

Chemistry I Core Objectives

Introductory Units:

- 1) Use principles of experimental design to solve problems (plan experiment, collect and analyze data, draw conclusions, communicate results, etc...) (TAKS)
- 2) "Express and manipulate chemical quantities using scientific conventions, metrics, and mathematical procedures such as dimensional analysis, scientific notation, and significant figures." (2C)

Unit 1 : Water: Understanding Solutions

- 3) Describe the nature of water and aqueous solutions.
 - a) Describe the structure of the water molecule and explain how its polarity affects its properties such as surface tension, solubility, boiling point, freezing point, and specific heat. (4A) (12B C)
 - b) Express solution concentration in terms of solute, solvent, degrees of saturation, % concentration, ppm, and ppb. (12B) (13A)
 - c) Describe properties of acids, bases, and the pH scale. (14B)
- 4) Describe factors accounting for the amount of usable water on the earth.
 - a) Investigate laboratory water purification techniques including filtration and distillation. (1B)
 - b) Demonstrate proper safety and equipment techniques in the chemical laboratory. (1A)
 - c) Compare and contrast municipal water treatment systems with natural water purification. (1B)
 - d) Describe the location of Earth's water supply and how water moves through the water cycle. (12C)
 - e) Differentiate between pure substances and various types of mixtures (homogeneous/heterogeneous, solutions, suspensions, and colloids. (12B)
- 5) Determine chemical symbols, formulas, and chemical names of elements and compounds. (11B)
- 6) Compare and contrast bonding and properties of ionic and covalent compounds. (13B)

Unit 2: Materials: Structures and Uses

- 7) Analyze physical and chemical properties of substances. (2D) (4A D) (11A)
 - a) classification of metals, nonmetals, and metalloids
 - b) construction of a periodic table as it relates to periodicity
 - c) substitution for scarce resources
- 8) Apply the law of conservation of mass. (11A, B, 5A, 1B)
 - a) explain the significance of a balanced chemical equation
 - b) relate the signs of a chemical change to a chemical equation
 - c) balance chemical equations using common compounds
 - d) Make wise choices in the use, conservation, and recycling of metals and mineral resources.
- 9) Calculate and evaluate the chemical quantity of the mole in common compounds. (2C)
 - a) molar mass
 - b) number of representative particles
 - c) % composition
 - d) % of a metal in an ore
- 10) Use an activity series to make predictions about chemical reactions. (10A B)
 - a) define oxidation and reduction
 - b) identify the substance that is oxidized and the substance that is reduced
 - c) write balanced half-cell reactions
 - d) explain the process of oxidation and reduction as it relates to corrosion, electroplating and recovery of a metal from an ore

Units 3 and 7 (Third Megaspore): Petroleum and Food: To Burn or To Build? That Is The Question!
Unit III Petroleum

- 11) Describe the chemical makeup of petroleum in terms of density, viscosity, molecular structure, and techniques for separating crude oil into fractions. 1B; 8B
- 12) Apply specific chemical principles for a given alkane: 11A; 8A;8B; 8C; 8D
- use electron-dot formulas and molecular formulas to illustrate the nature of the covalent bond.
 - write the condensed general formula and name for the 1st ten alkanes.
 - draw the structural formulas for all of the isomers of butane and pentane
 - relate the structure of the isomers to their relative boiling points using the concept of intermolecular forces.
- 13) Using experimental data, calculate the heat of combustion and molar heat of combustion, and write and interpret a balanced thermochemical equation for the combustion of the hydrocarbon.: 2B; 2C; 5B; 5C
- 14) Using structural or molecular formulas, classify hydrocarbons as saturated or unsaturated, and hydrocarbons having functional groups such as alcohols, carboxylic acids, esters, and ethers in terms of:
- identifying their bonding and properties
 - illustrating their condensation, addition, and polymerization reactions (8B, C, D)
- 15) Make wise choices for use, conservation, and recycling of petroleum, and describe alternative fuels for petroleum. (3B) (2E).(1B)

END FIRST SEMESTER

Chemistry I Core Objectives – 2nd Semester

16. Use principles of experimental design to solve problems (plan experiment, collect and analyze data, draw conclusions, communicate results, etc...) (TAKS)

Unit VII Food

17. Apply specific chemical principles for a given carbohydrate, protein, fat, vitamin, mineral, or food additive: (8A) (8C) (5B)
- Apply the food pyramid in evaluation of food choices. (3B) (3C) (2C); (11B); (11C)
 - Calculate the energy produced by a given amount
 - Classify a given molecular structure and the bonding therein
 - Explain synthesis of polysaccharides, fats, and proteins
 - Evaluate associated health requirements and risks, including vitamins as limiting reactants
 - Explain the effect that a vitamin or mineral has when it acts as a catalyst (enzyme),
18. Use laboratory techniques to analyze food samples.
- Calorimetry to determine the energy content in a snack.
 - Using experimental data, calculate the content of Vitamin C in a given food sample. (1A) (2A) (2B) (2C)
 - Using chromatography, identify specific food colors in food samples.

Unit 4: Air: Chemistry and the Atmosphere

Enduring Understandings:

- Behavior of gases in the atmosphere is governed by basic chemical principles.
- Individuals and communities are responsible for improving and maintaining acceptable air quality levels.

19. Describe physical properties of gases in terms of compressibility, structure, kinetic molecular theory, fluidity, and volume. (4B)
20. Use lab techniques and/ or experimental data to:
- Solve problems related to gas laws (Boyle, Charles, Gay-Lussac, Combined, Ideal) including using experimental data to demonstrate relationships between temperature, pressure, volume, and amount of gas. (2B) (2C) (7A B) (*The TEK specifies the Universal Gas Law. We have previously taught the concept behind it, but not the ideal gas law formula specifically. Avogadro's Law and molar volume are included here.*)
 - Demonstrate calorimetry and how it applies to heat capacity of materials on the Earth. Include interactions of solar radiation with Earth's atmosphere and materials on the surface. (5C) (5B) (5C)
21. Evaluate environmental issues associated with air pollution (acid rain, global warming, smog, photochemical smog, ozone depletion), including causes, effects and solutions. (3B C E) (9D) (15B)
- Describe structure and function of acids, bases, and buffers, including strength, concentration and simple dissociation reactions. (14A-D)
 - Using experimental data, evaluate the amount of carbon dioxide produced by respiration and combustion. (2C, 5B)

Unit 5: Applying Chemical Reactions

Enduring Understandings:

- The chemical industry strives to improve industrial products and processes while making them less harmful to humans and the environment.

22. Describe the nature and function of chemical processes including the nitrogen cycle, the Haber process, and the Hall-Heroult process. (5A)
- a. Explain factors affecting reaction rates (temperature, concentration of reactants, and catalysts) and use them to evaluate ways a chemical reaction can be manipulated. (13C) (15B) (*only place this TEK is covered.*)
 - b. Describe the qualities of dynamic equilibrium and use Le Chatlier's principle to make predictions. (5A)
 - c. Identify aspects of "Green Chemistry" and the Responsible Care program, and use them to evaluate aspects of chemical manufacturing such as conservation, waste management, and safety. (1B) (3B-E)

Unit 6: Nuclear Interactions

Enduring Understandings:

- Everyday life and activities are dependent on nuclear interactions.
- The uses of nuclear technology pose both a risk and a benefit to our future society.

23. Explain contributions made by Dalton, Thomson, Rutherford and Bohr toward development of atomic models and the periodic table.(3E) (6C)
24. Apply principles of chemistry to illustrate various aspects of subatomic particles and isotopes:
- a. Identify subatomic properties; describe their location, mass, charge, and symbols. (6A)
 - b. Explain how different isotopes and radioisotopes are formed. (6A-B)
 - c. Explain factors influencing nuclear stability. (6A-B)
 - d. Write balanced nuclear equations for natural and artificial radioactive decay. (9A) (11B)
 - e. Perform calculations related to the half-lives of the radioisotopes. (9B) (11C)
25. Explain the impact of various nuclear phenomena on society.
- a. Differentiate nuclear fission and nuclear fusion in terms of masses, reactants, products, amount of energy, and their feasibility as alternative energy sources. (6A, 9A)
 - b. Describe applications for radioisotopes in commercial and medical fields. (6B) (9C)
 - c. Discuss how nuclear energy impacts society and the environment in regards to containment, waste storage, and waste disposal. (3C) (9D)