College Station ISD Chemistry Year at a Glance

1st Six Weeks Aug. 27 – Oct. 4	**2nd Six Weeks** Oct. 5 - Nov. 9	**3rd Six Weeks** Nov. 12 –Dec. 21
Unit 1: Matter and Change and Scientific Measurement *Students Will:* • Demonstrate safe lab practices and make choices about conservation of materials. • Plan and implement data collection to solve applicable problems. • Communicate conclusions and defend reasoning. • Identify the properties of matter with a focus on mixtures and solutions. • Identify physical and chemical properties and changes. Unit 2: Problem Solving in Chemistry *Students Will:* • express and manipulate chemical quantities using scientific conventions and mathematical procedures, including dimensional analysis, scientific notation, and significant figures. Unit 3: Models of Atomic Structure *Students Will:* • understand the models of modern atomic theory, including Dalton's Postulates, Thomson's discovery of electron properties and Rutherford's and Bohr's nuclear atom. • understand the electromagnetic spectrum and be able to perform calculations using the mathematical relationships between energy, frequency, and wavelength of light and Planck's constant • use isotopic composition to calculate average atomic mass of an element • express the arrangement of electrons in atoms through electron configurations Scientific Investigation and Reasoning Skills • Students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving based around the inquiry model. • Students will investigate how chemistry is an integral part of our daily lives.	Unit 4: Periodicity *Students Will:* • Understand and explain the historical development of the Periodic Table based on physical and chemical properties and can apply its predictive power. • use the Periodic Table to identify and explain the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals; and • use the Periodic Table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy. Unit 5: Chemical Quantities *Students Will:* • quantify the changes that occur during chemical reactions by defining and using the concept of a mole. • use the mole concept to calculate the number of atoms, ions, or molecules in a sample of material. • calculate percent composition and empirical and molecular formula. Unit 6: Ionic and Covalent Compounds *Students Will:* • Understand how atoms form ionic, metallic, and covalent bonds. • name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules. • write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids, and bases. Scientific Investigation and Reasoning Skills • Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable. • Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.	Unit 7: Chemical Reactions *Students Will:* • understand and differentiate among single and double replacement, synthesis and decomposition, combustion and acid-base reactions • investigate factors that influence solubilities and understand the production of gases and precipitates in chemical reactions Unit 8: Stoichiometry *Students Will:* • quantify the changes that occur during chemical reactions using the concept of a mole. • use the mole concept to calculate the number of atoms, ions, or molecules in a sample of material. • use the law of conservation of mass to write and balance chemical equations. • perform stoichiometric calculations, including determination of mass relationships between reactants and products, calculation of limiting reagents, and percent yield. Scientific Investigation and Reasoning Skills • Students should be able to distinguish between scientific decision-making methods and ethical and social decisions that involve the application of scientific information. • Students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving based around the inquiry model

4th Six Weeks Jan. 7- Feb. 22	5th Six Weeks Feb. 25 – April 12	6th Six Weeks April 15 – May 31

Unit 9: Solids, Liquids and Gases

Students Will:

- know the characteristics of matter and differentiate between physical and chemical changes and properties.
- compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume.
- understand the principles of ideal gas behavior, kinetic molecular theory, and the conditions that influence the behavior of gases.
- describe and calculate the relations between volume, pressure, number of moles, and temperature for an ideal gas as described by Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressure, and the ideal gas law.
- perform stoichiometric calculations, including determination of mass and volume relationships between reactants and products for reactions involving gases.
- describe the postulates of kinetic molecular theory.

Unit 10: Chemical Bonding

Students Will:

- construct electron dot formulas to illustrate ionic and covalent bonds.
- describe the nature of metallic bonding and explain metallic properties such as thermal and electrical conductivity, malleability, and ductility.
- predict molecular structure for molecules with linear, trigonal planar, or tetrahedral electron pair geometries using VSEPR theory.

Unit 11: Properties of Water

Students Will:

- understand and apply the factors that influence the behavior of solutions.
- describe the unique role of water in chemical and biological systems.
- develop and use general rules regarding solubility through investigations with aqueous solutions.
- calculate the concentration of solutions in units of molarity and use molarity to calculate the dilutions of solutions.
- distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions.

Scientific Investigation and Reasoning Skills

- Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.
- Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

Unit 12: Thermodynamics

Students Will:

- Know that energy changes occur in chemical reactions and understand energy and its forms, including kinetic, potential, chemical, and thermal energies;
- understand the law of conservation of energy and the processes of heat transfer.
- use thermochemical equations to calculate energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic.
- perform calculations involving heat, mass, temperature change, and specific heat.
- use calorimetry to calculate the heat of a chemical process.

Unit 13: Equilibrium and Rate Laws

Students Will:

- examine the factors that influence the rate of a chemical reaction
- describe the changes that occur when an equilibrium system is stressed and calculate the changes in system concentrations as a result of those stresses.

Unit 14: Acids and Bases

Students Will:

- define acids and bases and distinguish between Arrhenius and Bronsted-Lowry definitions and predict products in acid base reactions that form water.
- understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions;
- define pH and use the hydrogen or hydroxide ion concentrations to calculate the pH of a solution.
- distinguish between degrees of dissociation for strong and weak acids and bases.

Scientific Investigation and Reasoning Skills

- Students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving based around the inquiry model.
- Students will investigate how chemistry is an integral part of our daily lives.

Unit 15: Neutralization

Students Will:

- describe how acid base neutralization occurs and the resulting pH of solutions
- Students will calculate ion concentrations of neutralization reactions

Unit 16: Nuclear

Students Will:

- understand the basic processes of nuclear chemistry.
- describe the characteristics of alpha, beta, and gamma radiation.
- describe radioactive decay process in terms of balanced nuclear equations.
- compare fission and fusion reactions.

Unit 17: Oxidation Reduction Reactions

Students Will:

- understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions.
- Describe the parts and functions of electrolytic cells
- Calculate voltages of electrolytic cells.

Scientific Investigation and Reasoning Skills

- Students should be able to distinguish between scientific decision-making methods and ethical and social decisions that involve the application of scientific information.
- Students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving based around the inquiry model