CHEMISTRY
CURRICULUM

COURSE OUTLINE		
Unit One	Introduction to Chemistry & Lab Safety	5 days
Unit Two	Introduction to Matter & Measurement	10 days
Unit Three	Atomic Structure	15 days
Unit Four	The Periodic Law	5 days
Unit Five	Chemical Bonds	15 days
Unit Six	Chemical Formulas & Compounds	10 days
Unit Seven	Chemical Equations & Reactions	10 days
Unit Eight	Stoichiometry	10 days
Unit Nine	Physical Characteristics of Gases	10 days
Unit Ten	Liquids & Solids	15 days
Unit Eleven	Solutions & Colligative Properties	10 days
Unit Twelve	Acids & Bases	10 days
Unit Thirteen	Thermochemistry	5 days
Unit Fourteen	Oxidation-Reduction Reactions	10 days
Unit Fifteen	Organic Chemistry & Biochemistry	15 days
Unit Sixteen	Nuclear Chemistry	5 days

School-wide Academic Expectations Addressed in Chemistry:

- Problem Solving
- Collaboration

School-wide Social and Civic Expectations Addressed in Chemistry:

- Honesty
- Responsibility
- Respect
- Safety

Common Core Standards Addressed in Chemistry:

- *Reading Standard for Science Literacy (RST):* 2, 3, 4, 7, 8, 9
- *Writing Standards for Science Literacy (WHST):* 1, 2, 4, 9

NGSS Standards Addressed in Chemistry:

- *TBD*

Unit 1: Introduction to Chemistry and Lab Safety

Introduction: Chemicals, even water can cause harm. The challenge is to know how to use chemicals and equipment properly, to ensure success and safety in the laboratory setting.

CT State Standard: OSHA & ANSI; Connecticut High School Science Safety: Prudent Practices and Regulations

Common Core Standard(s): RST 4

Essential Question(s): What tools are used in the laboratory and how should these tools be properly used?

Key Terms/Concepts: Safety is the top priority in the lab. Proper equipment must be used to ensure safety and good lab results.

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
OSHA & ANSI; Connecticut High School Science Safety	1. Identify lab equipment and the proper method of use	• Lab - Equipment Identification Activity • Demonstration of proper techniques	Quiz
	2. Distinguish between safe and unsafe laboratory procedures	• Film – Lab Safety	Oral Response
	3. Carry-out standard laboratory techniques	• Lab – Various Standard Laboratory Techniques	Performance Based Assessment
	4. Identify proper attire for laboratory setting	• Power Point & Class Discussion	On-going

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012).

Suggested Technology: DVD player, Computer & Projector

Unit 2: Introduction to Matter and Measurement

Introduction: Chemistry is the study of the composition, structure and properties of matter and the changes it undergoes. Chemistry is central to all the sciences - living and nonliving matter have a chemical structure.

CT State Standard: *Enrichment Content Standards: Atomic & Molecular Structure*

Common Core Standard(s): RST 4; WHST 4

Essential Question(s): What is matter? How is matter structured or organized? How is matter qualitatively and quantitatively measured?

Key Terms/Concepts: Atom, Matter, Density, Accuracy, Precision, Significant Figures, Scientific Notation, Graphing

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Atomic & Molecular Structure	1. Identify the atom as the basic building block of matter	• Lecture, Notes & Class Discussion	Test
	2. Distinguish between physical & chemical properties of matter	• Lab - Exp. 1-1 Mixture Separation	Performance Task
	3. Classify changes of matter as physical/chemical	• Class Discussion	Oral Responses
	4. Name & use SI units for measurement	• Lecture, Notes & Class Discussion	On-going
	5. Distinguish between mass & volume	• Class Discussion	Oral Responses
	6. Perform density calculations	• Practice Problems	Embedded Assessment
	7. Distinguish between accuracy & precision	• Lab – Accuracy & Precision in Measurement	Performance Task
	8. Perform mathematical operations involving significant figures	• Practice Problems	Performance Task On-going
	9. Identify inversely & directly proportional relationships mathematically & graphically	• Analyze two types of graphs	Oral Responses
	10. Convert measurement into scientific notation	• Practice Problems	Performance Task On-going

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), *ChemFile Lab Program*: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Calculators

UNIT 3: Atomic Structure

Introduction: An atom is the smallest particle of an element that retains the chemical properties of that element. This unit focuses on the development of the understanding of the atom and its structure.

CT State Standard: *Enrichment Content Standards: Conservation of Matter & Stoichiometry and Atomic & Molecular Structure*

Common Core Standard(s): RST 3, 7; WHST 1, 4, 2, 9

Essential Question(s): What is the structure of the atom? How has this model evolved? What information can be obtained from various models?

Key Terms/Concepts: Law of Conservation of Mass, Bohr's Atomic Model, Protons, Neutrons, Electrons, Quarks, Atomic Number, Average Atomic Mass, Photoelectric Effect, Line-emission Spectrum, Quantum Model of Atom, Electron Configurations

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
State of CT Conservation of Matter & Stoichiometry	1. Explain the law of conservation of mass, law of definite proportions & law of multiple proportions	• Lab - Conservation of Mass	Performance Task Lab Follow-up Questions
State of CT Atomic & Molecular Structure	2. Summarize & analyze role of Dalton, Thomson, Millikan, Rutherford and Bohr in the development of the quantum model of the atom 3. List the properties of protons, neutrons & electrons and describe quarks 4. Identify an element based on atomic structure and calculate average atomic mass	• Film – The Rutherford-Bohr Model • Computer Simulation of Rutherford's Gold Foil Experiment • Lecture, Notes & Discussion • Practice Problems	Follow-up Questions Embedded Assessment 3D Model of Atoms
State of CT Conservation of Matter & Stoichiometry	5. Explain the mathematical relationship of the mole to mass, volume and number of particles	• Lecture & notes • Graphic Tool for Conversions	On-going
	6. Explain the mathematical relationship of speed, wavelength and frequency	• Demonstration - Wave Types • Notes & Discussion • Label Diagram	Embedded Assessment
	7. Discuss the dual wave-particle nature of light	• Lecture & Notes	Oral Responses
State of CT Atomic & Molecular Structure	8. Discuss the significance of the photoelectric effect & line emissions spectrum in the development of the atomic model	• Lab - 4-1 Flame Test	Performance Task Lab Report
	9. Identify the role of de Broglie, Heisenberg, Schrödinger & Einstein in the development of the quantum model of the atom	• Film – Electronic Arrangement	Summative Assessment/Test
	10. List the four quantum numbers and describe their	• Lecture, Notes & Discussion	Checklist

	significance in the quantum model		
	11. Determine electron configurations for various elements	• Practice Problems • Cooperative Learning	Embedded Task

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: DVD Player, Computer & Projector

UNIT 4: The Periodic Law

Introduction: The periodic table has evolved over the years to become an essential tool used in the study of chemistry. The ability to interpret information contained within the table, affords students and professionals, the ability to better understand and predict the behaviors of elements and chemicals.

CT State Standard: *Enrichment Content Standards: Atomic & Molecular Structure*

Common Core Standard(s): RST 2, 7, 9; WHST 4, 9

Essential Question(s): How was the periodic table developed? What information can be obtained from the periodic table? How can this information be used?

Key Terms/Concepts: Periods, Families/Groups, Valence Electrons, Ionization Energy, Electron Affinity, Electronegativity

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
State of CT Atomic & Molecular Structure	1. Explain the roles of Mendeleev, Moseley and others in the development of the modern periodic table	• Power Point - History of Periodic Table	Summative Assessment/Test
	2. Describe the set-up of the modern periodic table	• Class discussion • Student volunteers label large periodic table	Embedded Assessment
	3. Use the periodic table to identify trends in ionization energy, electron affinity, electronegativity and valence electrons	• Cooperative Learning	Performance Task

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Computer & Projector

UNIT 5: Chemical Bonds

Introduction: In nature, most atoms are joined to other atoms by chemical bonds. This unit addresses the various types of chemical bonds and the resulting behavior of various compounds.

CT State Standards: *Enrichment Content Standards: Chemical Bonds*

Common Core Standard(s): RST 2, 3, 4; WHST 4

Essential Question(s): What are the three basic types of chemical bonds? How do they form and how do they behave?

Key Terms/Concepts: Ionic, Polar Covalent, Non-polar Covalent, Octet Rule, Lewis Structures, Bond Length, Bond Strength, Multiple Bonds

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
State of CT Chemical Bonds	1. Describe ionic and covalent bonding	• Lab - Chemical Bonds • Film – *How Atoms Bond*	Performance Task Lab Follow-up Questions
	2. Classify bonding type to electronegativity differences	• Practice Problems	Embedded Assessment
	3. Explain relationship between potential energy, bond formation, bond length, and bond energy	• Lecture, Notes & Discussion	Oral Assessment
	4. State the octet rule	• Student Response	Oral Assessment
	5. Draw Lewis Structures for molecules & compounds	• Build & draw Lewis Structures for various compounds • Cooperative Learning	Performance Task
	6. Explain the function of resonance structures	• Student Response	Summative Assessment/Test
	7. Compare & contrast chemical formulas and properties for ionic and covalent compounds	• Practice Problems • Lecture, notes & discussion	Performance Task
	8. Describe the electron-sea model of metallic bonding and explain characteristics of metals based on bond type	• Film – *Metallic & Ionic Solids*	Written Response
	9. Predict the shapes of molecules based on VSEPR & Hybridization Theory	• Model Building and Shape Prediction • Cooperative Learning	Performance Task

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: VCR/DVD Player

UNIT 6: Chemical Formulas and Compounds

Introduction: Chemical names and formulas are used to describe the atomic composition of compounds. Learning how to write chemical formulas and to interpret formulas, allows for more effective communication.

CT State Standards: *Enrichment Content Standards: Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 3

Essential Question(s): How are chemical formulas written? What information can be determined from a chemical formula?

Key Terms/Concepts: Criss-cross method, Oxidation Numbers, Formula Mass, Molar Mass, Molar Equivalents, Percent Composition

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
State of CT Conservation of Matter & Stoichiometry	1. Determine the formula and name of ionic & covalent compounds	• Lab - Exp. 7-2 Naming Ionic Compounds	Performance Task
	2. Assign oxidation numbers for each element in a chemical formula	• Practice Problems	Performance Task
	3. Calculate the formula mass and molar mass of any given compound	• Practice Problems	Performance Task
	4. Convert the mass of any given substance to moles, number of particles or volume of gas at STP	• Practice Problems	Performance Task
	5. Calculate the percent composition of any given compound	• Practice Problems	Performance Task
	6. Define and determine an empirical formula from molecular formulas and percent composition	• Lab - 7-3 Determining Empirical Formulas	Performance Task Lab Follow-up Questions
	7. Explain the relationship between empirical and molecular formulas	• Notes & Discussion	Oral Assessment
	8. Determine a molecular formula from empirical formulas and percent composition	• Practice Problems	Summative Assessment/Test

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Calculator

UNIT 7: Chemical Equations and Reactions

Introduction: A chemical reaction is the process by which one or more substances are changed into other substances. Chemical equations represent, with symbols and formulas the identities and relative amounts of reactants and products in a chemical reaction.

CT State Standards: *Enrichment Content Standards: Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 3, 4, 9

Essential Question(s): What observations suggest a chemical reaction has taken place? How does one record these observations in a universal format? What are the basic chemical reactions?

Key Terms/Concepts: Word Equation, Formula Equation, Balance Chemical Equation, Synthesis/Composition, Decomposition, Single-replacement, Double-replacement, Combustion, Activity Series

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
State of CT Conservation of Matter & Stoichiometry	1. List observations that suggest a chemical reaction has taken place	• Demonstration - Hungry Dragon • Cooperative Learning	Embedded Task
	2. Write a word equations, formula equations and balanced chemical equation for a given chemical reaction	• Practice Problems	Embedded Task
	3. Classify a chemical reaction as: Synthesis/Composition, Decomposition, Singe-Replacement, Double-Replacement or Combustion	• Demonstration - Reaction Types • Lab - Reaction Types	Performance Task
	4. Using an Activity Series, predict whether a reaction will occur and what the products will be	• Practice Problems	Summative Assessment/Test

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2102), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: None

UNIT 8: Stoichiometry

Introduction: Stoichiometry comes from the Greek words for "element" and "measure". Stoichiometry is based on chemical equations and the conservations of matter. It is used to predict quantities of reactants and products.

CT State Standards: *Enrichment Content Standards: Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 3, 4, 9

Essential Question(s): What is a mole? What is a mole equivalent to? How much reactant is needed for a reaction to occur? How much product can be produced in a reaction?

Key Terms/Concepts: Molar Ratio, Limiting Reactant, Excess Reactant, Theoretical Yield, Actual Yield, Percent Yield

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Conservation of Matter & Stoichiometry	1. Calculate the amount of moles of a reactant or product	• Practice Problems	Embedded Assessment
	2. Calculate the mass or volume of a gas at STP, of a reactant or product	• Practice Problems	Embedded Assessment
	3. Determine the limiting and excess reactant in a chemical reaction	• Practice Problems	Embedded Assessment
	4. Distinguish between theoretical yield, actual yield, and percent yield	• Practice Problems	Summative Assessment/Test

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Calculators

UNIT 9: Physical Characteristics of Gases

Introduction: The air that we breathe, the bubbles in our soda, and the oxygen produced by plants are examples of gases. Understanding the impact of gases on our daily lives is essential.

CT State Standards: *Enrichment Content Standards: Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 2, 3, 7, 8; WHST 2, 4

Essential Question(s): How do gases respond when temperature, pressure and volume are altered?

Key Terms/Concepts: Expansion, Fluidity, Density, Compressibility, Diffusion, Effusion, Elastic Collision, STP, Various Gas Laws

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Conservation of Matter & Stoichiometry	1. Describe how the kinetic-molecular theory explains certain properties of matter	• Lecture, Notes & Discussion	
	2. Describe the properties and characteristics of gases	• Lab - Oxygen & Hydrogen Gas Production • Lab - CO2 Production	Performance Task Investigative Project
	3. Define pressure, how it is measured and convert units of pressure	• Lecture, Notes & Discussion	
	4. Use Boyle's, Charles', Gay-Lussac's, Combined, and Dalton's law of Partial Pressures to calculate volume, pressure, temperature and partial pressure	• Practice Problems	Embedded Assessment
	5. Use the Ideal Gas Law to calculate pressure, temperature, volume or amount of gas	• Practice Problems	Embedded Assessment
	6. Calculate molar mass or density of various gases	• Practice Problems	Summative Assessment/Test
	7. Determine the relative rates of effusion between two gases, using Graham's Law of Effusion	• Video Clip • Cooperative Learning	Embedded Assessment

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Calculator, Computer & Projector

UNIT 10: Liquids and Solids

Introduction: Liquids and solids are states of matter, which correspond to the energy and movement of the molecules that make up the materials.

CT State Standards: *Enrichment Content Standards: Chemical Bonds, Reaction and Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 2, 3, 4, 7, 9; WHST 9

Essential Question(s): How are liquids and solids different from gases and each other? How are the particles arranged and what impact does this have on their ability to react?

Key Terms/Concepts: Particle arrangement, Amorphous Solids, Crystalline Solids, Equilibrium, Le Châtelier's Principle, Volatility, Phase Changes, Phase Diagrams

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Chemical Bonds	1. Compare & contrast the motion and arrangement of particles of a solids and liquid	• Lecture, Notes & Discussion	
	2. Discuss the various processes by which matter changes phases	• Class discussion & Review	Test
	3. Describe and identify various crystal shapes	• Lab - Crystal Observation Under Microscope • Lab - Growing Crystals in Gel	Performance Task Embedded Assessment
	4. Explain the relationship between equilibrium and changes of state	• Demonstration - Catalysis of Hydrogen Peroxide	
	5. Predict changes in equilibrium using Le Châtelier's Principle	• Film - *Equilbrium* • Practice Problems • Demonstration – Le Chatelier's Principle (kit)	Embedded Assessment
	6. Interpret phase diagrams	• Analyze Phase Diagrams • Cooperative Learning	Performance Task
	7. Describe the structure and properties of water	• Lecture, Notes & Discussion	Summative Assessment/Test
Conservation of Matter & Stoichiometry	8. Calculate the heat energy released or absorbed when a substance changes state	• Lab - Heat of Fusion of Ice	Performance Task Lab report

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Dissecting Microscopes

UNIT 11: Solutions and Colligative Properties

Introduction: Solutions may exist as gases, liquids or solids. The various forms allow for a wide variety of applications. This unit focuses on the types of mixtures and the impact solutions have on the everyday biological, chemical and physical events.

CT State Standards: *Enrichment Content Standards: Chemical Bonds, Reaction and Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 2, 3, 8; WHST 2, 4, 9

Essential Question(s): What are the various types of mixtures? What is a solution? How does changing the amount of solute impact the behavior of the solution?

Key Terms/Concepts: Solutions, Suspensions, Colloids, Electrolyte, Tyndall Effect, Immiscible, Henry's Law, Effervescence, Heat of Solution, Solubility Curves, Solubility Guidelines, Colligative Properties

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Reaction Rates	1. Distinguish between heterogeneous and homogenous mixtures	• Lecture & Notes	
	2. Compare & contrast the properties of solutions, colloids and suspension	• Lab - Solutions, Suspension & Colloids	Performance Task
	3. Distinguish between electrolytes and non-electrolytes; Classify various substances as electrolytes or non-electrolytes	• Demonstration - Electrolytes • Cooperative Learning	Summative Assessment
	4. Determine factors that affect rate of dissolving	• Lab - Temperature V Solubility	Performance Task Written Responses
Conservation of Matter & Stoichiometry	5. Determine heat of solution	• Lab - Hot/Cold Packs Design	Investigative Project
	6. Calculate Molarity & Molality of solutions	• Practice Problems	Performance Task
	7. Write equations for the dissolution of soluble ionic compounds	• Lecture & demonstration of skill • Practice Problems	Performance Task
	8. Using solubility guidelines, predict whether a precipitate will form	• Practice Problems • Class discussion	Embedded Task
Chemical Bonds	9. Compare & contrast dissociation of ionic compounds and ionization of molecules	• Lecture, Notes & Discussion	
	10. Define four colligative properties and calculate boiling point elevation and freezing point depression of various solutions	• Lab - Predicting the Boiling Point of Solution	Performance Task

Suggested Resources: *Modern Chemistry:* Holt, Rinehart & Winston (2012), 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Electrolyte Apparatus

UNIT 12: Acids and Bases

Introduction: Acid rain, GERD, and cooking, all are related to acids and bases, and how they behave. This unit allows students to identify the properties of acids/bases and apply the knowledge to everyday activities.

CT State Standards: *Enrichment Content Standards: Reaction Rates*

Common Core Standard(s): RST 2, 3, 4, 8, 9; WHST 2, 4, 9

Essential Question(s): What are the different types of acids/bases? How are they classified? What impact do acids/bases have on our daily lives? How is pH determined and calculated? What is a titration and how it is performed?

Key Terms/Concepts: Alkaline, Arrhenius Acid/Base, Brønsted-Lowry Acid/Base, Lewis Acid/Base, Amphoteric, Conjugate Pairs, Neutralization

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Reaction Rates	1. Identify five general properties of acids/bases	• Lecture, notes, discussion	Oral Responses
	2. Name common acids/bases given their chemical formulas; List five acids commonly used in industry and the laboratory; Give two properties of each	• Cooperative Learning	Quiz
	3. Distinguish between strong and weak acids/bases	• Demonstration	
	4. Define and identify Brønsted-Lowry acid/bases; Determine conjugate pairs	• Practice Problems	Embedded Assessment
	5. Define and identify Lewis acid/bases;	• Lecture, notes, discussion	
	6. Explain the process of neutralization and how it applies to acid rain	• Lecture, notes, discussion	
	7. Calculate pH from hydronium or hydroxide concentration	• Practice Problems	Summative Assessment/Test
	8. Describe how buffers and acid-base indicators function; Carry-out an acid-base titration	• Lab - Making & Testing Indicators • Lab – Exp. 16-1 How much Calcium Carbonate is in an Eggshell? • Lab - Exp. D15 How Effective is an Antacid?	Performance Task Follow-up Questions Investigative Project Oral Presentation
	9. Identify five general properties of acids/bases	• Lecture, notes, discussion	Oral Responses
	10. Name common acids/bases given their chemical formulas; List five acids commonly used in industry and the laboratory; Give two properties of each	• Cooperative Learning	Quiz

Suggested Resources: *Modern Chemistry:* Holt, Rinehart & Winston (2012), 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Electrolyte Apparatus

UNIT 13: Thermochemistry

Introduction: Thermochemistry is the study of the changes in heat energy that accompany chemical reactions and physical changes.

CT State Standards: *Enrichment Content Standards: Conservation of Matter & Stoichiometry, Reaction Rates and Atomic & Molecular Structure*

Common Core Standard(s): RST 2, 8

Essential Question(s): What is enthalpy? How does changing heat affect a reaction?

Key Terms/Concepts: Enthalpy, Entropy, Heat of Reaction, Heat of Formation, Heat of Combustion

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Conservation of Matter & Stoichiometry	1. Define heat and temperature; State and use proper units for each	• Lecture, Notes & Discussion	Oral Responses
Atomic & Molecular Structure	2. Compare & contrast heat of reaction (Hess's Law), heat of formation, heat of combustion and enthalpy	• Lab - Experiment 17-2 Calorimetry and Hess's Law	Performance Task Lab follow-up questions
Reaction Rates	3. Solve problems involving heat of reaction, heat of formation, and heat of combustion	• Practice Problems	Embedded Assessment

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Calculator

UNIT 14: Oxidation-Reduction Reactions

Introduction: Oxidation-Reduction reactions involve the transfer of electrons and occur simultaneously. The rusting of a piece of iron, the spray of a skunk or the battery in your cell phone, all are a result of redox reactions.

CT State Standards: *Enrichment Content Standards: Chemical Bonds, Reaction and Conservation of Matter & Stoichiometry*

Common Core Standard(s): RST 4, 7, 9; WHST 2, 9

Essential Question(s): What is a redox reaction? How are oxidation numbers determined? How do electrochemical cells work?

Key Terms/Concepts: Oxidation, Reduction, Oxidation Numbers, Half-reactions, Voltaic Cell, Electrolytic Cell

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Conservation of Matter & Stoichiometry	1. Identify oxidation and reduction within a chemical reaction	• Lecture, Notes & Discussion	Oral Responses
Atomic & Molecular Structure	2. Balance redox reactions using half-reaction method	• Lab - A21 Oxidation-Reduction Reactions • Practice Problems • Cooperative Learning	Performance task Lab follow-up questions
	3. Compare & contrast the nature and parts of a voltaic cell and electrolytic cell	• Web Activity - Electrolytic Cell	Investigative Project
Reaction Rates	4. Explain the process and importance of electroplating	• Lab - C21 Electroplating for Corrosion Protection	Performance task Summative Assessment
	5. Describe the chemistry of a rechargeable cell	• Lecture, Notes & Discussion	
	6. Calculate cell potentials	• Practice Problems	Embedded Assessment

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Computer

UNIT 15: Organic Chemistry and Biochemistry

Introduction: The bonding characteristics of carbon allow the formation of many different organic compounds. These compounds provide the basis of life.

CT State Standards: *Enrichment Content Standards: Organic Chemistry & Biochemistry*

Common Core Standard(s): RST 2, 7; WHST 9

Essential Question(s): What is an organic compound? Why can carbon form so many compounds? What are polymers and why are they important?

Key Terms/Concepts: Allotropes, Alkanes, Alkenes, Alkynes, Alcohols, Alkyl Halides, Ethers, Esters, Aldehydes, Ketones, Carboxylic Acids, Amines, Polymers

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Organic Chemistry & Biochemistry	1. Name & draw structural formulas for alkanes, alkenes, and alkynes 2. Compare & contrast structures and functions	• Build & draw 3 D models	Performance Task Summative Assessment
	3. Identify alcohols, alkyl halides, ethers, esters, aldehydes, ketones, carboxylic acids, and amines based on functional groups	• Build & draw 3 D models • Lab - Making Esters	Performance Task Investigative Project
	4. Identify the two main types of polymers and the basic mechanisms by which they are made	• Web Activity	Embedded Assessment
	5. Relate the structure of specific polymers to their properties and functions.	• Lab - A25 Polymers	Performance Task

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: Computer

UNIT 16: Nuclear Chemistry

Introduction: Submarines, power plants, dating ancient artifacts, treatment of disease, all depend on some knowledge of nuclear chemistry. Nuclear chemistry is a subfield dealing with radioactivity, nuclear processes and nuclear properties.

CT State Standards: *State Enrichment Standards: Conservation of Matter & Stoichiometry and Atomic & Molecular Structure*

Common Core Standard(s): RST 2, 4, 9; WHST 2

Essential Question(s): Why are substances radioactive? How does nuclear decay affect the nucleus? What is the importance of nuclear chemistry?

Key Terms/Concepts: Nuclide, Alpha Particle, Beta Particle, Half-life, Transmutation, Fission, Fusion

STANDARD	LEARNING OBJECTIVES CONTENT & SKILLS	INSTRUCTIONAL STRATEGIES	SUGGESTED ASSESSMENTS
Conservation of Matter & Stoichiometry	1. Explain why a nuclear reaction occurs; Balance a nuclear chemical equation	• Lecture, Notes & Discussion	Embedded Task
Atomic & Molecular Structure	2. Describe the different types of nuclear decay and their effects on the nucleus	• Lecture, Notes & Discussion	
	3. Define the term half-life; Explain how it relates to the stability of the nucleus	• Activity - M&M Half-Life Simulation	Embedded Task

Suggested Resources: *Modern Chemistry*: Holt, Rinehart & Winston (2012), ChemFile Lab Program: Holt, Rinehart & Winston, 40 Low-Waste, Low-Risk Chemistry Labs: David Dougan (1997)

Suggested Technology: DVD Player

Updated: 4/10/2017