Pequea Valley School District
Science

Unit: 1- Stoichiometry **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How is stoichiometry used to solve problems in chemistry?

How does stoichiometry extend from the use of the mole and balanced equations?

Keystone Eligible Content/PA Core Standard
3.4.12.A- Apply concepts about the structure and properties of matter.
3.2.10.C-Apply the elements of scientific inquiry to solve problems.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)

Stoichiometry
Balanced Equations
Formula Mass
Mole Ratio
Mole Conversions
Limiting Reactant
Actual Yield
Theoretical Yield
Percent Yield
BCA table

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Review and know how to write balanced equations and write chemical formulas.**
2) **Know how the mole and mole ratios are determined using a balanced equation.**
3) **Know how a BCA table can be used to document a stoichiometry problem.**
4) **Know what limiting reactant, actual yield, theoretical yield and percent yield are.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to interpret chemical reactions in simulated and real situations in order to write correct formulas, equations, mole ratios and, ultimately, the stoichiometry for each one.**
2) **Understand how a mole ratio can be elicited from a balanced equation in any complete chemical reaction.**
3) **Understand traditional and BCA methods for documenting stoichiometry.**
4) **Understand how to determine limiting reactants and use them in determining theoretical and percent yield.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review usage of the mole, balanced equations, word equations and chemical formulas and pass a separate quiz showing readiness to move on to stoichiometry.**
2) **Learn and document completed stoichiometry problems using a BCA table method.**
3) **Complete limiting reactant video and online assignment.**
4) **Master different levels and skill sets of mole conversions and stoichiometry problems using traditional and/or BCA methods.**
5) **Perform a single replacement lab using copper metal and silver nitrate to demonstrate the transfer of knowledge from simulated to real-world situations.**
6) **Unit learning assessments (2 quizzes, 1 unit test, 1 lab, 1 formal lab report, 2 Gizmos)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 3, Dukerich, Modeling Chemistry program (Arizona State Univ.)

Software/Resources: Gizmos online activities, Zumdahl Cengage Learning online videos, Jespersen lecture PowerPoint.

Pequea Valley School District
Science

Unit: 2- Gas Behavior and Laws **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How do you describe the properties of gases at the macroscopic and molecular levels?

What are the relationships and applications of the gas laws?

Keystone Eligible Content/PA Core Standard
3.4.12.A- Apply concepts about the structure and properties of matter.
3.2.10.B-Apply process knowledge and organize scientific and technological phenomena in varied ways.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)

pressure
barometer
manometer
Boyle's law
Charles' law
Gay-Lussac's law
Combined gas law
Ideal gas law
Dalton's partial pressures
mole fraction
van der Waals equation
kinetic molecular theory
Raoult's law
vapor pressure

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know about gas pressure and its various units.**
2) **Know Boyle's, Charles", Gay-Lussac's, Combined and Ideal gas laws.**
3) **Know how Dalton's law of partial pressures and mole fraction are related**

4) **Know when to use the van der Waals equation for real gases.**
5) **Know why gases are special substances in relation to the kinetic molecular theory.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to interconvert units of atm, mmHg, kPa and torr for pressure of gases.**
2) **Understand how to use and solve the various equations for the various gas laws.**
3) **Understand how to use and solve Dalton's law of partial pressures and how it can be used to solve mole fraction and molecular mass problems.**
4) **Understand how to determine van der Waals problems and when to use this equation..**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Describe formulas and usage of the gas laws and pass a separate quiz showing conversion of different pressure units.**
2) **Learn and document completed stoichiometry problems using a BCA table method.**
3) **Complete gas law animations and Gizmo simulation assignments.**
4) **Watch and discuss Julius Sumner Miller video on the pressure of the atmosphere.**
5) **Master different levels and skill sets of pressure conversions and gas law problems.**
6) **Perform a molar mass lab using Mg metal and hydrochloric acid.**
7) **Apply stoichiometry skills to gases using techniques and content previously learned.**
8) **Unit learning assessments (2 quizzes, 1 unit test, 1 lab, 2 Gizmos)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 10

Software/Resources: Gizmos online activities, Bishop online animation, Jespersen lecture PowerPoint, Julius Sumner Miller video.

Pequea Valley School District
Science

Unit: 3- Solutions and Concentration **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How do you describe aqueous solutions qualitatively and quantitatively?

How do electrolytes and nonelectrolytes dissociate?

How do you use molarity in preparing and calculating solution concentrations?

Keystone Eligible Content/PA Core Standard
3.4.10.A- Explain concepts about the structure and properties of matter.
3.2.12.B-Evaluate experimental information for appropriateness and adherence to relevant science processes.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)

Solution	Weak electrolyte
Solvent	Nonelectrolyte
Solute	Hydrate
Concentration	Molecular equation
Dilute	Ionic equation
Saturated	Spectator ions
Unsaturated	Strong acid
Supersaturated	Strong base
Solubility	Weak acid
Precipitate	Weak base
Electrolyte	Molarity
Dissociation	Solution Stoichiometry
Strong electrolyte	Titration

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know the differences between solutions and their concentrations both qualitatively and quantitatively.**
2) **Know the vocabulary of aqueous solutions and their applications to various dilution scenarios and calculations.**
3) **Know how to determine the molarity of solutions.**
4) **Know how to write complete ionic, net ionic and molecular equations.**
5) **Know how to do solubility problems and the relationship to temperature and solubility curves.**
6) **Know how to calculate solution stoichiometry problems using a solubility chart.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to calculate solution concentrations using the $M_1V_1=M_2V_2$ equation.**
2) **Understand how to write the 3 different kinds of equations for ionic reactions using the concepts of spectator ions and precipitates.**
3) **Understand the relationship between solubility vs. temperature for ionic and molecular solids.**
4) **Understand stoichiometry of aqueous solutions through a lab gravimetric analysis.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review solution vocabulary and complete summary assignment of all important terms.**
2) **Learn how to document completed the 3 versions of equations showing forms of all dissolved and solid species.**
3) **Complete solubility and temperature Gizmo simulation assignments.**
4) **Watch and discuss Khan academy video on the equation types.**
5) **Master different levels and skill sets of molarity conversions and problems.**
6) **Use a solubility curve to estimate the amount of solid that can be dissolved for a compound at a given temperature.**
7) **Perform a gravimetric analysis lab using sodium chloride and silver nitrate.**
8) **Apply stoichiometry skills to solutions using techniques and content previously learned.**
9) **Unit learning assessments (1 quiz, 1 unit test, 1 lab, 1 Gizmo, 1 PhET simulation)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 4

Software/Resources: PhET simulations on molarity, concentration, and sugar/salts, Khan academy video and EdPuzzle on ionic equations, Gizmo on solubility vs. temperature, Jespersen lecture PowerPoint.

Pequea Valley School District
Science

Unit: 4- Oxidation and Reduction **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How do you use oxidation numbers to determine redox reactions?

How are redox equations balanced?

What techniques can be used to balance redox reactions for acidic, aqueous solutions?

Keystone Eligible Content/PA Core Standard
3.4.12.B-Apply and analyze energy sources and conversions and their relationship to heat and temperature.
3.2.12.B-Evaluate experimental information for appropriateness and adherence to relevant science processes.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)
Oxidation
Oxidation numbers
Reduction
Redox reactions
Oxidizing agent
Reducing agent
Half-reactions
Redox Titration

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know how to describe the differences between oxidation and reduction.**
2) **Know how to determine oxidation numbers.**
3) **Know how to balance oxidation and reduction reactions (redox) using a variety of methods.**

4) **Know how to balance acidic, aqueous reactions.**
5) **Know how to perform a redox titration and calculate concentrations of an unknown analyte.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to assign oxidation numbers to determine the overall oxidation states in a compound.**
2) **Understand how to write various kinds of redox equations including simple and acidic, aqueous reactions.**
3) **Understand the use of half-reactions in balancing redox reactions.**
4) **Understand the use of titrations and stoichiometry to determine the concentration of an unknown analyte.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Learn how to determine and apply oxidation numbers to simple redox equations.**
2) **Write multiple balanced redox equations using the half-reaction method.**
3) **Publish chosen redox problems to be displayed online to other learners.**
4) **Watch and discuss various video lessons on the equation types and techniques.**
5) **Master the alternate method for balancing a redox reaction in acidic, aqueous solutions.**
6) **Perform a redox titration lab using potassium permanganate and iron(II) sulfate.**
7) **Unit learning assessments (2 quizzes, 1 unit test, 1 lab, 1 simulation)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 5

Software/Resources: Jespersen lecture PowerPoint, Cengage/Crash course/Khan/Tyler DeWitt videos, Titration simulation, Kahoot challenge.

Pequea Valley School District
Science

Unit: 5- Thermodynamics and Enthalpy **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How is the law of conservation of energy applied to various scenarios in chemistry?

What is the connection between temperature, energy and heat using the concept of a state function?

How is Hess's law used to determine the enthalpy of a reaction?

Keystone Eligible Content/PA Core Standard
3.4.12.B-Apply and analyze energy sources and conversions and their relationship to heat and temperature.
3.2.12.C-Apply the elements of scientific inquiry to solve multi-step problems.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)

Kinetic energy	Calorimetry
Potential energy	Endothermic
Thermodynamics	Exothermic
Calorie	Heats of reaction
Joule	Enthalpy
Temperature	Standard state
Heat	System
State functions	Surroundings
Heat capacity	Hess's law
Specific heat	Standard heat of reaction

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know the differences between potential and kinetic energy and the law of conservation of energy.**
2) **Know the vocabulary of thermodynamics and their applications to various calculations.**
3) **Know how to measure the quantity of heat using the calorimetry equation.**
4) **Know how to determine the enthalpy change of a reaction using Hess's law and the standard heats of reaction.**
5) **Know how to solve for internal energy change using heat and work (E= q+w)**
6) **Know how the energy in chemical reactions can be related to bond energies.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to calculate heat using a calorimeter and the associated simulation and equations.**
2) **Understand the methods for determining the various forms of enthalpy including heats of reactions, formation and atom combination.**
3) **Understand the energy changes associated with exothermic and endothermic reactions.**
4) **Understand how to utilize Hess's law to manipulate various pathways in determining the overall energy changes in a chemical reaction.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review thermochemistry vocabulary and complete summary assignment of all important terms.**
2) **Construct a concept map and inquiry activity on the ideas of thermodynamics and enthalpy.**
3) **Complete a calorimetry Gizmo and PhET simulation assignments.**
4) **Watch and discuss various videos on heat vs. temperature vs. energy.**
5) **Master different levels and skill sets of energy conversions and problems.**
6) **Perform a scavenger hunt using Hess's law to practice a variety of problem solving techniques for enthalpy.**
7) **Unit learning assessments (2 quizzes, 1 unit test, 1 scavenger hunt, 1 video assignment, 1 Gizmo, 1 PhET simulation)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 6

Software/Resources: PhET simulations on energy, Cengage, Eureka!, and Crash course videos,, Gizmo on calorimetry, Jespersen lecture PowerPoint, Kahoot vocab challenge.

Pequea Valley School District
Science

Unit: 6- Entropy **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How is entropy used in conjunction with enthalpy to predict direction of spontaneous change?

What are the connections between the first, second and third laws of thermodynamics?

How is Gibbs free energy used to calculate the spontaneity of a reaction?

Keystone Eligible Content/PA Core Standard
3.4.12.B-Apply and analyze energy sources and conversions and their relationship to heat and temperature.
3.2.12.B-Evaluate experimental information for appropriateness and adherence to relevant science processes.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)

Spontaneity	Second law of thermodynamics
Probability	Gibbs free energy
Enthalpy	Third law of thermodynamics
Entropy	Standard enthalpy of formation
System	Heats of reaction
Surroundings	Bond energy
Universe	Standard heat of reaction

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know the differences between enthalpy and entropy.**
2) **Know the definition of spontaneity and how it relates to the natural direction of a reaction.**
3) **Know how to calculate the Gibbs free energy change using three different methods.**
4) **Know how to determine the enthalpy change of a reaction using Hess's law and the standard heats of reaction.**
5) **Know how to use Gibbs free energy equation.**
6) **Know how the energy in chemical reactions can be related to bond energies.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how Gibbs free energy is used to summarize the spontaneity of a reaction.**
2) **Understand what it means for a chemical reaction to be enthalpy or entropy driven.**
3) **Understand the methods for determining the various forms of enthalpy, entropy and free energy using table values standard heats of formation.**
4) **Understand that the entropy of the universe is ALWAYS increasing based on the idea of increased tendency to greater disorder.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review entropy concept and vocabulary using a Padlet assignment.**
2) **Construct a concept map and inquiry activity on the ideas of thermodynamics and enthalpy.**
3) **Watch and discuss various videos on spontaneity, enthalpy and free energy.**
4) **Use the idea of equilibrium, where delta G =0, to calculate boiling points and melting points of various substances.**
5) **Complete chapter resources to complete a chart on delta H and delta S and their impact on spontaneity.**
6) **Perform the Thermite experiment to show the high exothermic and large entropy increase of this reaction.**
7) **Use an in-class partner PowerPoint to review and practice a variety of problem solving techniques for entropy and Gibbs free energy.**
8) **Unit learning assessments (2 quizzes, 1 unit test, 1 inquiry based assignment, 1 PowerPoint review, 2 video assignments, thermite demo.**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 18

Software/Resources: Padlet intro, Cengage and Crash course videos, Jespersen lecture PowerPoint, Kahoot vocab challenge, PowerPoint review, Quizizz review.

Pequea Valley School District
Science

Unit: 7- Equilibrium **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How can you distinguish, describe and explain the nature of chemical equilibrium?

What is Le Chatelier's principle and how is it used?

How are molar concentrations and gas pressures converted using the basic equilibrium laws?

Keystone Eligible Content/PA Core Standard
3.4.10.A- Explain concepts about the structure and properties of matter.
3.2.10.C-Apply the elements of scientific inquiry to solve problems.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)
Mass action
Dynamic Equilibrium
Equilibrium constant
Reaction quotient
Le Chatelier's principle
ICE table
Rule of 100

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know the differences between mass action, rate of reaction and equilibrium.**
2) **Know how to calculate the equilibrium constant of a reaction under various conditions.**
3) **Know how the Haber process was developed and used.**
4) **Know the importance and use of Le Chatelier's principle.**
5) **Know how to convert equilibrium constants for gaseous reactions.**
6) **Know how to use reaction quotient to predict the direction of shift in equilibrium reactions.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to calculate various equilibrium problems using the law of mass action equations.**
2) **Understand the use of Le Chatelier's principle in both concept, calculations and lab situations.**
3) **Understand equilibrium applications in the context of molar concentrations and gas pressures.**
4) **Understand how to utilize the rule of 100, reaction quotient and the quadratic equation to solve various equilibrium problems.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review equilibrium concepts and complete summary assignment of all important terms.**
2) **Write a summary on the history and relationship between Le Chatelier's principle and the Haber process.**
3) **Complete equilibrium Gizmos for both molar concentrations and gaseous pressures.**
4) **Watch and summarize various videos on dynamic equilibrium and Le Chatelier's principle.**
5) **Solve different levels and skill sets of equilibrium and mass action problems.**
6) **Unit learning assessments (1 quiz, 1 unit test, 1 video assignment, 1 summary assignment, 2 Gizmos)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 14

Software/Resources: Cengage and Crash course videos, 2 Gizmos on chemical equilibrium, Jespersen lecture PowerPoint, Kahoot vocab challenge, Quizizz review.

Pequea Valley School District
Science

Unit: 8- Acids, Bases and pH **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How does the Bronsted-Lowry definition of acids and bases aid us in determining strength?

What is the connection between conjugate acid-base pairs, amphoteric substances and pH?

How is pH determined for weak acids and bases?

Keystone Eligible Content/PA Core Standard
3.4.12.A- Apply concepts about the structure and properties of matter.
3.2.10.B-Apply process knowledge and organize scientific and technological phenomena in varied ways.

Pacing: Approximate number of class sessions per unit: 20

Tier 3 Vocabulary (Content specific vocabulary)

Bronsted-Lowry acid
Bronsted-Lowry base
Conjugate acid-base pair
Amphoteric substances
Conjugate acid
Conjugate base
Proton donor
Proton acceptor
Hydronium ion
pH
Acid ionization constant, K_a
Base ionization constant, K_b
Percentage ionization
Acid -Base titrations

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know how to identify Bronsted-Lowry acids and bases.**
2) **Know the terms weak acid, weak base, conjugate acid-base pair, hydronium ion and pH.**
3) **Know how to compare and calculate strengths of weak acids and bases.**
4) **Know how to perform an acid-base titration using an indicator.**
5) **Know how to use the equilibrium concept (K_a and K_b) and apply it to pH problems for weak acids and weak bases.**
6) **Know the relationship between percentage ionization, K_a, pK_a and pH.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to determine the equations for conjugate acids and conjugate bases.**
2) **Understand the methods for ranking the various weak acids and weak bases in terms of strength.**
3) **Understand how to calculate simple pH of strong acids and more complex calculations of weak acids and bases.**
4) **Understand the method of using an acid-base titration to determine concentration and pH.**
5) **Understand how to use Ka and Kb to determine pH calculations.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review acid-base vocabulary and complete summary assignment of acid-base definitions.**
2) **Complete a titration Gizmo and PhET simulation assignment.**
3) **Watch and discuss various videos on conjugate acids and conjugate bases, weak acids vs. strong acids and pH.**
4) **Master different levels and skill sets of pH calculations and problems.**
5) **Unit learning assessments (1 quizzes, 1 unit test, 2 video assignments, 1 Gizmo, 1 PhET simulation)**

Literature: Jespersen/Hyslop, Chemistry text- Chapters 15.1-15.2 and 16.1-16.5 and 16.9

Software/Resources: PhET simulations on pH, Cengage, Khan and Crash course videos,, Gizmo on titrations, Jespersen lecture PowerPoint, Kahoot vocab challenge.

Pequea Valley School District
Science

Unit: 9- Organic Chemistry **Course: Chemistry II** **Grade: 10-12**

Planning the Focus Based on the Desired Result
What do you want all students to know, understand and do by the end of the unit?

Unit Essential Question(s): How are the structural formulas for organic compounds written?

What are the functional groups and how is the naming system (nomenclature) explained?

What are the typical reactions involved in making esters and polymers?

Keystone Eligible Content/PA Core Standard
3.4.10.A- Explain concepts about the structure and properties of matter.
3.2.12.A-Evaluate the nature of scientific and technological knowledge.

Pacing: Approximate number of class sessions per unit :20

Tier 3 Vocabulary (Content specific vocabulary)

Organic chemistry	Esters
Structural formulas	Amines
Molecular formulas	Amides
Nomenclature	Alkanes
Straight chain hydrocarbons	Alkenes
Isomers	Alkynes
Alcohols	Saturated
Ethers	Unsaturated
Aldehydes	Aromatic hydrocarbons
Ketones	IUPAC rules
Carboxylic acids	Dehydration synthesis
Polymers	

Know - What do learners need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge "nuggets".***

1) **Know the differences between structural and molecular formulas.**
2) **Know the nomenclature of the various functional groups.**
3) **Know how to determine isomers.**
4) **Know how to make an ester from its alcohol and carboxylic acid.**
5) **Know how to make a polymer like nylon using a dehydration reaction.**
6) **Know how to construct the various functional groups using a molecular model kit.**

Understand - What do learners need to **understand**? What is the **big idea**? ***List broad concepts or "big ideas" in a statement of enduring understanding.***

1) **Understand how to distinguish between a straight chain hydrocarbon and the various branched chain isomers.**
2) **Understand the structure of all functional groups listed in the vocabulary section.**
3) **Understand the naming system for functional groups in organic compounds (IUPAC rules).**
4) **Understand the importance and synthesis of esters and polymers.**
5) **Understand how to use the straight chain carbon skeleton to construct the representative organic compounds using a molecular model kit.**

Learning Outcome - What do learners need to be able to **accomplish** by the unit's end? ***List skills and competencies.***

1) **Review nomenclature of basic straight chain compounds and their derived isomers.**
2) **Construct models of all representative functional group compounds.**
3) **Complete a laboratory on both ester and polymer synthesis.**
4) **Watch and discuss various videos on nomenclature, alkanes, alkenes, alkynes and aromatic hydrocarbons.**
5) **Master different levels and skill sets of energy conversions and problems.**
6) **Perform a Macrogalleria web search of manufacturing and application of various organic compounds.**
7) **Unit learning assessments (1 quiz, 1 unit test, 1 Macrogalleria web search, 3 video assignments, 2 labs)**

Literature: Jespersen/Hyslop, Chemistry text- Chapter 22

Software/Resources: Macrogalleria website, Cengage, Khan and Crash course videos, Molecular model kits, Jespersen lecture PowerPoint.