11</p> <p>B.12.1</p>	<p>Worksheets Quizzes Tests Labs</p>

	<p>learn how a formula describes a compound's composition</p> <p>3.3 Learn about the internal parts of an atom; understand Rutherford's experiment; describe some important features of subatomic particles; learn about the terms isotope, atomic number, and mass number; understand the use of the symbol ${}^A_Z X$ to describe a given atom</p> <p>3.4 Learn the various features of the periodic table; learn some of the properties of metals, nonmetals, and metalloids; learn the natures of the common elements</p> <p>3.5 Describe the formation of ions from their parent atoms; learn to name ions; predict which ion a given element forms by using the periodic table; describe how ions combine to form neutral compounds</p>	<p>B.12.1</p> <p>B.12.1, D.12.11</p> <p>D.12.1</p>	
<p>Chapter 4</p> <p>Students will learn how to name ionic and covalent compounds, the names of common polyatomic ions, how to name acids, and how to write formulas of a compound, given its name</p>	<p>4.1 Learn to name binary compounds of a metal and nonmetal and binary compounds containing only nonmetals; summarize the naming of all types of binary compounds</p> <p>4.2 Learn the names of common polyatomic ions and how to name compounds with polyatomic ions; learn how the anion composition determines an acid's name and the names for common acids; learn to write the formula for a compound given its name</p>	<p>D.12.1, D12.2</p> <p>D.12.1</p>	<p>Worksheets</p> <p>Quizzes</p> <p>Tests</p> <p>Labs</p>
<p>Chapter 5</p> <p>Students will show how</p>	<p>5.1 Show how very large or very small numbers can be expressed in scientific notation; learn the English, metric, and SI systems of measurement; use the</p>	<p>A.12.3</p>	<p>Worksheets</p> <p>Quizzes</p> <p>Tests</p>

<p>numbers can be expressed in scientific notation, learn and use the metric system, express and identify answers in the correct number of significant figures, solve problems with dimensional analysis, convert temperatures from one another, and define density and its units.</p>	<p>metric system to measure length, volume, and mass</p> <p>5.2 Learn how uncertainty in a measurement arises; indicate a measurements uncertainty by using significant figures; determine the number of significant figures in a calculated result</p> <p>5.3 Learn how dimensional analysis can be used to solve problems; learn the three temperature scales and how to convert from one temperature scale to another; practice using problem-solving techniques; define density and its units</p>	<p>A.12.3</p>	<p>Labs</p>
<p>Chapter 6</p> <p>Students will learn to calculate average atomic mass, the concept of a mole, molar mass, and an atom. Students will convert between grams, moles, and atoms of a given substance. Students will learn to find percent mass, empirical formulas, and molecular formulas.</p>	<p>6.1 Understand the concept of average atomic mass; learn how counting can be done by weighing; understand atomic mass and learn how it is determined; understand the mole concept and Avogadro's number; convert among moles, mass, and number of atoms</p> <p>6.2 Understand the definition of molar mass; convert between moles and mass; calculate mass percent of an element in a compound</p> <p>6.3 Understand the meaning of empirical formulas and is able to calculate an empirical formula and a molecular formula of a compound</p>	<p>A.12.3, C.12.3, C.12.4, D.12.1</p> <p>A.12.3</p> <p>C.12.3, C.12.4</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 7</p> <p>Students will learn how to write a balanced chemical reaction and identify the characteristics of a chemical reaction.</p>	<p>7.1 Learn the signals that show a chemical reaction has occurred</p> <p>7.2 Learn to identify the characteristics of a chemical reaction; learn the information given by a chemical equation</p>	<p>C.12.3, C.12.4, D.12.1, D.12.4, D.12.6</p> <p>C.12.3, C.12.4, D.12.1, D.12.4, D.12.6</p>	<p>Worksheets Quizzes Tests Labs</p>

	7.3 Write a balanced equation for a chemical reaction	D.12.1, D.12.4, D.12.6	
<p>Chapter 8</p> <p>Students will identify a solid in a precipitation reaction and write the molecular, ionic, and net ionic equations for a precipitation reaction. Students will be able to characterize reactions between strong acids and strong bases and metals and nonmetals. Students will be able to classify different chemical reactions</p>	<p>8.1 Predict whether a reaction will occur; identify the solid that forms in a precipitation reaction; write molecular, complete ionic, and net ionic equations</p> <p>8.2 Write a reaction between strong acid and strong base and redox reactions; understand how electron transfer produces a chemical reaction</p> <p>8.3 Classify reactions</p>	<p>C.12.3, C.12.4, D.12.1, D.12.4, D.12.6, D.12.11</p> <p>D.12.1, D.12.4, D.12.6, D.12.11</p> <p>C.12.3, C.12.4, D.12.1, D.12.4, D.12.6, D.12.11</p>	<p>Worksheets</p> <p>Quizzes</p> <p>Tests</p> <p>Labs</p>
<p>Chapter 9</p> <p>Students will calculate stoichiometric calculations; understand the concept of limiting reactants and how to determine a limiting reactant using stoichiometry; calculate percent yield</p>	<p>9.1 Comprehend the information given in a balanced equation; used balanced equations to determine a relationship between moles of a reactant and products</p> <p>9.2 Relate masses of a reactant and product in a chemical reaction; perform mass calculations that involved scientific notation</p> <p>9.3 Explain the concept of limiting reactants; recognize the limiting reactant in a reaction; use the limiting reactant to do stoichiometric calculations; calculate percent yield</p>	<p>D.12.1</p> <p>C.12.3, C.12.4</p> <p>C.12.3, C.12.4</p>	<p>Worksheets</p> <p>Quizzes</p> <p>Tests</p> <p>Labs</p>
<p>Chapter 10</p> <p>Students will be able to understand the general properties of energy,</p>	<p>10.1 Understand the general properties of energy, temperature, and heat; explain the direction of energy flow as heat</p>	<p>D.12.3</p>	<p>Worksheets</p> <p>Quizzes</p> <p>Tests</p> <p>Labs</p>

<p>temperature, and heat; describe how heat flows and how it's measured; calculate the enthalpy of a reaction; perform Hess's Law calculations</p>	<p>10.2 Describe how energy flow affects internal energy; calculate heat</p> <p>10.3 Calculate heat (enthalpy) of a chemical reaction; perform calculations using Hess's Law</p> <p>10.4 Understand how the quality of energy changes as it is used; identify the energy resources of our world; determine the amount of entropy in a system</p>	<p>D.12.3</p> <p>B.12.1, C.12.3, C.12.4, D.12.3</p> <p>D.12.3</p>	
<p>Chapter 11</p> <p>Students will be able to describe Rutherford's model of the atom, explore the nature of electromagnetic radiation, explain using electronic configuration how the electrons are arranged around the nucleus of an atom</p>	<p>11.1 Describe Rutherford's model of the atom; explore the nature of electromagnetic radiation; see how atoms emit light</p> <p>11.2 Understand how the emission spectrum of hydrogen demonstrates the quantized nature of energy; learn about Bohr's model of the hydrogen atom/ understand how the electron's position is represented in the wave mechanical model</p> <p>11.3 Learn the shapes of the s, p, and d orbitals; review the energy levels and orbitals of the wave mechanical model of the atom; learn about electron spin</p> <p>11.4 Understand how the principal energy levels fill with electrons in atoms beyond hydrogen; identify the valence electrons and core electrons; write the electronic configuration of atoms; explain the trends of the periodic table</p>	<p>B.12.1, D.12.3</p> <p>B.12.1, B.12.2, D.12.1</p> <p>D.12.1</p> <p>A.12.3</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 12</p> <p>Students will identify the types of chemical bonds and</p>	<p>12.1 Learn about ionic and covalent bonds and explain how they are formed; recognize a polar covalent bond; understand the nature of bonds and their relationship to electronegativity; comprehend bond</p>	<p>D.12.1, D12.2</p>	<p>Worksheets Quizzes Tests Labs</p>

<p>the forces holding them together. Students will be able to predict the molecular structure of a molecule.</p>	<p>polarity and how it is related to molecular polarity</p> <p>12.2 Learn about stable electron configurations; predict the formulas of ionic compounds; understand factors governing ionic size</p> <p>12.3 Write Lewis structures</p> <p>12.4 Predict molecular structure and bond angles; apply the VSEPR model to molecules</p>	<p>D.12.1</p> <p>D.12.1</p> <p>D.12.1</p>	
<p>Chapter 13</p> <p>Students will discover the properties of gases, the laws they represent, and relationships between temperature, pressure, and volume.</p>	<p>13.1 Learn the units of pressure and atmospheric pressure; understand how the pressure and volume of a gas are related; do calculations involving Boyle's Law; learn about absolute zero; understand how volume and temperature are related; do calculations involving Charles's Law; understand how the volume and the number of moles of a gas are related; do calculations involving Avogadro's Law</p> <p>13.2 Understand the ideal gas law and use it in calculations; describe the relationship between partial pressure and total pressure of a gas mixture; perform calculations involving Dalton's Law of partial pressures; understand the molar volume of an ideal gas; learn the definition of STP; calculate stoichiometric problems using the ideal gas law</p> <p>13.3 Understand the relationship between laws and models; recall the postulates of the kinetic molecular theory; use the kinetic molecular theory to explain the gas laws; describe the properties of real gases</p>	<p>A.12.3, B.12.1, C.12.3, C.12.4</p> <p>A.12.3, B.12.1, C.12.3, C.12.4</p> <p>B.12.1</p>	<p>Worksheets</p> <p>Quizzes</p> <p>Tests</p> <p>Labs</p>

<p>Chapter 14</p> <p>Students will explain the intermolecular forces between atoms in a molecule and predict the properties of liquids using these forces. Students will explore important properties of water. Students will understand use the heat of fusion and heat of vaporization.</p>	<p>14.1 Learn about dipole-dipole, hydrogen, and London dispersion forces; understand the effect of intermolecular forces on the properties of liquids; learn some of the important features of water; learn about the interactions among water molecules; understand and use the heat of fusion and heat of vaporization</p> <p>14.2 Understand the relationship among vaporization, condensation, and vapor pressure; relate the boiling point of water to its vapor pressure</p>	<p>D12.2</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 15</p> <p>Students understand and use concentrations terms: mass percent and molarity. Students will learn how to calculate the concentration of a solution and how to make a solution.</p>	<p>15.1 Students will understand the process of dissolving, why certain substances dissolve in water, and the rate of dissolving solids in a liquid.</p> <p>15.2 Understand and use molarity; learn to calculate the concentration of a solution</p>	<p>C.12.3, C.12.4</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 16</p> <p>Students will understand the Arrhenius and Brønsted-Lowry models for acids and bases, acid strength, the relationship between acid strength and strength of the conjugate base, and pH and pOH.</p>	<p>16.1 Define and give examples of Arrhenius acids/bases and Brønsted-Lowry acids/bases; identify the relationship of conjugate acid-base pairs; describe how to determine the strength of an acid; understand the relationship between acid strength and the strength of the conjugate base; learn about the ionization of water</p> <p>16.2 Explain the difference between pH and pOH; find pH and pOH for various solutions</p> <p>16.3 Learn and perform acid-base titrations</p>	<p>B.12.1, C.12.3, C.12.4</p> <p>A.12.3, G.12.4</p> <p>C.12.3, C.12.4</p>	<p>Worksheets Quizzes Tests Labs</p>

<p>Chapter 17</p> <p>Students will be able to explain which factors effect equilibrium, use Le Châtelier's Principle to explain which way a reaction will shift.</p>	<p>17.1 Understand the collision model of chemical reactions; explain the concept of activation energy; understands how a catalyst speeds up a chemical reaction; learn how equilibrium is established</p> <p>17.2 Understand the law of chemical equilibrium; learn to calculate values for the equilibrium constant; explain how the presence of solids and liquids affect the equilibrium expression</p> <p>17.3 Predict the changes that occur when a system at equilibrium is disturbed; calculate equilibrium concentrations; calculate the solubility product of a salt</p>	<p>A.12.4</p> <p>A.12.4, C.12.3, C.12.4</p>	<p>Worksheets Quizzes Tests Labs</p>
<p>Chapter 20</p> <p>Students will be able to name and draw organic molecules.</p>	<p>20.1 Understand the types of bonds formed by the carbon atom; identifies the 10 basic alkanes; draw structural formulas; identify and name alkanes using different functional groups</p> <p>20.2 Name hydrocarbons with double and triple bonds</p> <p>20.3 Learn the common functional groups in organic molecules; name and draw simple alcohols</p>	<p>D.12.1, D12.2, G.12.4</p> <p>D.12.1, D12.2, G.12.4</p> <p>D.12.1, D12.2, G.12.4</p>	<p>Worksheets Quizzes Tests Labs</p>

The following standards are continuous in the chemistry curriculum:

A.12.5, A.12.6, A.12., B.12.3,C.12.1, C.12.5, C.12.6, G.12.1, H.12.6, H.12.7

Wisconsin State Standards

By the end of grade twelve, students will:

A.12.1 Apply* the underlying themes* of science to develop defensible visions of the future

A.12.2 Show* how conflicting assumptions about science themes* lead to different opinions and decisions about evolution*, health, population, longevity, education, and use of resources, and show* how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future

A.12.3 Give examples that show* how partial systems*, models*, and explanations* are used to give quick and reasonable solutions that are accurate enough for basic needs

A.12.4 Construct* arguments that show* how conflicting models* and explanations* of events can start with similar evidence*

A.12.5 Show* how the ideas and themes* of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources

A.12.6 Identify* and, using evidence* learned or discovered, replace inaccurate personal models* and explanations* of science-related events

A.12.7 Re-examine the evidence* and reasoning that led to conclusions drawn from investigations*, using the science themes*

Performance Standards

By the end of grade twelve, students will:

B.12.1 Show* how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences

B.12.2 Identify* the cultural conditions that are usually present during great periods of discovery, scientific development, and invention

B.12.3 Relate* the major themes* of science to human progress in understanding science and the world

B.12.4 Show* how basic research and applied research contribute to new discoveries, inventions, and applications

B.12.5 Explain* how science is based on assumptions about the natural world and themes* that describe the natural world

Performance Standards

By the end of grade twelve, students will:

C.12.1 When studying science content, ask questions suggested by current social issues, scientific literature, and observations* of phenomena, build hypotheses that might answer some of these questions, design possible investigations*, and describe results that might emerge from such investigations

C.12.2 Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions

C.12.3 Evaluate* the data collected during an investigation*, critique the data-collection procedures and results, and suggest ways to make any needed improvements

C.12.4 During investigations*, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data

C.12.5 Use the explanations* and models* found in the earth and space, life and environmental, and physical sciences to develop likely explanations* for the results of their investigations*

C.12.6 Present the results of investigations* to groups concerned with the issues, explaining* the meaning and implications of the results, and answering questions in terms the audience can understand

C.12.7 Evaluate* articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design

Performance Standards

By the end of grade twelve, students will:

STRUCTURE OF ATOMS AND MATTER

D.12.1 Describe* atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions*

D.12.2 Explain* the forces that hold the atom together and illustrate* how nuclear interactions* change the atom

D.12.3 Explain* exchanges of energy* in chemical interactions* and exchange of mass and energy in atomic/nuclear reactions

CHEMICAL REACTIONS

D.12.4 Explain* how substances, both simple and complex, interact* with one another to produce new substances

D.12.5 Identify* patterns in chemical and physical properties and use them to predict* likely chemical and physical changes and interactions

D.12.6 Through investigations*, identify* the types of chemical interactions*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions

MOTIONS AND FORCES

D.12.7 Qualitatively and quantitatively analyze* changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically

D.12.8 Understand* the forces of gravitation, the electromagnetic force, intermolecular force, and explain* their impact on the universal system

D.12.9 Describe* models* of light, heat, and sound and through investigations* describe* similarities and differences in the way these energy* forms behave

CONSERVATION OF ENERGY AND THE INCREASE IN DISORDER

D.12.10 Using the science themes*, illustrate* the law of conservation of energy* during chemical and nuclear reactions

INTERACTIONS OF MATTER AND ENERGY

D.12.11 Using the science themes*, explain* common occurrences in the physical world

D.12.12 Using the science themes* and knowledge of chemical, physical, atomic, and nuclear interactions*, explain* changes in materials, living things, earth's features, and stars

Performance Standards

By the end of grade twelve, students will:

ENERGY IN THE EARTH SYSTEM

E. 12.1 Using the science themes*, distinguish between internal energies* (decay of radioactive isotopes, gravity) and external energies (sun) in the earth's systems and show* how these sources of energy have an impact on those systems

GEOCHEMICAL CYCLES

E.12.2 Analyze* the geochemical and physical cycles of the earth and use them to describe* movements of matter

THE ORIGIN AND EVOLUTION OF THE EARTH SYSTEM

E.12.3 Using the science themes*, describe* theories of the origins and evolution* of the universe and solar system, including the earth system* as a part of the solar system, and relate* these theories and their implications to geologic time on earth

E.12.4 Analyze* the benefits, costs, and limitations of past, present, and projected use of resources and technology and explain* the consequences to the environment

THE ORIGIN AND EVOLUTION OF THE UNIVERSE

E.12.5 Using the science themes*, understand* that the origin of the universe is not completely understood, but that there are current ideas in science that attempt to explain its origin

Performance Standards

By the end of grade twelve, students will:

THE CELL

F.12.1 Evaluate* the normal structures and the general and special functions* of cells in single-celled and multiple-celled organisms

F.12.2 Understand* how cells differentiate and how cells are regulated

THE MOLECULAR BASIS OF HEREDITY

F.12.3 Explain* current scientific ideas and information about the molecular and genetic basis of heredity

F.12.4 State the relationships between functions* of the cell and functions of the organism as related to genetics and heredity

BIOLOGICAL EVOLUTION*

F.12.5 Understand* the theory of evolution*, natural selection, and biological classification

F.12.6. Using concepts of evolution* and heredity, account for changes* in species and the diversity of species, include the influence of these changes on science, e.g. breeding of plants or animals

THE INTERDEPENDENCE OF ORGANISMS

F.12.7 Investigate* how organisms both cooperate and compete in ecosystems

F.12.8 Using the science themes*, infer* changes in ecosystems prompted by the introduction of new species, environmental conditions, chemicals, and air, water, or earth pollution

MATTER, ENERGY AND ORGANIZATION IN LIVING SYSTEMS

F.12.9 Using the science themes*, investigate* energy* systems* (related to food chains) to show* how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism

F.12.10 Understand* the impact of energy* on organisms in living systems*

F.12.11 Investigate* how the complexity and organization* of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism

THE BEHAVIOR OF ORGANISMS

F.12.12 Trace how the sensory and nervous systems* of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses

Performance Standards

By the end of grade twelve, students will:

G.12.1 Identify* personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered

G.12.2 Design, build, evaluate, and revise models* and explanations related to the earth and space, life and environmental, and physical sciences

G.12.3 Analyze* the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community

G.12.4 Show* how a major scientific or technological change has had an impact on work, leisure, or the home

G.12.5 Choose a specific problem in our society, identify* alternative scientific or technological solutions to that problem and argue it merits

Performance Standards

By the end of grade twelve, students will:

H.12.1 Using the science themes* and knowledge of the earth and space, life and environmental, and physical sciences, analyze* the costs, risks, benefits, and consequences of a proposal concerning resource management in the community and determine the potential impact of the proposal on life in the community and the region

H.12.2 Evaluate* proposed policy recommendations (local, state, and/or national) in science and technology for validity, evidence, reasoning, and implications, both short and long-term

H.12.3 Show* how policy decisions in science depend on social values, ethics, beliefs, and time-frames as well as considerations of science and technology

H.12.4 Advocate a solution or combination of solutions to a problem in science or technology

H.12.5 Investigate* how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region

H.12.6 Evaluate* data and sources of information when using scientific information to make decisions

H.12.7 When making decisions, construct a plan that includes the use of current scientific knowledge and scientific reasoning

Sources: Information adapted from McDougal Littell—World of Chemistry (Zumdahl/Zumdahl/DeCoste) text, 2007

Wisconsin State Science Standards, 2009, <http://www.dpi.state.wi.us/standards/sciintro.html>