East Carter Co. R-II School District
Course Scope and Sequence

Course: Chemistry (grades 11-12)

# OF DAYS	TOPICS
10	Chapter 1: Introduction to Chemistry Essential Questions: What is chemistry? Differentiate among its traditional divisions. What are the reasons we study Chemistry? What ways does Chemistry affect our daily lives? What are the ways in which chemistry impacts the various fields of science? What are the steps involved in the scientific method? What is the difference between a theory and a scientific law? Why does learning chemistry require daily effort? Concepts: analytical chemistry; biochemistry; inorganic chemistry; organic chemistry; scientific method; theory/law
10	Chapter 2: Matter and change Essential Questions: What are the characteristics of matter and substances? What are the three states of matter? differentiate between them. What is a physical property? list several common physical properties of substances. What is the difference between homogeneous and heterogeneous samples of matter? What is the difference between an element and a compound? What are some common elements, given their symbols? What is the difference between physical and chemical changes in matter? What is the law of conservation of mass? Concepts: Chemical/physical properties; heterogeneous/homogeneous matter; law of conservation of mass/matter

10	Chapter 3: Scientific Measurement Essential Questions: What is the difference between qualitative and quantitative measurements? How do you convert measurements using scientific notation? Distinguish among accuracy, precision, and error of a measurement. Apply the concept of significant figures when reporting the result of a calculation. Apply SI units of measurements to scientific calculations. Distinguish between the mass and weight of an object. Calculate the density of an object from experimental data. Convert between the Celsius and Kelvin Temperature scales. Concepts: Qualitative/Quantitative ; SI units; Density; Significant figures; scientific notation; specific gravity
5	Chapter 4: Problem Solving in Chemistry Essential Questions: What are some useful problem solving skills used in Chemistry (the 3 steps)? Construct conversion factors from equivalent measurements and apply dimensional analysis to a variety of conversion problems. Concepts: Problem Solving Approach (ACE); conversion factors; dimensional analysis
10	CHapter 5: Atomic Structure and the periodic table Essential questions: What is Dalton's atomic Theory? Characterize the size of an atom? Distinguish among protons, electrons, and neutrons in terms of relative mass and charge. Describe the structure of an atom, including the location of the protons, electrons, and neutrons with respect to the nucleus. Explain how the atomic number identifies an element. Use the atomic number and mass number of an element to find the numbers of protons, neutrons, and electrons Explain how isotopes differ and why the atomic numbers of elements are not whole numbers. Calculate the average atomic mass of an element from isotope data. Describe the origin of the periodic table. Identify the position of groups , periods, and the transition metals in the periodic table. Concepts: Dalton's Atomic Theory; Periodic Table
	Chapter 6: Chemical Names and Formulas Essential Questions: What is the difference between ionic and molecular compounds? What is a cation, and an anion? Relate them to metal and nonmetal.

15	What is the difference among chemical formulas, molecular formulas, and formula units? Use experimental data to show that a compound obeys the law of definite proportions. Use the periodic table to determine the charge of an ion. Define a polyatomic ion and give the names of formulas of the most common polyatomic ions. Apply the rules for naming and writing formulas for binary ionic compounds. Apply the rules for naming and writing formulas for ternary ionic compounds. Apply the rules for naming and writing formulas for binary molecular compounds. Name and write formulas for common acids. Concepts: Chemical formulas; naming/writing formulas of ionic and molecular compounds, law of definite proportions; law of multiple proportions
14	Chapter 7: Chemical Quantities Essential questions: How is Avagodro's number related to a mole of any substance? Calculate the mass of a mole of any substance. How do you use the molar mass to convert between mass and moles of a substance? Use the mole to convert among measurements of mass, volume, and number of particles. Calculate the percent composition of a substance from its chemical formula or experimental data. Derive the empirical formula and the molecular formula of a compound from experimental data. Concepts: Avogadro's number; Empirical/ molecular formula; percent composition
10	Chapter 8 Chemical Reactions Essential Questions: Write equations describing chemical reactions using appropriate symbols Write balanced chemical equations when given the names or formulas of the reactants and products of a chemical reaction. Identify a reaction as combination, decomposition, replacement, or combustion and predict the products of each type. Write and balance net ionic equations. Use solubility rules to predict the precipitate formed in double-replacement reactions. Concepts: Activity series of metals; balancing chemical equations; types of chemical reactions; net ionic equations
	Chapter 9: Stoichiometry Essential questions: Calculate the amount of reactants required or product formed in a non chemical process. Interpret balance chemical equations in terms of interacting moles, representative particles, masses, and gas volume at STP.

15	Construct mole ratios from balanced chemical equations and apply these ratios in mole-mole stoichiometric calculations Calculate stoichiometric quantities from balanced chemical equations using units of moles, mass, representative particles, and volumes of gasses at STP. Identify and use the limiting reagent in a reaction to calculate the maximum amount of product(s) produced and the amount of excess reagent. Calculate theoretical yield, actual yield, or percent yield given appropriate information. Concepts: The arithmetic of equations (stoichiometry); Chemical Calculations; Limiting Reagent and percent yield.
10	Chapter 10: States of Matter Essential questions: Describe the motion of gas particles according to the kinetic theory. Interpret gas pressure in terms of kinetic theory. Describe the nature of a liquid in terms of the attractive forces between the particles. Differentiate between evaporation and boiling of a liquid using kinetic theory. Describe how the degree of organization of particles distinguishes slides from gasses and liquids. Distinguish between a crystal lattice and a unit cell. Explain how allotropes of an element differ. Interpret the phase diagram of water at any given temperature and pressure. Describe the behavior of solids that change directly to the vapor state and recondense to solids without passing through the liquid state. Concepts: Changes of state; The nature of solids; The nature of liquids; The nature of gasses.
14	Chapter 11: Thermochemistry–Heat and Chemical Change Essential Questions: explain the relationship between energy and heat. Distinguish between heat capacity and specific heat Construct equations that show the heat changes for chemical and physical processes. Calculate heat changes in chemical and physical processes. Classify by type, the heat changes that occur during melting, freezing, boiling, and condensing Calculate heat changes that occur during melting, freezing, boiling, and condensing. Apply Hess's law of heat summation to find heat changes for chemical and physical processes Calculate heat changes using standard heats of formation. Concepts: The flow of heat–energy; Measuring and expressing heat changes; heat in changes of state;Calculating heat changes
14	Chapter 12: The Behavior of Gasses Essential questions: Describe the properties of gas particles. Explain how the kinetic energy of gas particles relates to Kelvin temperature. Explain how the amount of gas and the volume of the container affect gas pressure. Infer the effect of temperature changes on the pressure exerted by a contained gas.

	State Boyle's Law, Charles's law, Gay-Lussac's law, and the combined gas law. Apply the gas laws to problem involving the temperature, volume, and pressure f a contained gas. Calculate the amount of gas at any specified conditions of pressure, volume, and temperature. Distinguish between ideal and real gasses. State Avogadro's hypothesis, Dalton's law, and Graham's law. Calculate moles, masses, and volumes of gasses at STP. Calculate partial pressures and rates of effusion. Concepts: The properties of gasses; Factors affecting gas pressure; The gas law; Ideal Gasses. Gas molecules (mixtures and movements)

Course Description

In this course, students will be taught the Missouri Learning Standards for Chemistry as well as gain a basic understanding of topics in Chemistry which they may encounter in their daily lives. The standards will be taught through a variety of activities including lecture, laboratory exercises, cooperative learning with peers, research activities, and projects. Everyday students will be exposed to grade level appropriate concepts related to the Missouri Learning Standards in chemistry.