SMMUSD Curriculum Map- Chemistry

Semester 1:

Topic	**Scientific Measurement** **(2 weeks)**
Learning Objectives	▪ convert between scientific notation and standard form of a number ▪ convert from one metric unit to another ▪ convert temperature between **Fahrenheit**, **Celsius**, and **Kelvin** ▪ read metric scales to the correct number of digits ▪ define **density** ▪ perform calculations involving density
Key Standards	**Investigation and Experimentation Standard**s 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will: a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Common Labs	▪ Lab: Reading Scales and Conversions Students perform a variety of metric measurements (including mass, length, volume, and time) using common laboratory materials. ▪ Lab: Density Students calculate the density of solids and liquids by measuring mass (including mass by differences) and volume (including volume by displacement and volume of a geometric solid).
Lesson notes/resources and ideas	▪ Have students use a metric scale with common metric prefixes (giga, mega, kilo, centi, milli, micro, nano) to convert from one unit to another by moving the decimal place or with conversion factors/fractions. ▪ Students can use equations to convert between different temperature scales. Give students some common temperatures and their Celsius, Fahrenheit, and Kelvin equivalents (i.e. body temperature, freezing and boiling points of water, absolute zero etc.) ▪ Perform a demonstration to illustrate how density can be experimentally determined. Discuss why some materials will float on other materials.
Text Resources	▪ Chapter 1: The Science of Chemistry
Enrichment Opportunities	▪ convert between imperial and metric units using conversion factors ▪ convert squared and cubed terms to different units ▪ convert rate expressions from one set of units to another ▪ report values and round numbers to the correct number of significant figures ▪ report sums, differences, products, and quotients to the correct number of significant figures ▪ Lab: Thickness of Aluminum Foil Students will experimentally determine the thickness of aluminum foil from the mass, area, and density of a rectangular piece.

Topic	**Atomic Structure and Electron Configuration** **(3.5 weeks)**
Learning Objectives	▪ identify elements by both name and chemical symbol ▪ discuss the development of atomic models (Dalton, Thomson, Rutherford, Chadwick, Bohr) ▪ compare **protons**, **electrons**, and **neutrons** in terms of charge, mass, and location in an atom ▪ give the number of protons, electrons, neutrons, and atomic mass for a given element ▪ define **isotope** ▪ define **ion** ▪ define **cation** and **anion** ▪ define **valence electrons** ▪ determine the number of valence electrons for an atom ▪ locate **rows/periods** and **groups/families** on the periodic table ▪ draw Bohr diagrams for atoms and ions ▪ give **orbital notati**on for a given element by applying **Aufbau Principal**, **Hund's Rule**, and **Pauli Exclusion Principal** ▪ write **electronic configuration** for a given element ▪ write **noble gas configuration** for a given element

Key Standards	**Atomic and Molecular Structure** 1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept: a. *Students know* how to relate the position of an element in the periodic table to its atomic number and atomic mass. e. *Students know* the nucleus of the atom is much smaller than the atom yet contains most of its mass. g. * *Students know* how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table. h. * *Students know* the experimental basis for Einstein's explanation of the photoelectric effect. i. * *Students know* the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom. j. * *Students know* that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship $E=h\nu$).
Common Labs	none for this unit
Lesson notes/resources and ideas	▪ Have students complete the element word search to practice finding elements on the periodic table and giving their symbols. ▪ Students should be able to determine the number of protons and electrons for any atom/ion using the periodic table. ▪ Students should be able to calculate the number of neutrons for a given isotope of an element. ▪ Have students relate the location of an element on the periodic table to the electron configuration.
Text Resources	▪ Chapter 3: Atoms and Moles
Enrichment Opportunities	▪ calculate average atomic mass from the relative abundance and individual masses of each isotope ▪ define and give examples of **electromagnetic radiation** ▪ define **wavelength** and **frequency** ▪ perform calculations involving wavelength, frequency, and energy ▪ discuss the development of quantum theory (Planck, Einstein, Heisenberg, Schrodinger) ▪ describe the photoelectric effect ▪ discuss the quantum numbers: **principal quantum number**, **angular momentum quantum number**, **magnetic quantum number**, and **spin quantum number** and the orbital properties they define ▪ Lab: Atomic Spectra of Elements Students use a spectroscope to observe the line emission spectrum for elements (for example hydrogen and helium). Students can relate wavelength of light to frequency and energy of electronic transitions.

Topic	**Periodic Trends and Bonding (3 weeks)**
Learning Objectives	• discuss the development of the periodic table (Mendeleev) • locate and give properties of main families including the **alkali metals**, **alkaline earth metals**, **transition metals**, **halogens**, **nobles gases**, **lanthanides**, **actinides**, and **hydrogen** • define **atomic radiu**s and **ionic radius** and explain periodic trends in these properties • define **ionization energy** and explain periodic trends in this property • define **electronegativity** and explain periodic trends in this property • draw Lewis dot structures • assign shapes to molecules using **VSEPR Theory**
Key Standards	**Atomic and Molecular Structure** 1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept: c. *Students know* how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms. **Chemical Bonds** 2. Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules. As a basis for understanding this concept: e. *Students know* how to draw Lewis dot structures. f. * *Students know* how to predict the shape of simple molecules and their polarity from Lewis dot structures.

	g. * *Students know* how electronegativity and ionization energy relate to bond formation.
Common Labs	▪ Lab: VSEPR Model Building Students determine the Lewis structure for compounds and use this information to build a VSEPR model and draw a three dimensional representation.
Lesson notes/resources and ideas	▪ Periodic trends straw/graphing activity as a visual representation of how properties of elements change throughout the periodic table. ▪ Review of how the number of valence electrons is determined from the periodic table, relate to electron configuration. ▪ Show how compounds form according to the "octet rule". ▪ Use a chart to show how the VSEPR shape of a molecule can be determined from the number of atoms bonded to the central atom and the number of lone pairs on the central atom.
Text Resources	▪ Chapter 4: The Periodic Table ▪ Chapter 6: Covalent Compounds
Enrichment Opportunities	▪ assign **bond orders** ▪ draw Lewis Structures for ions ▪ assign **formal charges** to atoms in ions ▪ draw **resonance structures** for molecules ▪ classify bonds as ionic or covalent and as polar or non-polar using electronegativity ▪ classify molecules as polar or non-polar using shape

Topic	**Chemical Compounds** **(2.5 weeks)**
Learning Objectives	▪ define **matter** ▪ distinguish between a **pure substance** and a **mixture**; an **element** and a **compound**; a **homogeneous mixture** and a **heterogeneous mixture** (by definition and with examples) ▪ draw electron dot diagrams for atoms ▪ draw **Lewis structures** for ionic and covalent compounds ▪ compare **metals**, **non metals**, and **metalloids** in terms of properties and location on the periodic table ▪ predict the charges of metal and non metal ions ▪ name and write formulas for ionic compounds including compounds with multivalent ions and those with polyatomic ions ▪ name and write formulas for covalent compounds ▪ identify diatomic elements ▪ compare covalent and ionic compounds
Key Standards	**Atomic and Molecular Structure** 1. The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept: b. *Students know* how to use the periodic table to identify metals, semimetals, and nonmetals. d. *Students know* how to use the periodic table to determine the number of electrons available for bonding. **Chemical Bonds** 2. Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules. As a basis for understanding this concept: a. *Students know* atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds. b. *Students know* chemical bonds between atoms in molecules such as H_2, CH_4, N_2, H_2CCH_2, Cl_2, and many large biological molecules are covalent. c. *Students know* salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.
Common Labs	▪ Lab: Flame test Students perform a flame test on a variety of ionic compounds to determine the colour of the flame, and then determine the identity of an unknown ionic compound.
Lesson notes/resources and ideas	▪ Create a flow chart for students to use when determining how to name a given compound. Include questions like does the compound begin with a metal (ionic)? Does the compound begin with a hydrogen (acid)? Does the compound contain only non-metals (covalent)? ▪ Compound Jeopardy (divide students into teams and have them give the name/formula for chemical

	compounds)
Text Resources	▪ Chapter 5: Ions and Ionic Compounds ▪ Chapter 6: Covalent Compounds
Enrichment Opportunities	▪ name and write formulas for acids

Topic	**The Mole** **(3 weeks)**
Learning Objectives	▪ state **Avagadro's number** ▪ determine the number of atoms of each element in a given compound ▪ determine molar mass for a given element/compound ▪ convert between moles, mass, and atoms/molecules ▪ determine the **percent composition** for a compound
Key Standards	3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept: b. *Students know* the quantity *one mole* is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams. c. *Students know* one mole equals 6.02×10^{23} particles (atoms or molecules). d. *Students know* how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.
Common Labs	▪ Lab: Mole Calculations Students will determine the amount of common substances in terms of particles/mass/moles and perform conversions on the measured quantities.
Lesson notes/resources and ideas	▪ Give students an activity to illustrate how big a mole is (i.e. how much is a mole of pennies and how long would it take to spend, the green pea analogy etc.) ▪ Students can use conversion factors or equations to solve mole calculation problems. ▪ for fun tell mole jokes or have students create a stuffed mole
Text Resources	▪ Chapter 3: Atoms and Moles ▪ Chapter 7: The Mole and Chemical Composition
Enrichment Opportunities	▪ Determine the **empirical formula** and **molecular formula** for a compound ▪ Lab: Empirical Formula of a Compound Students can determine the mass of each element in a compound and use this to find moles and ratio of moles to determine the chemical formula.

Topic	**Chemical Reactions** **(2 weeks)**
Learning Objectives	▪ compare **chemical** and **physical** changes (by definition and with examples) ▪ compare the three phases of matter (solid, liquid, and gas) ▪ define **evaporation/boiling**, **condensation**, **melting**, **freezing**, **sublimation**, and **deposition** ▪ identify the reactants and products in a chemical equation ▪ State the **Law of Conservation of Mass** ▪ balance chemical equations ▪ classify reaction as **synthesis**, **decomposition**, **single replacement**, **double replacement**, **neutralization**, or **combustion** ▪ indicate the state of each substance in a chemical reaction
Key Standards	**Conservation of Matter and Stoichiometry** 3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept: a. *Students know* how to describe chemical reactions by writing balanced equations.

Common Labs	▪ Lab: Reaction Types Students perform a variety of chemical reactions and take observations of the reactants and products. Students then determine balanced chemical equations for reactions being performed.
Lesson notes/resources and ideas	▪ Demonstrate sublimation with dry ice. ▪ Demonstrate the law of conservation of matter by reacting baking soda with vinegar (as the equation is already balanced). This reaction can also show the different states of matter that can be present in a chemical reaction. ▪ For neutralization reaction, balance by writing water as "HOH" ▪ For combustion reactions, balance using "cho-cho"
Text Resources	▪ Chapter 8: Chemical Equations and Reactions
Enrichment Opportunities	▪ predict the products of a reaction given the reactants

Topic	**Stoichiometry (3 weeks)**
Learning Objectives	▪ define **stoichiometry** ▪ determine **mole ratios** ▪ perform stoichiometric calculations involving mass of a reactant or product
Key Standards	**Conservation of Matter and Stoichiometry** 3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept: e. *Students know* how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses. f. * *Students know* how to calculate percent yield in a chemical reaction.
Common Labs	▪ Lab: Reaction Stoichiometry Students will perform a chemical reaction and determine the amount of reactant/product required in a reaction.
Lesson notes/resources and ideas	▪ Students can perform stoichiometric calculations using a table to track the moles, mass, and molar mass of each reactant and product. ▪ Teach students to check their answers to Stoichiometry problems using the law of conservation of mass.
Text Resources	▪ Chapter 10: Stoichiometry
Enrichment Opportunities	- determine **percent yield** of a reaction given the actual yield/ actual yield given percent yield - perform stoichiometric calculations involving **limiting and excess** reactants

Semester 2:

Topic	Nuclear Chemistry (1.5 weeks)
Learning Objectives	▪ write **nuclide symbols** for a given isotope ▪ compare **alpha**, **beta**, and **gamma** radiation ▪ complete nuclear reactions ▪ define **half-life** ▪ perform calculations involving half-life
Key Standards	**Nuclear Processes** 11. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept: a. *Students know* protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons. b. *Students know* the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E = mc^2$) is small but significant in nuclear reactions. c. *Students know* some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions. d. *Students know* the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay. e. *Students know* alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations. f. * *Students know* how to calculate the amount of a radioactive substance remaining after an integral number of half-lives have passed.
Common Labs	▪ Lab: Half Life Students use an object to simulate the radioactive decay of an element. Student create a graph which they can use to determine the half life of the element.
Lesson notes/resources and ideas	▪ Students balance nuclear decay reactions including alpha, beta, gamma, neutron, proton capture/emission. ▪ Half life calculations can be performed using a table to keep track of time and mass or by using a half-life equation and solving algebraically.
Text Resources	▪ Chapter 18: Nuclear Chemistry
Enrichment Opportunities	▪ Discuss factors affecting nuclear stability ▪ Discuss applications of nuclear chemistry (nuclear energy, carbon dating, etc.)

Topic	Gases (2.5 weeks)
Learning Objectives	▪ perform calculations involving **Boyle's Law**, **Charles' Law**, and **Gay-Lassac's Law** ▪ solve **combined law** problems ▪ state the conditions of **STP** ▪ state the volume of one mole of gas at STP ▪ perform calculations involving gases at STP ▪ perform calculations involving the **Ideal Gas Law**

Key Standards	**Gases and Their Properties** 4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept: a. *Students know* the random motion of molecules and their collisions with a surface create the observable pressure on that surface. b. *Students know* the random motion of molecules explains the diffusion of gases. c. *Students know* how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases. d. *Students know* the values and meanings of standard temperature and pressure (STP). e. *Students know* how to convert between the Celsius and Kelvin temperature scales. f. *Students know* there is no temperature lower than 0 Kelvin g. * *Students know* the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms. h. * *Students know* how to solve problems by using the ideal gas law in the form $PV = nRT$. i. * *Students know* how to apply Dalton's law of partial pressures
Common Labs	▪ Lab: Testing for Gases Students carry out reactions to produce gases (including hydrogen, oxygen, and carbon dioxide) and then perform a burning/glowing splint test to observe how each gas interacts with a flame.
Lesson notes/resources and ideas	▪ Students will be given equations for each gas law and can solve by plugging in numbers and then cross multiplying or by solving the equation for the desired variable first. ▪ Students can graph data showing how pressure and volume vary indirectly and how pressure and temperature and volume and temperature vary directly. ▪ Students can use a graphing calculator to collect data for Boyle's Law. ▪ Show demonstrations for kinetic molecular theory and gas laws.
Text Resources	▪ Chapter 12: Gases
Enrichment Opportunities	▪ define **pressure** ▪ perform calculations involving pressure ▪ describe how pressure is measured using a **barometer** ▪ convert pressures between the units of atm, Pascals, and mm Hg ▪ perform calculations involving **Dalton's Law** of partial pressures ▪ perform stiochiometric calculations involving volume of gases

Topic	**Solutions (2.5 weeks)**
Learning Objectives	▪ define **solution** ▪ define **solute** and **solvent** ▪ compare **unsaturated** and **saturated** solutions ▪ define **molarity** ▪ perform calculations involving concentration ▪ perform calculations involving solution dilution ▪ define **dissociation** ▪ write dissociation equations for ionic compounds ▪ calculate the concentration of ions in a solution ▪ determine if a compound is **soluble** or **insoluble** in water ▪ define **precipitate**
Key Standards	**Solutions** 6. Solutions are homogeneous mixtures of two or more substances. As a basis for understanding this concept: a. *Students know* the definitions of *solute* and *solvent.* b. *Students know* how to describe the dissolving process at the molecular level by using the concept of random molecular motion. c. *Students know* temperature, pressure, and surface area affect the dissolving process. d. *Students know* how to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million, and percent composition.

Common Labs	▪ Lab: Solubility Students combine solutions together to observe the formation of a precipitate.
Lesson notes/resources and ideas	▪ Calculate molarity using moles, mass, and molecules. ▪ Demonstrate creating a standard solution. ▪ Dissociation poster for ionic compounds.
Text Resources	▪ Chapter 13: Solutions
Enrichment Opportunities	▪ calculate the concentration of ions resulting from mixing two solutions ▪ write the formula equation, complete ionic equation, and net ionic equation for a precipitation reaction ▪ describe a procedure to separate ions from a solution using solubility data ▪ perform stoichiometric calculations involving concentration of solutions ▪ Lab: Solution Concentration and Spectrophotometry Students prepare a standard solution, make dilutions of a solution, and measure the absorbance to create a calibration curve. Students determine the concentration of an unknown solution by measuring the absorbance and interpolating from the calibration curve.

Topic	**Acids and Bases** **(2 weeks)**
Learning Objectives	• define and give examples of **acids** and **bases** • give the properties of acids and bases • calculate pH, pOH, $[H^+]$, and $[OH^-]$ for strong acids and bases
Key Standards	**Acids and Bases** 5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept: a. *Students know* the observable properties of acids, bases, and salt solutions. b. *Students know* acids are hydrogen-ion-donating and bases are hydrogen-ion accepting substances. c. *Students* know strong acids and bases fully dissociate and weak acids and bases partially dissociate. d. *Students* know how to use the pH scale to characterize acid and base solutions. e. *Students* know the Arrhenius, Bronsted-Lowery and Lewis acid-base definitions. f. *Students* know how to calculate pH from the hydrogen ion concentration
Common Labs	▪ Labs: Properties of Acids and Bases Students use various chemical indicators (cabbage juice, phenolphthalein, bromthymol blue, pH paper) to observe the colour with a known acid, base, and neutral. Student then determine the classification of unknown solutions by observing colour changes with chemical indicators.
Lesson notes/resources and ideas	▪ Give students a list of the pH of common substances and have them create a pH scale. ▪ Students will use equations to perform pH and pOH calculations which will require them be introduced to the logarithm function on their calculator. ▪ Students will need to review dissociation to determine the concentration of H+ in and acidic solution and the concentration of OH- in a basic solution.
Text Resources	▪ Chapter 15: Acids and Bases
Enrichment Opportunities	▪ perform stoichiometric calculations involving pH and pOH ▪ Lab: Acid Base Titration Students determine the concentration of an acid or base by titration with a solution of known concentration.

Topic	Themochemistry (2.5 weeks)
Learning Objectives	▪ define **temperature** and **heat** ▪ describe and graph the temperature changes for a heating or cooling curve ▪ define **heat of vaporization** and **heat of fusion** ▪ perform calculations involving heat of vaporization and heat of fusion ▪ define **specific heat capacity** ▪ perform calculations involving specific heat capacity ▪ define **heat of reaction** ▪ define **exothermic** and **endothermic** ▪ Interpret a potential energy diagram to determine heat of reaction and activation energy ▪ calculate the heat of a reaction from heats of formation
Key Standards	**Chemical Thermodynamics** 7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept: a. *Students know* how to describe temperature and heat flow in terms of the motion of molecules (or atoms). b. *Students know* chemical processes can either release (exothermic) or absorb (endothermic) thermal energy. c. *Students know* energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts. d. *Students know* how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change. e. * *Students know* how to apply Hess's law to calculate enthalpy change in a reaction.
Common Labs	▪ Lab: Heat of Reaction by Calorimetry Students determine the amount of heat released in an exothermic process (burning a candle, cheeto, peanut etc) and using this heat to increase the temperature of water in a soda can.
Lesson notes/resources and ideas	▪ Use water as an example of how intermolecular bonds change at phase changes. ▪ Demonstrate endothermic and exothermic process by heat of solution dissolving salts (i.e. lithium chloride and ammonium nitrate) in water. ▪ Provide students with data on the heating or cooling of a pure substance and have them create a graph of temperature vs. time. Students will then be able to identify the melting/freezing point and boiling/condensing point.
Text Resources	▪ Chapter 2: Matter and Energy ▪ Chapter 10: Causes of Change
Enrichment Opportunities	▪ calculate the heat of a reaction from bond energies ▪ calculate the heat of a reaction from Hess' Law

Topic	Equilibrium (2 weeks)
Learning Objectives	▪ define **equilibrium** ▪ apply Le Chatelier's principle to predict the shift for applying the following stresses: temperature, concentration, volume, and pressure ▪ write an equilibrium expression for a reaction ▪ calculate Keq and determine if an equilibrium favors the products or reactants
Key Standards	**Chemical Equilibrium** 9. Chemical equilibrium is a dynamic process at the molecular level. As a basis for understanding this concept: a. *Students know* how to use LeChatelier's principle to predict the effect of changes in concentration, temperature, and pressure. b. *Students know* equilibrium is established when forward and reverse reaction rates are equal. c. * *Students know* how to write and calculate an equilibrium constant expression for a reaction.

Common Labs	▪ Lab: La Chatelier's Principle Students will create a chemical equilibrium and apply stress to the equilibrium (concentration and temperature changes) to observe how the position of the equilibrium is effected.
Lesson notes/resources and ideas	▪ Use the analogy of a chemical equilibrium being like a treadmill. ▪ Explore Le Chatelier's Principle using the SSR method (Stress, Shift, Result), show example of equilibria with coloured chemicals.
Text Resources	▪ Chapter 14: Chemical Equilibrium
Enrichment Opportunities	▪ graph the effects on the position of an equilibrium (showing relative concentrations) resulting from the following stresses: temperature, concentration, volume, and pressure

Topic	**Organic Chemistry (1.5 weeks)**
Learning Objectives	▪ name and draw hydrocarbons including **alkanes**, **cycloalkanes**, **alkenes**, and **alkynes** ▪ name and draw molecules with functional groups including **alkyl halides**, **alcohols**, **ethers**, **aldehydes**, **ketones**, **carboxylic acids**, **esters**, **amines**, and **amides** ▪ complete **ester synthesis reactions**
Key Standards	**Organic Chemistry** and Biochemistry 10. The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept: a. *Students know* large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits. b. *Students know* the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules. c. *Students know* amino acids are the building blocks of proteins. d. * *Students know* the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds. e. .* *Students know* how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids. f. * *Students know* the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins.
Common Labs	▪ Lab: Ester Synthesis Students will prepare esters by combining alcohols with carboxylic acids in the presence of a strong acid and observe the odour associated with each ester. Students will complete ester condensation equations to describe the reactions carried out.
Lesson notes/resources and ideas	▪ Create flashcards of each of the main organic compounds showing their structure and the ending used in naming.
Text Resources	▪ Chapter 19: Carbon and Organic Compounds
Enrichment Opportunities	▪ name and draw **structural isomers** for alkanes ▪ name and draw **stereoisomers** for alkenes ▪ Discuss common applications of different types of organic compounds