Content Area: Science

Course Title: Chemistry

Grade Level: 10-12

Unit Plan 1	**Quantitative and Structural Aspects of Matter**
Unit Plan 2	**The Language of Chemistry, Chemical Quantities, and Stoichiometry**
Unit Plan 3	**Chemical Periodicity and Bonding**
Unit Plan 4	**States of Matter**
Unit Plan 5	**Aqueous Solutions**
Unit Plan 6	**Thermochemistry and Equilibrium Systems (honors level)**

Date Created:
2/14/11

Board Approved on:

Unit Overview

Content Area: Chemistry Unit 1

Unit Title: Quantitative and Structural Aspects of Matter

Target Course/Grade Level: 10-12

Unit Summary

This unit is designed to give students a clear understanding of how scientific thought and quantitative skills are applied to the classification of matter.

Primary interdisciplinary connections:

Infused within the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

21st century themes:

The unit will integrate the 21st Century Life and Career strand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections:

For further clarification refer to NJ Class Standard Introductions at www.njcccs.org.

Learning Targets

Content Standards

This unit will assimilate the four strands of the Science Practices Standard 5.1. These include: understanding scientific explanations, generating scientific evidence through active investigations, reflecting on scientific knowledge and participating productively in science.

CPI #	Cumulative Progress Indicator (CPI)
5.1A-D	**Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.2.12.A.1	Use atomic models to predict the behaviors of atoms in interactions.
5.2.12.A.2	Account for the differences in the physical properties of solids, liquids, and gases.
5.2.12.A.4	Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes.
5.2.12.D.3	Describe the products and potential applications of fission and fusion reactions.

Unit Essential Questions

- **How is chemistry a quantitative and qualitative study of matter?**
- **Why do we study the atom?**

Unit Enduring Understandings

Students will understand that…

- **Chemistry is the study of the composition of matter and the changes it undergoes.**

• **How has the model for the structure of the atom evolved?**	• **Chemistry is the study of substances in our world and the changes they undergo.** • **Chemistry impacts our daily lives.**
Unit Objectives *Students will know…* • **Vocabulary and key terms** • **Procedures at the core of scientific methodology** • **Laboratory Safety procedures** • **Essential laboratory equipment** • **The difference between qualitative and quantitative measurements** • **How to convert measurements to scientific notation** • **Error analysis** • **How to use dimensional analysis to convert between units** • **How to classify matter** • **How to distinguish between chemical and physical properties** • **How to distinguish between chemical and physical changes** • **How to use chemical symbols** • **The historical development of the atom** • **Atomic Structure**	**Unit Objectives** *Students will be able to…* • **Use the metric system** • **Use dimensional analysis to convert within the metric system** • **Make temperature conversions** • **Recognize that density is a physical property and solve density problems** • **Solve problems in scientific notation** • **Distinguish between accuracy and precision** • **Calculate percent error** • **Use analytical equipment** • **Practice safe lab habits** • **Define the nature of chemistry, matter, and energy** • **Classify matter** • **Use chemical symbols** • **Use the symbols of the elements** • **Recognize changes in matter** • **Describe an atom and its structure** • **Trace the historical development of the atomic model (Dalton, Thomson, Rutherford, and Bohr)** • **Know the significance of isotopes**

Formative Assessments

- Observation
- Homework
- Class participation
- Writing Assignments
- Do Now
- Concept map
- Lab reports
- Notebook

Summative Assessments

- Chapter/Unit Test
- Presentations/Projects
- Laboratory Practicals
- Quarterly Exams

Modifications (ELLs, Special Education, Gifted and Talented)

- Teacher tutoring
- Peer tutoring
- Cooperative Learning Groups
- Differentiated Instruction
- Follow all IEP modifications/504 plan

Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Teacher Notes
- Textbook
- Laboratory Manuals and Equipment
- Science Websites

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Educator Websites:
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http://www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/stoichiometry/acid_base.htm
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Unit Overview

Content Area: Chemistry Unit 2

Unit Title: The Language of Chemistry, Chemical Quantities, and Stoichiometry

Target Course/Grade Level: 10-12

Unit Summary

This unit is designed to give students a clear understanding of the use of symbols as the language of chemistry. Students will also explore the mole concept as the foundation of chemistry.

Primary interdisciplinary connections:

Infused with in the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

21st century themes:

The unit will integrate the 21st Century Life and Career strand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections:

For further clarification refer to NJ Class Standard Introductions at www.njcccs.org.

Content Standards

CPI #	Cumulative Progress Indicator (CPI)
5.1A-D	**Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.2.12.A.1	Use atomic models to predict the behaviors of atoms in interactions.
5.2.12.A.2	Account for the differences in the physical properties of solids, liquids, and gases.
5.2.12.B.1	Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form.
5.2.12.B.3	Balance chemical equations by applying the law of conservation of mass.

Unit Essential Questions

- How do chemists use symbols to convey necessary concepts?
- How does the language of chemistry demonstrate systems, interactions, and patterns of change?
- What affects the patterns of change?

Unit Enduring Understandings

Students will understand that…

- The language of chemistry involves the nomenclature of substances
- The language of chemistry involves the writing and balancing of chemical equations
- The mole concept is the foundation for all chemical determinations

• How is the mole concept the foundation of chemistry? • How can we determine both qualitative and quantitative changes in the interaction of systems?	
Unit Objectives *Students will know…* • Vocabulary and key terms • Procedures at the core of scientific methodology • Laboratory Safety procedures • Essential laboratory equipment • The law of conservation of matter and energy • How chemical families differ • Chemical Nomenclature • How to use the mole concept	**Unit Objectives** *Students will be able to…* • Write formulas for ionic and molecular compounds • Convert mass into moles • Convert moles into representative particles • Convert moles to volume for gases • Calculate percent composition • Determine empirical and molecular formulas • Write a skeleton equation from a word equation • Write a balanced equation from a skeleton equation • Classify reaction types • Predict the products of various chemical reactions • Solve mass- mass problems

Formative Assessments

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- Do Now
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Summative Assessments

- Chapter/Unit Test
- Presentations/Projects
- Laboratory Practicals
- Quarterly Exams

Modifications (ELLs, Special Education, Gifted and Talented)

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- Peer tutoring
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Unit Overview

Content Area: Chemistry Unit 3

Unit Title: Chemical Periodicity and Bonding

Target Course/Grade Level: 10-12

Unit Summary

This unit is designed to give students a clear understanding of the patterns that exist among the various forms of matter and those factors that affect the stability of matter.

Primary interdisciplinary connections:

Infused with in the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

21st century themes:

The unit will integrate the 21st Century Life and Career strand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections:

For further clarification refer to NJ Class Standard Introductions at www.njcccs.org.

CPI #	Cumulative Progress Indicator (CPI)
5.1A-D	**Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.2.12.A.3	Predict the placement of unknown elements on the Periodic Table based on their physical and chemical properties.
5.2.12.B.1	Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form.
5.2.12.B.2	Describe oxidation and reduction reactions, and give examples of oxidation and reduction reactions that have an impact on the environment, such as corrosion and the burning of fuel.
5.2.12.B.3	Balance chemical equations by applying the law of conservation of mass.
5.2.12.C.2	Account for any trends in the melting points and boiling points of various compounds.

Unit Essential Questions	Unit Enduring Understandings
	Students will understand that…
• What patterns exist among the various forms of matter?	• The development of the periodic table was based upon the chemical and physical properties of the known elements
• What predictions about matter can be made from the periodic table?	• Students will understand the significance of the organization of the periodic table
• What affects the stability of matter?	• The periodic table is a tool to predict chemical and physical properties

	• There are various types of bonding • There is a difference between intra and inter molecular forces • Various types of molecular geometry exist • There is a difference between bond polarity and molecular polarity
Unit Objectives *Students will know…* • Vocabulary and key terms • Procedures at the core of scientific methodology • Laboratory Safety procedures • Essential laboratory equipment • Periodic trends • Reinforce the relationship between periodic trends and electron configuration • Polarity, electronegativity, and bonding • Intermolecular attractions	**Unit Objectives** *Students will be able to…* • Write electron configurations for atoms and ions • Use the periodic table to determine electron configuration • Predict chemical and physical properties from the periodic table • Determine valence electrons and predict types of bonding • Use Valence Shell Electron Pair Repulsion theory to predict molecular geometry • Use differences in electronegativity to determine types of bonding and degrees of polarity • Explain intermolecular attractions and how their strength determines physical properties

Formative Assessments

- Observation
- Homework
- Class participation
- Writing Assignments
- Do Now
- Concept map
- Lab reports
- Notebook

Summative Assessments

- Chapter/Unit Test
- Presentations/Projects
- Laboratory Practicals
- Quarterly Exams

Modifications (ELLs, Special Education, Gifted and Talented)

- Teacher tutoring
- Peer tutoring
- Cooperative Learning Groups
- Differentiated Instruction
- Follow all IEP modifications/504 plan

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Unit Overview

Content Area: Chemistry Unit 4

Unit Title: States of Matter

Target Course/Grade Level: 10-12

Unit Summary

This unit is designed to give students a clear understanding of how matter and energy drive the universe and how energy causes changes in matter.

Primary interdisciplinary connections:

Infused with in the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

21st century themes:

The unit will integrate the 21st Century Life and Career strand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections:

For further clarification refer to NJ Class Standard Introductions at www.njcccs.org.

Learning Targets

Content Standards

CPI #	Cumulative Progress Indicator (CPI)
5.1A-D	**Science Practices:** All students will understand that science is both a body of knowledge and an evidence based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.2.12.C.1	Use the kinetic molecular theory to describe and explain the properties of solids, liquids, and gases.
5.2.12.D.2	Describe the potential commercial applications of exothermic and endothermic reactions.
5.2.12.D.4	Measure quantitatively the energy transferred between objects during a collision.

Unit Essential Questions

- How do matter and energy drive the universe?
- How does the kinetic theory describe the relationship between the energy of particles in matter and its temperature?
- How does energy cause (or result from) changes in matter?

Unit Enduring Understandings

Students will understand that…

- The kinetic theory is the basis for understanding behavior and properties of gases
- Temperature , pressure, quantity (moles) affect solids, liquids, and gases
- Equilibrium systems exist during changes of state
- Phase diagrams can be used to determine the state of matter at given conditions

• How do the parameters of state determine the nature of matter? • How do intermolecular attractions determine states of matter?	• Various gas laws are used to predict behavior of gases • Heat can flow into or out of a system
Unit Objectives *Students will know…* • Vocabulary and key terms • Procedures at the core of scientific methodology • Laboratory Safety procedures • Essential laboratory equipment • The postulates of the kinetic theory • Units of temperature, volume, and pressure • How the parameters of state (pressure, temperature, volume and moles) affect matter • How intermolecular attractions determine the state of matter	**Unit Objectives** *Students will be able to…* • Realize the relationship between temperature and kinetic energy • Use calorimetry to predict heat flow into or out of a system • Explain phase changes • Distinguish between various forms of energy • To explain heat capacity • To use the equations of calorimetry • To use gas laws equations

Formative Assessments

- Observation
- Homework
- Class participation
- Writing Assignments
- Do Now
- Concept map
- Lab reports
- Notebook

Summative Assessments

- Chapter/Unit Test
- Presentations/Projects
- Laboratory Practicals
- Quarterly Exams

Modifications (ELLs, Special Education, Gifted and Talented)

- Teacher tutoring
- Peer tutoring
- Cooperative Learning Groups
- Differentiated Instruction
- Follow all IEP modifications/504 plan

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Unit Overview

Content Area: Chemistry Unit 5

Unit Title: Aqueous Solutions

Target Course/Grade Level: 10-12

Unit Summary

This unit is designed to give students a clear understanding of the chemistry of aqueous solutions.

Primary interdisciplinary connections:

Infused with in the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

21st century themes:

The unit will integrate the 21st Century Life and Career strand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections:

For further clarification refer to NJ Class Standard Introductions at www.njcccs.org.

Learning Targets

Content Standards

CPI #	Cumulative Progress Indicator (CPI)
5.1A-D	**Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.2.12.A.5	Describe the process by which solutes dissolve in solvents.
5.2.12.A.5	Describe the process by which solutes dissolve in solvents.
5.2.12.D.5	Model the change in rate of a reaction by changing a factor.
5.2.12.A.6	Relate the pH scale to the concentrations of various acids and bases.

Unit Essential Questions

- How does the structure of water relate to its unique properties?
- How do variables affect a given solution system?
- How do we describe the nature of an

Unit Enduring Understandings

Students will understand that…

- Certain factors affect the rate of solution
- Solubility determines how substances mix
- Solutions come in varying concentrations
- Water is a universal solvent
- Acids differ from bases

aqueous solution? • How do systems maintain neutrality?	• Water is a unique compound • pH determines whether something and acid or a base
Unit Objectives *Students will know…* • Vocabulary and key terms • Procedures at the core of scientific methodology • Laboratory Safety procedures • Essential laboratory equipment • The unique properties of water • The nature of chemical reactions in an aqueous environment	**Unit Objectives** *Students will be able to…* • **Discuss the factors that affect rate of solution** • **Predict solubility** • **Describe the solvation process** • **Distinguish between weak and strong electrolytes** • **Calculate concentrations of solutions** • **Solve dilution problems** • **Identify the properties of acids and bases** • **Know and calculate the role of pH in solution chemistry** • **Perform a titration on a neutralization reaction**

Formative Assessments

- Observation
- Homework
- Class participation
- Writing Assignments
- Do Now
- Concept map
- Lab reports
- Notebook

Summative Assessments

- Chapter/Unit Test
- Presentations/Projects
- Laboratory Practicals
- Quarterly Exams

Modifications (ELLs, Special Education, Gifted and Talented)

- Teacher tutoring
- Peer tutoring
- Cooperative Learning Groups
- Differentiated Instruction
- Follow all IEP modifications/504 plan

Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

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Unit Overview

Content Area: Chemistry Unit 6

Unit Title: Basic Thermochemistry and Equilibrium Systems

Target Course/Grade Level: 10-12

Unit Summary

This unit is designed to give students a clear understanding of the roles of enthalpy and entropy in the universe and how every system is an equilibrium system.

Primary interdisciplinary connections:

Infused with in the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

21st century themes:

The unit will integrate the 21st Century Life and Career strand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

Technology connections:

For further clarification refer to NJ Class Standard Introductions at www.njcccs.org.

Learning Targets

Content Standards

CPI #	Cumulative Progress Indicator (CPI)
5.1A-D	**Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.2.12.B.2	Describe oxidation and reduction reactions, and give examples of oxidation and reduction reactions that have an impact on the environment, such as corrosion and the burning of fuel.
5.2.12.D.2	Describe the potential commercial applications of exothermic and endothermic reactions.
5.2.12.D.4	Measure quantitatively the energy transferred between objects during a collision.
5.2.12.D.5	Model the change in rate of a reaction by changing a factor.

Unit Essential Questions	Unit Enduring Understandings
• What role does enthalpy play in determining the energy changes that occur in a chemical reaction?	*Students will understand that…* • Energy differs from heat and temperature • Nature favors an increase in disorder • Nature favors conditions of lower enthalpy

• How do we predict disorder of a system? • How do we determine the spontaneity of a reaction? • How do we qualitatively describe equilibrium systems? • How do we quantitatively measure equilibrium? • What is the difference between oxidation and reduction?	• When disorder and enthalpy are taken into consideration temperature may be the determining factor • There are various factors that affect reaction rate. • The size of the equilibrium constants determines the direction of a reaction • LeChatelier's Principle can be used to predict the shift in the direction of a reaction • Redox reactions involve electron transfer
Unit Objectives *Students will know…* • Vocabulary and key terms • Procedures at the core of scientific methodology • Laboratory Safety procedures • The difference between endo and exothermic reactions and the causes • The role of entropy and enthalpy in determining Gibbs free energy. • The role of activation energy in chemical reactions • The common ion effect on equilibrium systems • The difference between Kw and Keq. • The difference between oxidation and reduction	**Unit Objectives** *Students will be able to…* • Calculate Delta H,S,G, and K • Students will be able to interpret delta H and delta S and K • Write and balance half equations

Formative Assessments

- Observation
- Homework
- Class participation
- Writing Assignments
- Do Now
- Concept map
- Lab reports
- Notebook

Summative Assessments

- Chapter/Unit Test
- Presentations/Projects
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