



**KENOSHA UNIFIED SCHOOL DISTRICT NO. 1
CURRICULUM AND INSTRUCTIONAL SERVICES**

**STANDARDS AND BENCHMARKS
SCIENCE**

GRADE 10 CHEMISTRY

STANDARD A: SCIENCE CONNECTIONS—STUDENTS WILL UNDERSTAND AND DESCRIBE THE UNIFYING CONCEPTS AND PROCESSES AMONG SCIENCE TOPICS WHICH LEAD TO CONNECTIONS BETWEEN PHYSICAL SCIENCE, EARTH/SPACE SCIENCE, AND LIFE SCIENCE.

A-1: Systems

A system has properties that are different from those of its parts.

The successful operation of a system involves feedback.

It may not be possible to predict accurately the result of changing some part of a system.

A-2: Models

The basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same ways as the objects or processes under investigation.

The usefulness of a model can be tested by comparing its predictions to actual observations in the real world.

A-3: Change and Constancy

A system in equilibrium may return to the same state of equilibrium if the disturbances it experiences are small. Large disturbances may cause it to escape that equilibrium and eventually settle into some other state of equilibrium.

The concept of the conservation of matter and energy is involved in all fields of science.

Graphs and equations are useful ways for depicting and analyzing patterns of change.

In evolutionary change, the present arises gradually from the materials and forms of the past.

The precise behavior of most systems is unpredictable.

A-4: Scale

Representing large numbers in terms of powers of ten makes it easier to think about them and to compare things that are greatly different.

Large changes in scale typically change the way that things work in physical or biological systems.

As the number of parts of a system grows in size, the number of possible internal interactions increases much more rapidly.

A-5: Connections

Any event, issue, or problem in the natural or designed world can be associated with the general domains of science and the unifying themes of science.

Many scientific investigations require the contributions of individuals from different disciplines, including engineering.

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STANDARD B: NATURE OF SCIENCE—STUDENTS WILL UNDERSTAND THAT THE STUDY OF SCIENCE IS ONGOING, AND THEORIES AND CONCEPTS IN SCIENCE CHANGE OVER TIME AS NEW EVIDENCE IS FOUND. SCIENTIFIC EXPLANATIONS MUST ADHERE TO CRITERIA SUCH AS: A PROPOSED EXPLANATION MUST BE LOGICALLY CONSISTENT, IT MUST ABIDE BY THE RULES OF EVIDENCE, IT MUST BE OPEN TO QUESTIONS AND POSSIBLE MODIFICATION, AND IT MUST BE BASED ON HISTORICAL AND CURRENT SCIENTIFIC KNOWLEDGE.

B-1: Science is a Human Endeavor, and There are Many Commonly Known Careers in Science.

Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations.

Many people choose science as a career and devote their lives to studying it.

Scientists value peer review, truthful reporting about the methods and outcomes of investigations, and making public the results of work.

B-2: Nature of Scientific Process and Knowledge

Scientists strive for the best possible explanations about the natural world.

Scientific explanations must be consistent with experimental and observational evidence.

Scientific knowledge is subject to change as new evidence becomes available.

Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations, and communicating results.

B-3: History of Science

In history, diverse cultures have contributed scientific knowledge and technologic inventions.

Changes in science occur as modifications in existing knowledge.

The historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time.

STANDARD C: SCIENCE INQUIRY—STUDENTS WILL INVESTIGATE QUESTIONS USING SCIENTIFIC METHODS AND TOOLS, REVISE THEIR PERSONAL UNDERSTANDING TO ACCOMMODATE KNOWLEDGE, AND COMMUNICATE THOSE UNDERSTANDINGS TO OTHERS.

C-1: Ask Questions about Objects, Organisms, and Events in the Everyday World.

Formulate a testable hypothesis suggested by current social issues, scientific literature, or observations of phenomena and demonstrate its connections to scientific concepts.

C-2: Make Connections to Prior Knowledge.

Use prior knowledge of scientific facts, concepts, and investigations to make predictions and guide the design of an experiment.

C-3: Gather Background Knowledge Related to the Questions Being Investigated.

Locate and access data and scientific knowledge in age-appropriate information sources and reference materials. (See English/ Language Arts and Information and Technology Literacy Standards.)

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C-4: Design and Conduct Responsible and Safe Investigations to Help Answer Questions.
Demonstrate knowledge of age-appropriate safe laboratory procedures.

Design an appropriate scientific investigation based on current issues, scientific concepts, or student observations.

C-5: Safely Use Appropriate Senses, Equipment and Tools to Make Observations and Gather Data.
Select and use appropriate tools and equipment to make accurate observations and SI measurements for the purpose of scientific investigation.

C-6: Collecting and Representing Qualitative and Quantitative Data
(See Math Standard E.)
Collect and organize qualitative and quantitative data in a lab notebook or report, or by using media and technology appropriate to purpose and content.

Create and interpret appropriate types of graphs.

C-7: Summarizing, Synthesizing, Inferring, and Building Explanations
Use experimental results, mathematical formulas, models, and current scientific knowledge to develop and defend likely explanations of investigation results and refine work.

Relate mathematical functions to data.

C-8: Communicating Results
Complete appropriate lab report.

Share, defend, and revise results, explanations, and procedures using media and technology appropriate to purpose and content.

Evaluate physical and conceptual models for accuracy and completeness.

STANDARD D: PHYSICAL SCIENCE —STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE PHYSICAL AND CHEMICAL PROPERTIES OF MATTER, THE FORMS AND PROPERTIES OF ENERGY, AND THE WAYS IN WHICH MATTER AND ENERGY INTERACT.

D-1: Properties of Matter

The components that make up atoms have measurable properties.

Chemical and physical properties of a substance can be measured: density, melting point, boiling point, pH, conductivity, magnetic attraction, and solubility.

The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structures of the molecule, including the constituent atoms and the distances and angles between them.

Solids, liquids, and gases differ in the distances and angles between molecules or atoms and therefore the energy that binds them together.

Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures including synthetic polymers, oils, and the large molecules essential to life.

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D-2: Structure of Matter

The numbers of protons in the nucleus of an atom determines the atom's electron configuration, which determines how the atom interacts with other atoms.

Atoms form bonds which other atoms by transferring or sharing outer electrons.

The configuration of atoms in a molecule determines the molecule's properties.

Neutrons have a mass that is nearly identical to that of protons, but neutrons have no electric charge.

Neutrons have little effect on how an atom interacts with others, but they do affect the mass and stability of the nucleus.

Isotopes of the same element have the same number of protons, but different numbers of neutrons.

Scientists continue to investigate atoms and have discovered even smaller constituents of which protons and neutrons are made.

At the atomic level, electric forces between oppositely charged electrons and protons hold atoms and molecules together and they are involved in all chemical reactions.

The states of matter can be identified and described based on motion and distance between the particles that make them up.

D-3: Physical, Chemical and Nuclear Changes in Matter

A wide variety of biological, chemical, and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.

Chemical reactions form products that are different from the reactants and these chemical reactions can be represented by chemical equations.

Different energy levels are associated with different configurations of atoms in molecules. Some changes of configuration require a net input of energy, whereas others cause a net release.

During chemical reactions, energy is absorbed or release and the energy can be in the form of light, heat or electrical energy.

Matter and energy are conserved during chemical and physical changes.

The nuclei of radioactive isotopes spontaneously decay emitting particles and/or wave-like radiation.

Nuclear reactions (fission or fusion) convert a fraction of the mass of interacting particles into energy, but the total amount of mass and energy is conserved.

D-4: Position and Motion of Objects

(No Chemistry Benchmarks)

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D-5: Forces of Nature

At the atomic level, electric forces between oppositely charged electrons and protons held atoms and molecules together and thus are involved in all chemical reactions. On a larger scale, these forces hold solid and liquid materials together.

There are two kinds of charges—positive and negative. Like charges repel one another, opposite charges attract. In materials, there are almost exactly equal proportions of positive and negative charges, making the materials as a whole electrically neutral. Negative charges, being associated with electrons, are far more mobile in materials than positive charges are. A very small excess or deficit of negative charges in a material produces noticeable electric forces.

D-6: Interactions of Energy and Matter

Heat consists of random motion and the vibrations of atoms, molecules, and ions. The higher the temperature, the greater the atomic or molecular motion.

Energy is required to change the state of matter.

In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.

Each kind of atom or molecule can gain or lose energy only in particular discrete amounts and thus can absorb and emit light only at wavelengths corresponding to these amounts. These wavelengths can be used to identify the substance.

D-7: Conservation of Energy

The total energy of the universe is constant. Energy can be transferred in many ways, but it can never be destroyed.

As transfers of energy occur, the matter involved becomes steadily less ordered.

STANDARD E: EARTH SCIENCE—STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE STRUCTURE AND SYSTEMS OF EARTH AND THE UNIVERSE AND OF THEIR INTERACTIONS.

E-1: Properties and Structures of the Earth and its Materials

(No Chemistry Benchmarks)

E-2: History and Changes of the Earth

(No Chemistry Benchmarks)

E-3: Cycles in the Earth System

(No Chemistry Benchmarks)

E-4: The Earth, Our Solar System, and Space

(No Chemistry Benchmarks)

STANDARD F: LIFE AND ENVIRONMENTAL SCIENCE —STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE CHARACTERISTICS AND STRUCTURES OF LIVING THINGS, THE PROCESSES OF LIFE, AND HOW LIVING THINGS INTERACT WITH ONE ANOTHER AND THEIR ENVIRONMENT.

F-1: Characteristics, Structure, and Function in Living Things

(No Chemistry Benchmarks)

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F-2: Life Cycles and Heredity of Living Things
(No Chemistry Benchmarks)

F-3: Organisms, Populations, and Ecosystems
(No Chemistry Benchmarks)

F-4: Matter and Energy in Living Systems
(No Chemistry Benchmarks)

STANDARD G: SCIENCE APPLICATIONS—STUDENTS WILL DEMONSTRATE AN UNDERSTANDING OF THE RELATIONSHIP BETWEEN SCIENCE AND TECHNOLOGY AND THE WAYS IN WHICH THAT RELATIONSHIP INFLUENCES HUMAN ACTIVITIES.

G-1: The Process of Technological Design

Identify a problem or an opportunity to improve a design; propose designs and choose between alternative solutions; implement a proposed solution; evaluate the solution and its consequences; and communicate the problem, process, and solution.

G-2: Abilities to Distinguish Between Natural Objects and Objects Made by Humans

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

G-3: Understanding About Science and Technology

Science often advances with the introduction of new technologies, and solving technological problems often results in new scientific knowledge.

Scientists rely on technology to enhance the gathering and manipulation of data.

The accuracy and precision of data depends on the technology used.

STANDARD H: SCIENCE IN SOCIAL AND PERSONAL PERSPECTIVES—STUDENTS WILL USE SCIENCE INFORMATION AND SKILLS TO MAKE INFORMED DECISIONS ABOUT THEMSELVES, THEIR COMMUNITY, AND THE WORLD IN WHICH THEY LIVE.

H-1: Personal and Community Health

Scientific knowledge can be used to make real-life decisions.

H-2: Human Population Growth

(No Chemistry Benchmarks)

H-3: Types of Resources

(No Chemistry Benchmarks)

H-4: Quality of and Changes in Environments

(No Chemistry Benchmarks)

H-5: Science and Technology in Society

(No Chemistry Benchmarks)