NATIONAL SCIENCE EDUCATION STANDARDS

Science Content Standards

Unifying Concepts and Processes

UCP.1 Systems, order, and organization
UCP.2 Evidence, models, and explanation
UCP.3 Change, constancy, and measurement
UCP.4 Evolution and equilibrium
UCP.5 Form and function

Science as Inquiry

A.1 Abilities necessary to do scientific inquiry
A.2 Understandings about scientific inquiry

Physical Science

B.1 Structure of atoms
B.2 Structure and properties of matter
B.3 Chemical reactions
B.4 Motions and forces
B.5 Conservation of energy and increase in disorder
B.6 Interactions of energy and matter

Life Science

C.1 The cell
C.2 Molecular basis of heredity
C.3 Biological evolution
C.4 Interdependence of organisms
C.5 Matter, energy, and organization in living systems
C.6 Behavior of organisms

Earth and Space Science

D.1 Energy in the Earth system
D.2 Geochemical cycles
D.3 Origin and evolution of the Earth system
D.4 Origin and evolution of the universe

Science and Technology

E.1 Abilities of technological design
E.2 Understandings about science and technology

Science in Personal and Social Perspectives

F.1 Personal and community health
F.2 Population growth
F.3 Natural resources
F.4 Environmental quality
F.5 Natural and human-induced hazards
F.6 Science and technology in local, national, and global challenges

History and Nature of Science

G.1 Science as a human endeavor
G.2 Nature of scientific knowledge
G.3 Historical perspectives

CONTENTS IN BRIEF

CHAPTER 1 Introduction to Chemistry

BIG IDEA **Chemistry is a science that is central to our lives.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **A Story of Two Substances** 1. What is a substance? 2. How does ozone form and why is it important? 3. What are chlorofluorocarbons and how do they get into the atmosphere? 1 session 0.5 block	UCP.1, UCP.2; A.1, A.2; B.3, B.6; E.2; F.4, F.5, F.6; G.2, G.3	**Entry-Level Assessment** Focus Transparency 1 **Progress Monitoring** Formative Assessment, pp. 5, 6, 7 Reading Check, pp. 5, 7 Graph Check, p. 8 Section Review, p. 8
SECTION 2 **Chemistry and Matter** 1. How do mass and weight compare and contrast? 2. Why are chemists interested in a submicroscopic description of matter? 3. What defines the various branches of chemistry? 1 session 0.5 block	UCP.1, UCP.2; A.1; B.2; G.1, G.2	**Entry-Level Assessment** Focus Transparency 2 **Progress Monitoring** Formative Assessment, p. 11 Reading Check, p. 10 Section Review, p. 11
SECTION 3 **Scientific Methods** 1. What are the common steps of scientific methods? 2. What are the similarities and differences between qualitative data and quantitative data? 3. In an experiment, which variable is the independent variable, which is the dependent variable, and which are controls? 4. What is the difference between a theory and a scientific law? 1 session 0.5 block	UCP.1, UCP.2; A.2; G.1, G.2	**Entry-Level Assessment** Focus Transparency 3 **Progress Monitoring** Formative Assessment, pp. 12, 13, 16 Reading Check, pp. 13, 14 Section Review, p. 16
SECTION 4 **Scientific Research** 1. How do pure research, applied research, and technology compare and contrast? 2. What are some of the important rules for laboratory safety? 1 session 0.5 block	UCP.1, UCP.2; A.1, A.2; B.2, B.6; E.2; F.1, F.4, F.6; G.1, G.2, G.3	**Entry-Level Assessment** Focus Transparency 4 **Progress Monitoring** Formative Assessment, pp. 19, 22 Reading Check, p. 20 Graph Check, p. 20 Section Review, p. 22 **Summative Assessment** Chapter Assessment, p. 26 ExamView® *Assessment Suite* CD-ROM

CHAPTER 1 STUDY GUIDE

Vocabulary Practice

BIG IDEA Chemistry is a science that is central to our lives.

SECTION 1 A Story of Two Substances

MAIN IDEA Chemistry is the study of everything around us.

- Chemistry is the study of matter.
- Chemicals are also known as substances.
- Ozone is a substance that forms a protective layer in Earth's atmosphere.
- CFCs are synthetic substances made of chlorine, fluorine, and carbon that were originally thought to be the ideal coolants for refrigeration.

VOCABULARY
- chemistry
- substance

SECTION 2 Chemistry and Matter

MAIN IDEA Branches of chemistry involve the study of different kinds of matter.

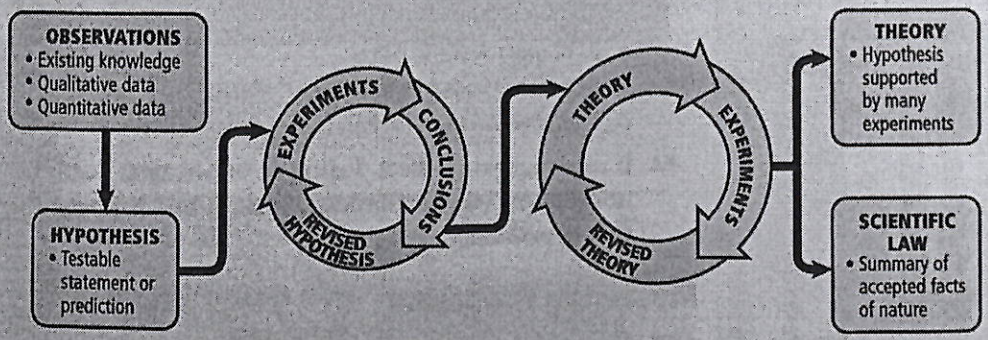
- Models are tools that scientists, including chemists, use.
- Macroscopic observations of matter reflect the actions of atoms on a submicroscopic scale.
- There are several branches of chemistry, including organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, and biochemistry.

VOCABULARY
- mass
- weight
- model

SECTION 3 Scientific Methods

MAIN IDEA Scientists use scientific methods to systematically pose and test solutions to questions and assess the results of the tests.

- Scientific methods are systematic approaches to problem solving.
- Qualitative data describe an observation; quantitative data use numbers.
- Independent variables are changed in an experiment. Dependent variables change in response to the independent variable.
- A theory is a hypothesis that is supported by many experiments.



VOCABULARY
- scientific method
- qualitative data
- quantitative data
- hypothesis
- experiment
- independent variable
- dependent variable
- control
- conclusion
- theory
- scientific law

SECTION 4 Scientific Research

MAIN IDEA Some scientific investigations result in the development of technology that can improve our lives and the world around us.

- Scientific methods can be used in pure research or in applied research.
- Some scientific discoveries are accidental, and some are the result of diligent research in response to a need.
- Laboratory safety is the responsibility of everyone in the laboratory.
- Many of the conveniences we enjoy today are technological applications of chemistry.

VOCABULARY
- pure research
- applied research

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 5 Days
Instructor:

Chemistry - Ch. 1

Unit title and short description

- Introduction to chemistry.
  → Chemistry is a science that is central to our lives.

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

- ✱ See attached Study Guide
-

Objectives – also called competencies in the SAS

What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

-
-
-

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 5 Days
Instructor:

Chemistry - Ch. 2

Unit title and short description

- Analyzing Data
  → Chemists collect and analyze data to determine how matter interacts.

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

- Units and Measurement,
- Scientific Notation + Dimensional Analysis

Uncertainty in Data
Representing Data

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Unit Exam
-
- Quizzes

Labs - Accuracy + Precision in the Determination of the Density of H_2O

CHAPTER 2 Analyzing Data

BIG IDEA **Chemists collect and analyze data to determine how matter interacts.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Units and Measurements** 1. What are the SI base units for time, length, mass, and temperature? 2. How does adding a prefix change a unit? 3. How are the derived units different for volume and density? 1 session 0.5 block	UCP.1, UPC.3; A.1, A.2; B.2; G.1, G.2	**Entry-Level Assessment** Focus Transparency 5 **Progress Monitoring** Formative Assessment, pp. 33, 38 Reading Check, pp. 34, 37 Section Review, p. 39
SECTION 2 **Scientific Notation and Dimensional Analysis** 1. Why use scientific notation to express numbers? 2. How is dimensional analysis used for unit conversion? 1 session 1 block	UCP.1, UPC.3; A.1, A.2; E.2	**Entry-Level Assessment** Focus Transparency 6 **Progress Monitoring** Formative Assessment, pp. 41, 45 Reading Check, p. 42 Section Review, p. 46
SECTION 3 **Uncertainty in Data** 1. How do accuracy and precision compare? 2. How can the accuracy of experimental data be described using error and percent error? 3. What are the rules for significant figures and how can they be used to express uncertainty in measured and calculated values? 1 session 0.5 block	UCP.1, UPC.3; A.1, A.2; E.2; G.2	**Entry-Level Assessment** Focus Transparency 7 **Progress Monitoring** Formative Assessment, p. 53 Reading Check, p. 49 Section Review, p. 54
SECTION 4 **Representing Data** 1. Why are graphs created? 2. How can graphs be interpreted? 1 session 0.5 block	UCP.1, UPC.3; A.1, A.2; B.2; E.1, E.2; F.1; G.2	**Entry-Level Assessment** Focus Transparency 8 **Progress Monitoring** Formative Assessment, p. 57 Reading Check, p. 57 Graph Check, pp. 55, 56, 57, 58 Section Review, p. 58 **Summative Assessment** Chapter Assessment, p. 62 Exam*View*® *Assessment Suite* CD-ROM

CHAPTER 2 STUDY GUIDE

Vocabulary Practice

BIG IDEA Chemists collect and analyze data to determine how matter interacts.

SECTION 1 Units and Measurements

MAIN IDEA Chemists use an internationally recognized system of units to communicate their findings.

- SI measurement units allow scientists to report data to other scientists.
- Adding prefixes to SI units extends the range of possible measurements.
- To convert to Kelvin temperature, add 273 to the Celsius temperature.

$$K = °C + 273$$

- Volume and density have derived units. Density, which is a ratio of mass to volume, can be used to identify an unknown sample of matter.

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

VOCABULARY
- base unit
- second
- meter
- kilogram
- kelvin
- derived unit
- liter
- density

SECTION 2 Scientific Notation and Dimensional Analysis

MAIN IDEA Scientists often express numbers in scientific notation and solve problems using dimensional analysis.

- A number expressed in scientific notation is written as a coefficient between 1 and 10 multiplied by 10 raised to a power.
- To add or subtract numbers in scientific notation, the numbers must have the same exponent.
- To multiply or divide numbers in scientific notation, multiply or divide the coefficients and then add or subtract the exponents, respectively.
- Dimensional analysis uses conversion factors to solve problems.

VOCABULARY
- scientific notation
- dimensional analysis
- conversion factor

SECTION 3 Uncertainty in Data

MAIN IDEA Measurements contain uncertainties that affect how a calculated result is presented.

- An accurate measurement is close to the accepted value. A set of precise measurements shows little variation.
- The measurement device determines the degree of precision possible.
- Error is the difference between the measured value and the accepted value. Percent error gives the percent deviation from the accepted value.

$$\text{error} = \text{experimental value} - \text{accepted value}$$

$$\text{percent error} = \frac{|\text{error}|}{\text{accepted value}} \times 100$$

- The number of significant figures reflects the precision of reported data.
- Calculations are often rounded to the correct number of significant figures.

VOCABULARY
- accuracy
- precision
- error
- percent error
- significant figure

SECTION 4 Representing Data

MAIN IDEA Graphs visually depict data, making it easier to see patterns and trends.

- Circle graphs show parts of a whole. Bar graphs show how a factor varies with time, location, or temperature.
- Independent (x-axis) variables and dependent (y-axis) variables can be related in a linear or a nonlinear manner. The slope of a straight line is defined as rise/run, or $\Delta y/\Delta x$.

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

- Because line graph data are considered continuous, you can interpolate between data points or extrapolate beyond them.

VOCABULARY
- graph

CHAPTER 3 Matter—Properties and Changes

BIG IDEA **Everything is made of matter.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Properties of Matter** 1. What characteristics identify a substance? 2. What distinguishes physical properties from chemical properties? 3. How do the properties of the physical states of matter differ? 1 session 0.5 block	UCP.1; A.1; B.2	**Entry-Level Assessment** Focus Transparency 9 **Progress Monitoring** Formative Assessment, pp. 71, 72 Reading Check, pp. 71, 72, 73, 74 Section Review, p. 75
SECTION 2 **Changes in Matter** 1. What is a physical change and what are several common examples? 2. What defines a chemical change? How can you tell that a chemical change has taken place? 3. How does the law of conservation of mass apply to chemical reactions? 1 session 0.5 block	UCP.3; A.2; B.2, B.3, B.6; G.1, G.2, G.3	**Entry-Level Assessment** Focus Transparency 10 **Progress Monitoring** Formative Assessment, pp. 77, 78 Reading Check, p. 77 Section Review, p. 79
SECTION 3 **Mixtures of Matter** 1. How do mixtures and substances differ? 2. Why are some mixtures classified as homogeneous, while others are classified as heterogeneous. 3. What are several techniques used to separate mixtures? 2 sessions 1 block	UCP.1, UCP.3; A.1; B.2	**Entry-Level Assessment** Focus Transparency 11 **Progress Monitoring** Formative Assessment, p. 80 Reading Check, p. 81 Section Review, p. 83
SECTION 4 **Elements and Compounds** 1. What distinguishes elements from compounds? 2. How is the periodic table organized? 3. What are the laws of definite and multiple proportions and why are they important? 2 sessions 1 block	UCP.1, UCP.2; A.1; B.1, B.2; G.1, G.3	**Entry-Level Assessment** Focus Transparency 12 **Progress Monitoring** Formative Assessment, pp. 85, 90 Reading Check, pp. 85, 86, 87, 89 Graph Check, p. 89 Section Review, p. 90 **Summative Assessment** Chapter Assessment, p. 94 ExamView® *Assessment Suite* CD-ROM

CHAPTER 3 STUDY GUIDE

Vocabulary Practice

BIG IDEA Everything is made of matter.

SECTION 1 Properties of Matter

MAIN IDEA Most common substances exist as solids, liquids, and gases, which have diverse physical and chemical properties.

- The three common states of matter are solid, liquid, and gas.
- Physical properties can be observed without altering a substance's composition.
- Chemical properties describe a substance's ability to combine with or change into one or more new substances.
- External conditions can affect both physical and chemical properties.

VOCABULARY

- states of matter
- solid
- liquid
- gas
- vapor
- physical property
- extensive property
- intensive property
- chemical property

SECTION 2 Changes in Matter

MAIN IDEA Matter can undergo physical and chemical changes.

- A physical change alters the physical properties of a substance without changing its composition.
- A chemical change, also known as a chemical reaction, involves a change in a substance's composition.
- In a chemical reaction, reactants form products.
- The law of conservation of mass states that mass is neither created nor destroyed during a chemical reaction; it is conserved.

$$\text{mass}_{\text{reactants}} = \text{mass}_{\text{products}}$$

VOCABULARY

- physical change
- phase change
- chemical change
- law of conservation of mass

SECTION 3 Mixtures of Matter

MAIN IDEA Most everyday matter occurs as mixtures—combinations of two or more substances.

- A mixture is a physical blend of two or more pure substances in any proportion.
- Solutions are homogeneous mixtures.
- Mixtures can be separated by physical means. Common separation techniques include filtration, distillation, crystallization, sublimation, and chromatography.

VOCABULARY

- mixture
- heterogeneous mixture
- homogeneous mixture
- solution
- filtration
- distillation
- crystallization
- sublimation
- chromatography

SECTION 4 Elements and Compounds

MAIN IDEA A compound is a combination of two or more elements.

- Elements cannot be broken down into simpler substances.
- Elements are organized in the periodic table of the elements.
- Compounds are chemical combinations of two or more elements and their properties differ from the properties of their component elements.
- The law of definite proportions states that a compound is always composed of the same elements in the same proportions.

$$\text{percent by mass} = \frac{\text{mass of the element}}{\text{mass of the compound}} \times 100$$

- The law of multiple proportions states that if elements form more than one compound, those compounds will have compositions that are whole-number multiples of each other.

VOCABULARY

- element
- periodic table
- compound
- law of definite proportions
- percent by mass
- law of multiple proportions

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 10 Days
Instructor:

Chemistry - Ch. 3 - Matter - Properties and Changes

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

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-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

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Essential Questions – meant to challenge study to ponder, question and query

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-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Study Guide & Test
-
- Lab - Physical Properties

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 8 Days
Instructor:

Chemistry - Chapter 4 - The Structure of the Atom

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

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Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

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-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

- Study Guide + Exam
-
- Lab - Isotopes of Pennies

CHAPTER 4 The Structure of the Atom

BIG IDEA **Atoms are the fundamental building blocks of matter.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Early Ideas About Matter** 1. What are the similarities and differences of the atomic models of Democritus, Aristotle, and Dalton? 2. How does Dalton's theory explain the conservation of mass? 1 session 0.5 block	UCP.2; A.1; B.1, B.2	**Entry-Level Assessment** Focus Transparency 13 **Progress Monitoring** Formative Assessment, p. 105 Reading Check, pp. 103, 104 Section Review, p. 105
SECTION 2 **Defining the Atom** 1. What is an atom? 2. How can the subatomic particles be distinguished between in terms of relative charge and mass? 3. Where are the locations of the subatomic particles within the structure of an atom? 2 sessions 1 block	UCP.2; B.1, B.2	**Entry-Level Assessment** Focus Transparency 14 **Progress Monitoring** Formative Assessment, pp. 107, 112, 113, 114 Reading Check, pp. 108, 109, 110, 112 Section Review, p. 114
SECTION 3 **How Atoms Differ** 1. How is the atomic number used to determine the identity of an atom? 2. What is an isotope? 3. Why are atomic masses not whole numbers? 4. Given the mass number and atomic number, how are the number of electrons, protons, and neutrons in an atom calculated? 1 session 0.5 block	B.1	**Entry-Level Assessment** Focus Transparency 15 **Progress Monitoring** Formative Assessment, p. 117 Reading Check, p. 120 Section Review, p. 121
SECTION 4 **Unstable Nuclei and Radioactive Decay** 1. What is the relationship between unstable nuclei and radioactive decay? 2. How are alpha, beta, and gamma radiation characterized in terms of mass and charge? 1 session 0.5 block	B.2	**Entry-Level Assessment** Focus Transparency 16 **Progress Monitoring** Formative Assessment, p. 124 Section Review, p. 124 **Summative Assessment** Chapter Assessment, p. 128 ExamView® *Assessment Suite* CD-ROM

CHAPTER 4 STUDY GUIDE

Vocabulary Practice

BIG IDEA Atoms are the fundamental building blocks of matter.

SECTION 1 Early Ideas About Matter

MAIN IDEA The ancient Greeks tried to explain matter, but the scientific study of the atom began with John Dalton in the early 1800s.

- Democritus was the first person to propose the existence of atoms.
- According to Democritus, atoms are solid, homogeneous, and indivisible.
- Aristotle did not believe in the existence of atoms.
- John Dalton's atomic theory is based on numerous scientific experiments.

VOCABULARY
- Dalton's atomic theory

SECTION 2 Defining the Atom

MAIN IDEA An atom is made of a nucleus containing protons and neutrons; electrons move around the nucleus.

- An atom is the smallest particle of an element that maintains the properties of that element.
- Electrons have a 1− charge, protons have a 1+ charge, and neutrons have no charge.
- An atom consists mostly of empty space surrounding the nucleus.

VOCABULARY
- atom
- cathode ray
- electron
- nucleus
- proton
- neutron

SECTION 3 How Atoms Differ

MAIN IDEA The number of protons and the mass number define the type of atom.

- The atomic number of an atom is given by its number of protons. The mass number of an atom is the sum of its neutrons and protons.

$$\text{atomic number} = \text{number of protons} = \text{number of electrons}$$

$$\text{mass number} = \text{atomic number} + \text{number of neutrons}$$

- Atoms of the same element with different numbers of neutrons are called isotopes.
- The atomic mass of an element is a weighted average of the masses of all of its naturally occurring isotopes.

VOCABULARY
- atomic number
- isotope
- mass number
- atomic mass unit (amu)
- atomic mass

SECTION 4 Unstable Nuclei and Radioactive Decay

MAIN IDEA Unstable atoms emit radiation to gain stability.

- Chemical reactions involve changes in the electrons surrounding an atom. Nuclear reactions involve changes in the nucleus of an atom.
- There are three types of radiation: alpha (charge of 2+), beta (charge of 1−), and gamma (no charge).
- The neutron-to-proton ratio of an atom's nucleus determines its stability.

VOCABULARY
- radioactivity
- radiation
- nuclear reaction
- radioactive decay
- alpha radiation
- alpha particle
- nuclear equation
- beta radiation
- beta particle
- gamma ray

CHAPTER 5 Electrons in Atoms

BIG IDEA **The atoms of each element have a unique arrangement of electrons.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 Light and Quantized Energy 1. How do the wave and particle natures of light compare? 2. What is a quantum of energy and how is it related to an energy change of matter? 3. How do continuous electromagnetic spectra and atomic emission spectra compare and contrast? 2 sessions 1 block	UCP.1, UCP.2; A.1, A.2; B.1, B.6; G.1, G.2, G.3	**Entry-Level Assessment** Focus Transparency 17 **Progress Monitoring** Formative Assessment, pp. 141, 145 Reading Check, pp. 139, 141, 142, 144 Section Review, p. 145
SECTION 2 Quantum Theory and the Atom 1. How do the Bohr and quantum mechanical models of the atom compare? 2. What is the impact of de Broglie's wave-particle duality and the Heisenberg uncertainty principle on the current view of electrons in atoms? 3. What are the relationships among a hydrogen atom's energy levels, sublevels, and atomic orbitals? 2 sessions 1 block	UCP.1, UCP.2; A.2; B.1, B.6; G.2, G.3	**Entry-Level Assessment** Focus Transparency 18 **Progress Monitoring** Formative Assessment, pp. 147, 150, 154 Reading Check, pp. 148, 151, 152, 153, 154 Section Review, p. 155
SECTION 3 Electron Configuration 1. How are the Pauli exclusion principle, the aufbau principle, and Hund's rule used to write electron configurations with orbital diagrams and electron configuration notation? 2. What are valence electrons, and how do electron-dot structures represent an atom's valence electrons? 1 session 0.5 block	UCP.1, UCP.2; A.1, A.2; B.1, B.6; E.2; F.6; G.2, G.3	**Entry-Level Assessment** Focus Transparency 19 **Progress Monitoring** Formative Assessment, pp. 157, 159 Reading Check, pp. 157, 159 Section Review, p. 162 **Summative Assessment** Chapter Assessment, p. 166 ExamView® *Assessment Suite* CD-ROM

CHAPTER 5 STUDY GUIDE

Vocabulary Practice

BIG IDEA The atoms of each element have a unique arrangement of electrons.

SECTION 1 Light and Quantized Energy

MAIN IDEA Light, a form of electromagnetic radiation, has characteristics of both a wave and a particle.

- All waves are defined by their wavelengths, frequencies, amplitudes, and speeds.

$$c = \lambda\nu$$

- In a vacuum, all electromagnetic waves travel at the speed of light.
- All electromagnetic waves have both wave and particle properties.
- Matter emits and absorbs energy in quanta.

$$E_{\text{quantum}} = h\nu$$

- White light produces a continuous spectrum. An element's emission spectrum consists of a series of lines of individual colors.

VOCABULARY

- electromagnetic radiation
- wavelength
- frequency
- amplitude
- electromagnetic spectrum
- quantum
- Planck's constant
- photoelectric effect
- photon
- atomic emission spectrum

SECTION 2 Quantum Theory and the Atom

MAIN IDEA Wavelike properties of electrons help relate atomic emission spectra, energy states of atoms, and atomic orbitals.

- Bohr's atomic model attributes hydrogen's emission spectrum to electrons dropping from higher-energy to lower-energy orbits.

$$\Delta E = E_{\text{higher-energy orbit}} - E_{\text{lower-energy orbit}} = E_{\text{photon}} = h\nu$$

- The de Broglie equation relates a particle's wavelength to its mass, its velocity, and Planck's constant.

$$\lambda = h / m\nu$$

- The quantum mechanical model assumes that electrons have wave properties.
- Electrons occupy three-dimensional regions of space called atomic orbitals.

VOCABULARY

- ground state
- quantum number
- de Broglie equation
- Heisenberg uncertainty principle
- quantum mechanical model of the atom
- atomic orbital
- principal quantum number
- principal energy level
- energy sublevel

SECTION 3 Electron Configuration

MAIN IDEA A set of three rules can be used to determine electron arrangement in an atom.

- The arrangement of electrons in an atom is called the atom's electron configuration.
- Electron configurations are defined by the aufbau principle, the Pauli exclusion principle, and Hund's rule.
- An element's valence electrons determine the chemical properties of the element.
- Electron configurations can be represented using orbital diagrams, electron configuration notation, and electron-dot structures.

VOCABULARY

- electron configuration
- aufbau principle
- Pauli exclusion principle
- Hund's rule
- valence electron
- electron-dot structure

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 7 Days
Instructor:

Chemistry - Ch. 5 - Electrons in Atoms

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

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-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

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-

Essential Questions – meant to challenge study to ponder, question and query

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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 5 Days
Instructor:

Chemistry - Ch. 6

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

-
-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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-
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CHAPTER 6 The Periodic Table and Periodic Law

BIG IDEA **Periodic trends in the properties of atoms allow us to predict physical and chemical properties.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Development of the Modern Periodic Table** 1. How was the periodic table developed? 2. What are the key features of the periodic table? 1 session 0.5 block	UCP.1, UCP2, UCP.5; A.1, A.2; B.1, B.2; E.2; G.1, G.2, G.3	**Entry-Level Assessment** Focus Transparency 20 **Progress Monitoring** Formative Assessment, pp. 177, 179 Reading Check, pp. 176, 177 Section Review, p. 181
SECTION 2 **Classification of the Elements** 1. Why do elements in the same group have similar properties? 2. Based on their electron configurations, what are the four blocks of the periodic table? 1 session 0.5 block	UCP.1, UCP.2, UCP.5; A.1; B.1, B.2	**Entry-Level Assessment** Focus Transparency 21 **Progress Monitoring** Formative Assessment, pp. 183, 185 Reading Check, p. 185 Section Review, p. 186
SECTION 3 **Periodic Trends** 1. What are the period and group trends of different properties? 2. How are period and group trends in atomic radii related to electron configuration? 2 sessions 1 block	UCP.1, UCP.2, UCP.5; A.1, A.2; B.1, B.2, B.6; E.1, E.2; G.2, G.3	**Entry-Level Assessment** Focus Transparency 22 **Progress Monitoring** Formative Assessment, pp. 188, 190, 191 Reading Check, pp. 188, 191, 192 Graph Check, p. 191 Section Review, p. 194 **Summative Assessment** Chapter Assessment, p. 198 ExamView® *Assessment Suite* CD-ROM

CHAPTER 6 STUDY GUIDE

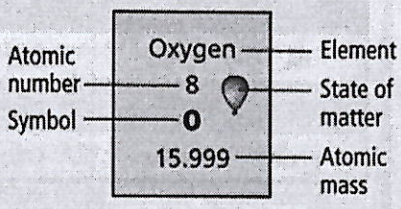
Vocabulary Practice

BIG IDEA Periodic trends in the properties of atoms allow us to predict physical and chemical properties.

SECTION 1 Development of the Modern Periodic Table

MAIN IDEA The periodic table evolved over time as scientists discovered more useful ways to compare and organize the elements.

- The elements were first organized by increasing atomic mass, which led to inconsistencies. Later, they were organized by increasing atomic number.
- The periodic law states that when the elements are arranged by increasing atomic number, there is a periodic repetition of their chemical and physical properties.
- The periodic table organizes the elements into periods (rows) and groups or families (columns); elements with similar properties are in the same group.
- Elements are classified as either metals, nonmetals, or metalloids.



VOCABULARY
- periodic law
- group
- period
- representative element
- transition element
- metal
- alkali metal
- alkaline earth metal
- transition metal
- inner transition metal
- lanthanide series
- actinide series
- nonmetal
- halogen
- noble gas
- metalloid

SECTION 2 Classification of the Elements

MAIN IDEA Elements are organized into different blocks in the periodic table according to their electron configurations.

- The periodic table has four blocks (s, p, d, f).
- Elements within a group have similar chemical properties.
- The group number for elements in groups 1 and 2 equals the element's number of valence electrons.
- The energy level of an atom's valence electrons equals its period number.

SECTION 3 Periodic Trends

MAIN IDEA Trends among elements in the periodic table include their sizes and their abilities to lose or attract electrons.

- Atomic and ionic radii decrease from left to right across a period, and increase as you move down a group.
- Ionization energies generally increase from left to right across a period, and decrease as you move down a group.
- The octet rule states that atoms gain, lose, or share electrons to acquire a full set of eight valence electrons.
- Electronegativity generally increases from left to right across a period, and decreases as you move down a group.

VOCABULARY
- ion
- ionization energy
- octet rule
- electronegativity

CHAPTER 7 Ionic Compounds and Metals

BIG IDEA **Atoms in ionic compounds are held together by chemical bonds formed by the attraction of oppositely charged ions.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Ion Formation** 1. What holds atoms together in a chemical bond? 2. How do positive and negative ions form? 3. How does ion formation relate to electron configuration? 1 session 0.5 block	UCP.1, UCP.2; A.1; B.1, B.2	**Entry-Level Assessment** Focus Transparency 23 **Progress Monitoring** Formative Assessment, pp. 208, 209 Reading Check, p. 207 Section Review, p. 209
SECTION 2 **Ionic Bonds and Ionic Compounds** 1. How do ionic bonds form and how are the ions arranged in an ionic compound? 2. What can you conclude about the strength of ionic bonds based on the physical properties of ionic compounds? 3. Is ionic bond formation exothermic or endothermic? 1 session 0.5 block	UCP.1, UCP.2; B.1, B.2, B.3, B.4, B.6	**Entry-Level Assessment** Focus Transparency 24 **Progress Monitoring** Formative Assessment, pp. 215, 217 Reading Check, pp. 213, 214 Section Review, p. 217
SECTION 3 **Names and Formulas for Ionic Compounds** 1. What is a formula unit and how does it relate to an ionic compound's composition? 2. How do you write the formulas for compounds formed from different ions and oxyanions? 3. What are the naming conventions for ionic compounds and oxyanions? 2 sessions 1 block	UCP.1, UCP.2; B.2; E.2; G.2	**Entry-Level Assessment** Focus Transparency 25 **Progress Monitoring** Formative Assessment, pp. 220, 222, 223, 224 Reading Check, p. 219 Section Review, p. 224
SECTION 4 **Metallic Bonds and the Properties of Metals** 1. What are the characteristics of a metallic bond? 2. How does the electron sea model account for the physical properties of metals? 3. What are alloys, and how can they be categorized? 2 sessions 1 block	UCP.1, UCP.2; A.1; B.1, B.2, B.3, B.4, B.6; E.1	**Entry-Level Assessment** Focus Transparency 26 **Progress Monitoring** Formative Assessment, p. 228 Reading Check, p. 226 Section Review, p. 228 **Summative Assessment** Chapter Assessment, p. 232 ExamView® *Assessment Suite* CD-ROM

CHAPTER 7 STUDY GUIDE

Vocabulary Practice

BIG IDEA Ionic compounds are held together by chemical bonds formed by the attraction of oppositely charged ions.

SECTION 1 Ion Formation

MAIN IDEA Ions form when atoms gain or lose valence electrons to achieve a stable octet electron configuration.

- A chemical bond is the force that holds two atoms together.
- Some atoms form ions to gain stability. This stable configuration involves a complete outer energy level, usually consisting of eight valence electrons.
- Ions are formed by the loss or gain of valence electrons.
- The number of protons remains unchanged during ion formation.

VOCABULARY
- chemical bond
- cation
- anion

SECTION 2 Ionic Bonds and Ionic Compounds

MAIN IDEA Oppositely charged ions attract each other, forming electrically neutral ionic compounds.

- Ionic compounds contain ionic bonds formed by the attraction of oppositely charged ions.
- Ions in an ionic compound are arranged in a repeating pattern known as a crystal lattice.
- Ionic compound properties are related to ionic bond strength.
- Ionic compounds are electrolytes; they conduct an electric current in the liquid phase and in aqueous solution.
- Lattice energy is the energy needed to remove 1 mol of ions from its lattice.

VOCABULARY
- ionic bond
- ionic compound
- crystal lattice
- electrolyte
- lattice energy

SECTION 3 Names and Formulas for Ionic Compounds

MAIN IDEA In written names and formulas for ionic compounds, the cation appears first, followed by the anion.

- A formula unit gives the ratio of cations to anions in the ionic compound.
- A monatomic ion is formed from one atom. The charge of a monatomic ion is equal to its oxidation number.
- Roman numerals indicate the oxidation number of cations having multiple possible oxidation states.
- Polyatomic ions consist of more than one atom and act as a single unit.
- To indicate more than one polyatomic ion in a chemical formula, place parentheses around the polyatomic ion and use a subscript.

VOCABULARY
- formula unit
- monatomic ion
- polyatomic ion
- oxyanion

SECTION 4 Metallic Bonds and the Properties of Metals

MAIN IDEA Metals form crystal lattices and can be modeled as cations surrounded by a "sea" of freely moving valence electrons.

- A metallic bond forms when metal cations attract freely moving, delocalized valence electrons.
- In the electron sea model, electrons move through the metallic crystal and are not held by any particular atom.
- The electron sea model explains the physical properties of metallic solids.
- Metal alloys are formed when a metal is mixed with one or more other elements.

VOCABULARY
- electron sea model
- delocalized electron
- metallic bond
- alloy

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – __8__ Days
Instructor:

Chemistry- Ch. 7

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

-
-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 9 Days
Instructor:

Chemistry - Ch. 8

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

-
-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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CHAPTER 8 Covalent Bonding

BIG IDEA **Covalent bonds form when atoms share electrons.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **The Covalent Bond** 1. How does the octet rule apply to atoms that form covalent bonds? 2. Why do atoms form single, double, and triple covalent bonds? 3. What are sigma and pi bonds and how do they contrast? 4. How are the strength of a covalent bond, its bond length, and its bond dissociation energy related? 2 sessions 1 block	UCP.2, UCP.3, UCP.5; A.1; B.1, B.2, B.3, B.4, B.6	**Entry-Level Assessment** Focus Transparency 27 **Progress Monitoring** Formative Assessment, p. 245 Reading Check, pp. 243, 244, 246 Section Review, p. 247
SECTION 2 **Naming Molecules** 1. What rules do you follow to name a binary molecular compound from its molecular formula? 2. How are acidic solutions named? 1 session 0.5 block	UCP.2, UCP.3, UCP.5; B.2; G.2	**Entry-Level Assessment** Focus Transparency 28 **Progress Monitoring** Formative Assessment, pp. 249, 250, 251 Reading Check, p. 249 Section Review, p. 252
SECTION 3 **Molecular Structures** 1. What are the basic steps used to draw Lewis structures? 2. Why does resonance occur and what are some resonance structures? 3. Which molecules are exceptions to the octet rule, and why do these exceptions occur? 2 sessions 1 block	UCP.2, UCP.3, UCP.5; B.2	**Entry-Level Assessment** Focus Transparency 29 **Progress Monitoring** Formative Assessment, pp. 257, 258 Reading Check, p. 259 Section Review, p. 260
SECTION 4 **Molecular Shapes** 1. What is the VSEPR bonding theory? 2. How can you use the VSEPR model to predict the shape of, and the bond angles in, a molecule? 3. What is hybridization? 1 session 0.5 block	UCP.2, UCP.3, UCP.5; A.1; B.2, B.4	**Entry-Level Assessment** Focus Transparency 30 **Progress Monitoring** Formative Assessment, p. 263 Reading Check, p. 262 Section Review, p. 264
SECTION 5 **Electronegativity and Polarity** 1. How is electronegativity used to determine bond type? 2. How do polar and nonpolar covalent bonds and polar and nonpolar molecules compare? How do they contrast? 3. What are the characteristics of covalently bonded compounds? 1 session 0.5 block	UCP.2, UCP.3, UCP.5; A.1, A.2; B.1, B.2, B.4, B.6; E.2; G.3	**Entry-Level Assessment** Focus Transparency 31 **Progress Monitoring** Formative Assessment, pp. 267, 270 Reading Check, pp. 266, 267 Graph Check, p. 266 Section Review, p. 270 **Summative Assessment** Chapter Assessment, p. 274 Exam*View*® *Assessment Suite* CD-ROM

CHAPTER 8 STUDY GUIDE

Vocabulary Practice

BIG IDEA Covalent bonds form when atoms share electrons.

SECTION 1 The Covalent Bond

MAIN IDEA Atoms gain stability when they share electrons and form covalent bonds.

- Covalent bonds form when atoms share one or more pairs of electrons.
- Sharing one pair, two pairs, and three pairs of electrons forms single, double, and triple covalent bonds, respectively.
- Orbitals overlap directly in sigma bonds. Parallel orbitals overlap in pi bonds. A single covalent bond is a sigma bond but multiple covalent bonds are made of both sigma and pi bonds.
- Bond length is measured nucleus-to-nucleus. Bond dissociation energy is needed to break a covalent bond.

VOCABULARY

- covalent bond
- molecule
- Lewis structure
- sigma bond
- pi bond
- endothermic reaction
- exothermic reaction

SECTION 2 Naming Molecules

MAIN IDEA Specific rules are used when naming binary molecular compounds, binary acids, and oxyacids.

- Names of covalent molecular compounds include prefixes for the number of each atom present. The final letter of the prefix is dropped if the element name begins with a vowel.
- Molecules that produce H^+ in solution are acids. Binary acids contain hydrogen and one other element. Oxyacids contain hydrogen and an oxyanion.

VOCABULARY

- oxyacid

SECTION 3 Molecular Structures

MAIN IDEA Structural formulas show the relative positions of atoms within a molecule.

- Different models can be used to represent molecules.
- Resonance occurs when more than one valid Lewis structure exists for the same molecule.
- Exceptions to the octet rule occur in some molecules.

VOCABULARY

- structural formula
- resonance
- coordinate covalent bond

SECTION 4 Molecular Shapes

MAIN IDEA The VSEPR model is used to determine molecular shape.

- VSEPR model theory states that electron pairs repel each other and determine both the shape of and bond angles in a molecule.
- Hybridization explains the observed shapes of molecules by the presence of equivalent hybrid orbitals.

VOCABULARY

- VSEPR model
- hybridization

SECTION 5 Electronegativity and Polarity

MAIN IDEA A chemical bond's character is related to each atom's attraction for the electrons in the bond.

- The electronegativity difference determines the character of a bond between atoms.
- Polar bonds occur when electrons are not shared equally forming a dipole.
- The spatial arrangement of polar bonds in a molecule determines the overall polarity of a molecule.
- Molecules attract each other by weak intermolecular forces. In a covalent network solid, each atom is covalently bonded to many other atoms.

VOCABULARY

- polar covalent bond

CHAPTER 9 Chemical Reactions

BIG IDEA **Millions of chemical reactions in and around you transform reactants into products, resulting in the absorption or release of energy.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Reactions and Equations** 1. What is evidence of chemical change? 2. How are chemical reactions represented? 3. Why do chemical equations need to be balanced and how is this accomplished? 1 session 0.5 block	UCP.3, UCP.5; A.1; B.2, B.3, B.6	**Entry-Level Assessment** Focus Transparency 32 **Progress Monitoring** Formative Assessment, pp. 285, 287, 288 Section Review, p. 288
SECTION 2 **Classifying Chemical Reactions** 1. How are chemical reactions classified? 2. What are the characteristics of different classes of chemical reactions? 2 sessions 1 block	UCP.3, UCP.5; A.1; B.2, B.3	**Entry-Level Assessment** Focus Transparency 33 **Progress Monitoring** Formative Assessment, p. 294 Reading Check, pp. 294, 297 Section Review, p. 298
SECTION 3 **Reactions in Aqueous Solutions** 1. What are aqueous solutions? 2. How are complete ionic and net ionic equations written for chemical reactions in aqueous solutions? 3. How can you predict whether reactions in aqueous solutions will produce a precipitate, water, or a gas? 2 sessions 1 block	UCP.3, UCP.5; A.1, A.2; B.2, B.3, B.6	**Entry-Level Assessment** Focus Transparency 34 **Progress Monitoring** Formative Assessment, p. 307 Reading Check, pp. 301, 303, 307 Section Review, p. 308 **Summative Assessment** Chapter Assessment, p. 312 Exam*View*® *Assessment Suite* CD-ROM

CHAPTER 9 STUDY GUIDE

Vocabulary Practice

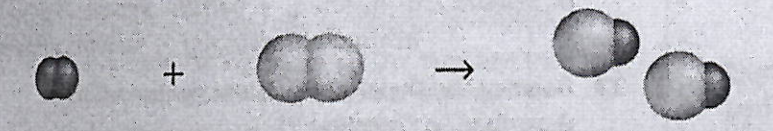
BIGIDEA Millions of chemical reactions in and around you transform reactants into products, resulting in the absorption or release of energy.

SECTION 1 Reactions and Equations

MAINIDEA Chemical reactions are represented by balanced chemical equations.

- Some physical changes are evidence that indicate a chemical reaction has occurred.
- Word equations and skeleton equations provide important information about a chemical reaction.
- A chemical equation gives the identities and relative amounts of the reactants and products that are involved in a chemical reaction.
- Balancing an equation involves adjusting the coefficients until the number of atoms of each element is equal on both sides of the equation.

H_2 (2 atoms H) + Cl_2 (2 atoms Cl) $\rightarrow$ 2HCl (2 atoms H + 2 atoms Cl)



Two hydrogen atoms + Two chlorine atoms $\rightarrow$ Two hydrogen atoms Two chlorine atoms

VOCABULARY
- chemical reaction
- reactant
- product
- chemical equation
- coefficient

SECTION 2 Classifying Chemical Reactions

MAINIDEA There are four types of chemical reactions: synthesis, combustion, decomposition, and replacement reactions.

- Classifying chemical reactions makes them easier to understand, remember, and recognize.
- Activity series of metals and halogens can be used to predict if single-replacement reactions will occur.

VOCABULARY
- synthesis reaction
- combustion reaction
- decomposition reaction
- single-replacement reaction
- double-replacement reaction
- precipitate

SECTION 3 Reactions in Aqueous Solutions

MAINIDEA Double-replacement reactions occur between substances in aqueous solutions and produce precipitates, water, or gases.

- In aqueous solutions, the solvent is always water. There are many possible solutes.
- Many molecular compounds form ions when they dissolve in water. When some ionic compounds dissolve in water, their ions separate.
- When two aqueous solutions that contain ions as solutes are combined, the ions might react with one another. The solvent molecules do not usually react.
- Reactions that occur in aqueous solutions are double-replacement reactions.

VOCABULARY
- aqueous solution
- solute
- solvent
- complete ionic equation
- spectator ion
- net ionic equation

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 7 Days
Instructor:

Chemistry - Ch. 9

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

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-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

-
-
-

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – 9 Days
Instructor:

Chemistry - Ch. 10

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

-
-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

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Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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CHAPTER 10 The Mole

BIDEA The mole represents a large number of extremely small particles.

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Measuring Matter** 1. How is a mole used to indirectly count the number of particles of matter? 2. What is a common everyday counting unit to which the mole can be related? 3. How can moles be converted to number of representative particles and vice versa? 1 session 0.5 block	UCP.1; A.1; B.2; E.2; G.2, G.3	**Entry-Level Assessment** Focus Transparency 35 **Progress Monitoring** Formative Assessment, pp. 321, 324 Reading Check, p. 323 Section Review, p. 324
SECTION 2 **Mass and the Mole** 1. Why can the mass of an atom be related to the mass of a mole of atoms? 2. How can the number of moles be converted to the mass of an element and vice versa? 3. How can the number of moles be converted to the number of atoms of an element and vice versa? 2 sessions 1 block	UCP.1; B.1, B.2; E.2	**Entry-Level Assessment** Focus Transparency 36 **Progress Monitoring** Formative Assessment, pp. 327, 329, 331 Reading Check, p. 327 Section Review, p. 332
SECTION 3 **Moles of Compounds** 1. What are the mole relationships shown by a chemical formula? 2. How is the molar mass of a compound calculated? 3. How can the number of moles be converted to the mass of a compound and vice versa? 4. What conversion factors are applied to determine the number of atoms or ions in a known mass of a compound? 2 sessions 1 block	UCP.1; B.2; E.2	**Entry-Level Assessment** Focus Transparency 37 **Progress Monitoring** Formative Assessment, pp. 335, 336, 337, 339 Section Review, p. 340
SECTION 4 **Empirical and Molecular Formulas** 1. What is meant by the percent composition of a compound? 2. How can the empirical and molecular formulas for a compound be determined from mass percent and actual mass data? 2 sessions 1 block	UCP.1; A.1, A.2; B.2; E.2; G.1	**Entry-Level Assessment** Focus Transparency 38 **Progress Monitoring** Formative Assessment, pp. 341, 345, 348, 350 Reading Check, p. 344 Section Review, p. 350
SECTION 5 **Formulas of Hydrates** 1. What is a hydrate and how does its name relate to its composition? 2. How is the formula of a hydrate determined from laboratory data? 1 session 0.5 block	UCP.1; A.1, A.2; B.2, B.3, B.6; E.1, E.2; F.5, F.6	**Entry-Level Assessment** Focus Transparency 39 **Progress Monitoring** Formative Assessment, p. 354 Reading Check, p. 352 Section Review, p. 354 **Summative Assessment** Chapter Assessment, p. 358 ExamView® Assessment Suite CD-ROM

CHAPTER 10 STUDY GUIDE

Vocabulary Practice

BIG IDEA The mole represents a large number of extremely small particles.

SECTION 1 Measuring Matter

VOCABULARY
- mole
- Avogadro's number

MAIN IDEA Chemists use the mole to count atoms, molecules, ions, and formula units.

- The mole is a unit used to count particles of matter indirectly. One mole of a pure substance contains Avogadro's number of representative particles.
- Representative particles include atoms, ions, molecules, formula units, electrons, and other similar particles.
- One mole of carbon-12 atoms has a mass of exactly 12 g.
- Conversion factors written from Avogadro's relationship can be used to convert between moles and number of representative particles.

SECTION 2 Mass and the Mole

VOCABULARY
- molar mass

MAIN IDEA A mole always contains the same number of particles; however, moles of different substances have different masses.

- The mass in grams of 1 mol of any pure substance is called its molar mass.
- The molar mass of an element is numerically equal to its atomic mass.
- The molar mass of any substance is the mass in grams of Avogadro's number of representative particles of the substance.
- Molar mass is used to convert from moles to mass. The inverse of molar mass is used to convert from mass to moles.

SECTION 3 Moles of Compounds

MAIN IDEA The molar mass of a compound can be calculated from its chemical formula and can be used to convert from mass to moles of that compound.

- Subscripts in a chemical formula indicate how many moles of each element are present in 1 mol of the compound.
- The molar mass of a compound is calculated from the molar masses of all of the elements in the compound.
- Conversion factors based on a compound's molar mass are used to convert between moles and mass of a compound.

SECTION 4 Empirical and Molecular Formulas

VOCABULARY
- percent composition
- empirical formula
- molecular formula

MAIN IDEA A molecular formula of a compound is a whole-number multiple of its empirical formula.

- The percent by mass of an element in a compound gives the percentage of the compound's total mass due to that element.
- The subscripts in an empirical formula give the smallest whole-number ratio of moles of elements in the compound.
- The molecular formula gives the actual number of atoms of each element in a molecule or formula unit of a substance.
- The molecular formula is a whole-number multiple of the empirical formula.

SECTION 5 Formulas of Hydrates

VOCABULARY
- hydrate

MAIN IDEA Hydrates are solid ionic compounds in which water molecules are trapped.

- The formula of a hydrate consists of the formula of the ionic compound and the number of water molecules associated with one formula unit.
- The name of a hydrate consists of the compound name and the word *hydrate* with a prefix indicating the number of water molecules in 1 mol of the compound.
- Anhydrous compounds are formed when hydrates are heated.

CHAPTER 11 Stoichiometry

BIG IDEA **Mass relationships in chemical reactions confirm the law of conservation of mass.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Defining Stoichiometry** **1.** Which relationships can be derived from a balanced chemical equation? **2.** How are mole ratios written from a balanced chemical equation? 1 session 0.5 block	UCP.1, UCP.3; A.1; B.3; E.1	**Entry-Level Assessment** Focus Transparency 40 **Progress Monitoring** Formative Assessment, p. 371 Reading Check, pp. 369, 371 Section Review, p. 372
SECTION 2 **Stoichiometric Calculations** **1.** What is the sequence of steps used in solving stoichiometric problems? **2.** How are these steps applied to solve stoichiometric problems? 2 sessions 1 block	UCP.1, UCP.3; A.1; B.3; E.1	**Entry-Level Assessment** Focus Transparency 41 **Progress Monitoring** Formative Assessment, p. 374 Section Review, p. 378
SECTION 3 **Limiting Reactants** **1.** In a chemical reaction, which reactant is the limiting reactant? **2.** How much of the excess reactant remains after the reaction is complete? **3.** How do you calculate the mass of a product when the amounts of more than one reactant are given? 1 session 0.5 block	UCP.1, UCP.3; B.3; E.1, E.2; F.1	**Entry-Level Assessment** Focus Transparency 42 **Progress Monitoring** Formative Assessment, pp. 381, 383, 384 Reading Check, p. 380 Section Review, p. 384
SECTION 4 **Percent Yield** **1.** What is the theoretical yield of a chemical reaction? **2.** How do you calculate the percent yield for a chemical reaction? 1 session 0.5 block	UCP.1, UCP.3; A.1, A.2; B.3, B.6; E.1, E.2; F.4, F.5, F.6; G.1	**Entry-Level Assessment** Focus Transparency 43 **Progress Monitoring** Formative Assessment, p. 388 Section Review, p. 388 **Summative Assessment** Chapter Assessment, p. 392 ExamView® *Assessment Suite* CD-ROM

CHAPTER 11 STUDY GUIDE

Vocabulary Practice

BIG IDEA Mass relationships in chemical reactions confirm the law of conservation of mass.

SECTION 1 Defining Stoichiometry

MAIN IDEA The amount of each reactant present at the start of a chemical reaction determines how much product can form.

- Balanced chemical equations can be interpreted in terms of moles, mass, and representative particles (atoms, molecules, formula units).
- The law of conservation of mass applies to all chemical reactions.
- Mole ratios are derived from the coefficients of a balanced chemical equation. Each mole ratio relates the number of moles of one reactant or product to the number of moles of another reactant or product in the chemical reaction.

VOCABULARY
- stoichiometry
- mole ratio

SECTION 2 Stoichiometric Calculations

MAIN IDEA The solution to every stoichiometric problem requires a balanced chemical equation.

- Chemists use stoichiometric calculations to predict the amounts of reactants used and products formed in specific reactions.
- The first step in solving stoichiometric problems is writing the balanced chemical equation.
- Mole ratios derived from the balanced chemical equation are used in stoichiometric calculations.
- Stoichiometric problems make use of mole ratios to convert between mass and moles.

SECTION 3 Limiting Reactants

MAIN IDEA A chemical reaction stops when one of the reactants is used up.

- The limiting reactant is the reactant that is completely consumed during a chemical reaction. Reactants that remain after the reaction stops are called excess reactants.
- To determine the limiting reactant, the actual mole ratio of the available reactants must be compared with the ratio of the reactants obtained from the coefficients in the balanced chemical equation.
- Stoichiometric calculations must be based on the limiting reactant.

VOCABULARY
- limiting reactant
- excess reactant

SECTION 4 Percent Yield

MAIN IDEA Percent yield is a measure of the efficiency of a chemical reaction.

- The theoretical yield of a chemical reaction is the maximum amount of product that can be produced from a given amount of reactant. Theoretical yield is calculated from the balanced chemical equation.
- The actual yield is the amount of product produced. Actual yield must be obtained through experimentation.
- Percent yield is the ratio of actual yield to theoretical yield expressed as a percent. High percent yield is important in reducing the cost of every product produced through chemical processes.

VOCABULARY
- theoretical yield
- actual yield
- percent yield

$$\text{Percent yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – __7__ Days
Instructor:

Chemistry - Ch. 11

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

-
-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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-
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Best Instructional Practice(s): *Describe what you believe are the best instructional approaches you would employ in order to help students obtain proficiency on the standards identified in the unit. Develop this descriptor so that a student could understand the process. This can be a narrative.*

CKSD Curriculum
Unit Template
Course/Subject/Grade Level?
Suggested Length of Unit – __8__ Days
Instructor:

Chemistry - Ch. 12

Unit title and short description

-

Major Academic Standards Addressed

Concepts – Content ——**What students should know**

-
-

Objectives – also called competencies in the SAS
What students should be able to do as a result of the instruction

-
-

Essential Questions – meant to challenge study to ponder, question and query

-
-

Assessments- Assessments should be directly related to the objectives identified for students in this unit.

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CHAPTER 12 States of Matter

BIG IDEA **Kinetic-molecular theory explains the different properties of solids, liquids, and gases.**

ESSENTIAL QUESTIONS	NATIONAL STANDARDS	RESOURCES TO ASSESS MASTERY
SECTION 1 **Gases** 1. How is the kinetic-molecular theory used to explain the behavior of gases? 2. Why does mass affect the rates of diffusion and effusion? 3. How is gas pressure measured and how is the partial pressure of a gas calculated? 2 sessions 1 block	UCP.1, UCP.2, UCP.3; A.1; B.2, B.4, B.5, B.6; E.2; G.3	**Entry-Level Assessment** Focus Transparency 44 **Progress Monitoring** Formative Assessment, pp. 405, 407, 409 Reading Check, p. 405 Section Review, p. 410
SECTION 2 **Forces of Attraction** 1. What are intramolecular forces? 2. How do intermolecular forces compare? How do they contrast? 1 session 0.5 block	UCP.1, UCP.2, UCP.3; B.2, B.4	**Entry-Level Assessment** Focus Transparency 45 **Progress Monitoring** Formative Assessment, pp. 412, 413 Reading Check, pp. 412, 413 Section Review, p. 414
SECTION 3 **Liquids and Solids** 1. How do the arrangements of particles in liquids and solids differ? 2. What are the factors that affect viscosity? 3. How are the unit cell and crystal lattice related? 2 sessions 1 block	UCP.1, UCP.2, UCP.3; A.1; B.2, B.4, B.5; G.1, G.3	**Entry-Level Assessment** Focus Transparency 46 **Progress Monitoring** Formative Assessment, pp. 419, 421, 422, 424 Reading Check, pp. 418, 420, 422 Section Review, p. 424
SECTION 4 **Phase Changes** 1. How can the addition and removal of energy cause a phase change? 2. What is a phase diagram? 1 session 0.5 block	UCP.1, UCP.2, UCP.3; A.1; B.2, B.4, B.5, B.6; E.2	**Entry-Level Assessment** Focus Transparency 47 **Progress Monitoring** Formative Assessment, pp. 427, 429 Reading Check, p. 428 Graph Check, pp. 426, 429, 430 Section Review, p. 430 **Summative Assessment** Chapter Assessment, p. 434 ExamView® *Assessment Suite* CD-ROM

CHAPTER 12 STUDY GUIDE

Vocabulary Pra

BIG IDEA Kinetic-molecular theory explains the different properties of solids, liquids, and gases.

SECTION 1 Gases

MAIN IDEA Gases expand, diffuse, exert pressure, and can be compressed because they are in a low-density state consisting of tiny, constantly-moving particles.

- The kinetic-molecular theory explains the properties of gases in terms of the size, motion, and energy of their particles.
- Dalton's law of partial pressures is used to determine the pressures of individual gases in gas mixtures.
- Graham's law is used to compare the diffusion rates of two gases.

$$\frac{\text{Rate}_A}{\text{Rate}_B} = \sqrt{\frac{\text{molar mass}_B}{\text{molar mass}_A}}$$

VOCABULARY
- kinetic-molecular theory
- elastic collision
- temperature
- diffusion
- Graham's law of effusion
- pressure
- barometer
- pascal
- atmosphere
- Dalton's law of partial pressures

SECTION 2 Forces of Attraction

MAIN IDEA Intermolecular forces—including dispersion forces, dipole-dipole forces, and hydrogen bonds—determine a substance's state at a given temperature.

- Intramolecular forces are stronger than intermolecular forces.
- Dispersion forces are intermolecular forces between temporary dipoles.
- Dipole-dipole forces occur between polar molecules.

VOCABULARY
- dispersion force
- dipole-dipole force
- hydrogen bond

SECTION 3 Liquids and Solids

MAIN IDEA The particles in solids and liquids have a limited range of motion and are not easily compressed.

- The kinetic-molecular theory explains the behavior of solids and liquids.
- Intermolecular forces in liquids affect viscosity, surface tension, cohesion, and adhesion.
- Crystalline solids can be classified by their shape and composition.

VOCABULARY
- viscosity
- surface tension
- surfactant
- crystalline solid
- unit cell
- allotrope
- amorphous solid

SECTION 4 Phase Changes

MAIN IDEA Matter changes phase when energy is added or removed.

- States of a substance are referred to as phases when they coexist as physically distinct parts of a mixture.
- Energy changes occur during phase changes.
- Phase diagrams show how different temperatures and pressures affect the phase of a substance.

VOCABULARY
- melting point
- vaporization
- evaporation
- vapor pressure
- boiling point
- freezing point
- condensation
- deposition
- phase diagram
- triple point