

**SWEETWATER UNION HIGH SCHOOL DISTRICT**

**DIVISION OF ADULT EDUCATION**

High School Subjects

<u>VI</u> Level	<u>Life and Chemical Processes 1, 2</u> 2015	<u>9041/9042</u> Code
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**DURATION:** Approximately 60 hours for each course, extended if necessary until all required work is satisfactorily completed.

**GRADE LEVEL:** Adult/ 9-12

**PREREQUISITES:** None

**CREDIT:** One (1) semester credit each toward the science requirements for high school graduation may be earned.

**PROGRAM DESCRIPTION:**

Students in the Life and Chemical Processes course will be expected to master the same state standards as in biology and chemistry, but which are taught with less detail. The course will consist of 60% biology standards and 40% chemistry standards. A special emphasis will be placed on learning skills such as summarizing, note taking, keeping a notebook, test taking and simple mathematics.

**STUDENT LEARNER OUTCOMES:**

- Students will establish personal, academic and/or workforce goals and demonstrate progress toward them
- Students will solve problems
- Students will communicate clearly and collaborate with others
- Students will use resources, including technology, to research, organize and communicate information

**GOALS: (Course Content Standards)**

Through the principles and practice presented in this course, students will

- 1.0 Investigation and Experimentation- Describe how scientific progress is made by asking meaningful questions and conducting careful investigations (CS IAE 1.0).
- 2.0 Periodic Table - Explain how the Periodic Table organizes the elements by increasing atomic number. Demonstrate how the Periodic Table shows how physical states of matter (solids, liquids, and gases) and chemical properties of the elements relate to atomic structure, known as periodicity (CS Chem 1.0).

- 3.0 Chemical Bonds – Relate how the 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 (CS Chem 2.0).
- 4.0 Conservation of Matter and Stoichiometry – Demonstrate how atoms are conserved in chemical reactions, leading to the principle of conservation of matter. This allows the calculation of the mass of products and reactants (CS Chem 3.0).
- 5.0 Solutions – Explain how solutions are homogeneous mixtures of two or more substances, with acids and bases being compounds that form ions in solutions (CS Chem 6.0).
- 6.0 Cell Biology- Demonstrate knowledge fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism’s cells (CS Bio 1.0).
- 7.0 Genetics- Explain how mutation and sexual reproduction lead to genetic variation in a population (CS Bio 2.0).
- 8.0 Genetics – Explain how genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism (CS Bio 4.0).
- 9.0 Evolution – Relate how evolution is result of genetic changes that occur in constantly changing environments (CS Bio 8.0).
- 10.0 Physiology -Coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment (CS Bio 9.0).
- 11.0 Ecology- Explain how stability in an ecosystem is a balance between competing effects such as nutrient recycling, food webs, and composition of producers and decomposers (CS Bio 6.0).

**CONTENT OBJECTIVES:**

Students who successfully complete this course will be able to:

- 1.0 With respect to investigation and experimentation,
  - 1.1 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. (CS IAE 1a)
  - 1.2 Recognize the need for controlled tests and identify and communicate reasons for

- inconsistent results, such as sources of unavoidable experimental error or uncontrolled conditions. (CS IAE 1b,c,j)
- 1.3. Formulate explanations by using logic and evidence, and recognize the cumulative nature of scientific evidence. (CS IAE 1d,k)
  - 1.4. Distinguish between hypothesis and theory as scientific terms and recognize the usefulness and limitations of models and theories as scientific representations of reality, and recognize that theories have to be changed to fit evidence. (CS IAE 1f,g,n)
- 2.0 With respect to the Periodic Table,
- 2.1 Explain that in a liquid the intermolecular forces are weaker than in a solid, so that the molecules can move in a random pattern relative to one another. (CS Chem. 2d)
  - 2.2. Explain that the random motion of gas molecules and their collisions with a surface create the observable pressure on that surface, that the random motion of gas molecules is the reason for the diffusion of gas. (CS Chem 4a, 4b)
  - 2.3. Define the values and meanings of standard temperature and pressure (STP). Convert between Celsius and Fahrenheit temperature scales. (CS Chem 4 d,e)
  - 2.4. Differentiate between atomic number (# protons) and atomic mass (# protons + neutrons). Explain that the nucleus of the atom is much smaller than the atom yet contains most of its mass. Include in the discussion the concept of isotopes. (CS Chem 1 a, e)
- 3.0 With respect to Chemical Bonds,
- 3.1 Explain how atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic compounds.
  - 3.2. Be able to use Lewis dot structures to draw covalent and ionic bonds (CS Chem 2a).
  - 3.3. Demonstrate how the bonding characteristics of carbon lead to a large variety of structures, ranging from simple hydrocarbons to complex polymers and biological molecules. (CS Chem. 10b)
- 4.0 With respect to Conservation of Matter and Stoichiometry,
- 4.1 Describe chemical reactions by writing simple balanced equations. (CS Chem. 3a)
  - 4.2. Demonstrate that chemical processes can either release (exothermic) or absorb (endothermic) thermal energy. (CS Chem. 7b)
  - 4.3. Demonstrate how reaction rates depend on such factors as concentration, temperature, surface area, and the use of a catalyst. (CS Chem. 8b)
- 5.0 With respect to Solutions,
- 5.1 Define and be able to distinguish between solute and solvents. Describe types of solutions. (CS Chem. 6a)
  - 5.2. Describe the dissolving process as a result of random molecular motion. Demonstrate how temperature, pressure, and surface area affect the dissolving process. (CS Chem. 6b,c)

- 5.3. Explain the observable properties of acids, bases and salt solutions and be able to use the pH scale to characterize acid and base solutions. (CS Chem. 5a, c,d)
- 6.0 With respect to Cell Biology,
- 6.1 Compare and contrast the 4 major classes of organic macromolecules - carbohydrates, proteins (especially enzymes), lipids, and nucleic acids--in terms of their structure, function, and importance. (CS Bio. 1h, 4e, 4f)
- 6.2. Compare and contrast bacterial, plant, and animal cells on the basis of their different organelles, and viruses and how they differ in complexity and general structure. (CS Bio 1c)
- 6.3. Sequence the movement of molecules necessary to produce a protein, starting from the nucleus (chromosomes) \_ (mRNA) \_ ribosomes (production) \_ endoplasmic reticulum (transportation), \_ Golgi bodies (packaging/secretion of proteins). (CS Bio 1d, 1e)
- 6.4. Recognize the importance of semi-permeable membranes in regulating diffusion and osmosis to maintain cellular homeostasis (CS Bio 1a)
- 6.5. Diagram how in photosynthesis, chlorophyll containing cells convert light energy into chemical energy, which is used to produce glucose. In cell respiration, glucose is used to produce energy (CS Bio 1h, 1g)
- 7.0 With respect to Genetics,
- 7.1 Distinguish between the stages of animal and plant cell division (mitosis) used for repair and growth of body cells, and meiosis, (reduces the original amount of DNA by half) which is an early step in sexual reproduction which produces sex cells. (CS Bio 2a, 2b, 2e)
- 7.2. Explain how the male sperm and female egg combine (fertilization) to produce a zygote with new combinations of genes, and how chromosomes determine an individual's sex. (CS Bio 2d, 2f)
- 7.3. Infer the genetic makeup of gametes from parental genotypes, analyze the types of zygote genotypes, and from that calculate the probability of zygote phenotypes resulting from a cross between these gametes for single trait and sex-linked crosses. (CS Bio 3a)
- 8.0 With respect to the Genetics,
- 8.1 Describe the structure and function of DNA, RNA and protien. (CS Bio 5a)
- 8.2. Diagram how to apply base-pairing rules to explain precise copying of DNA during replication, and how mistakes lead to mutations. (CS Bio 5b)
- 8.3. Diagram how the general pathway ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA. (CS Bio 4a)
- 8.4. Characterize how genetic engineering is applied to produce new biomedical and agricultural products, including how foreign DNA can be inserted into bacterial cells in order to alter their genetic makeup and form new protein products, eg insulin. (CS Bio 5d, 5c)
- 9.0 With respect to Evolution,
- 9.1 Evolution occurs by means of natural selection, which determines those

- organisms best suited to their environment. (CS Bio 8a)
- 9.2. Give examples of how natural selection acts on populations, and how great diversity within a population increases the chance that at least some organisms will survive major changes in the environment. (CS Bio 8b,c)
  - 9.3. Identify and categorize the evidence for evolution, including comparative embryology, DNA or protein sequence comparisons, fossil comparisons and comparative anatomy, and how they are used to show probable evolutionary relationships. (CS Bio 8e, 8f)
- 10.0 With respect to Physiology,
- 10.1 List the major bones and muscles in the body and how they function. (CS Bio 9h)
  - 10.2. Diagram and explain how the organs of the digestive system function together to break down food. (CS Bio 9f)
  - 10.3. Explain how the circulatory system circulates nutrients and oxygen rich blood and removes carbon dioxide. (CS Bio 9a)
  - 10.4. Explain how the respiratory system takes in oxygen out of the air, and removes carbon dioxide from the blood, and diagram the role of the kidneys and liver in removing wastes, cleansing the blood, and maintaining glucose balance. (CS Bio 9a, 9g)
  - 10.5. Apply knowledge of the immune system, including a) knowledge of bacterial and viral diseases b) the role of the skin c) the role of antibodies c) the role of vaccination D) AIDS as a model to explain the function of phagocytes and lymphocytes in the immune system and why an individual with a compromised immune system may be unable to fight off and survive infections of microorganisms that are usually benign. (CS Bio 10a; 10b, 10c, 10d, 10e, 10f)
  - 10.6. Identify structures of the nervous system and endocrine system; interpret how sensory, inter- and motor neurons coordinate input of and response to stimuli, and describe how neurons form the basis of cognition and consciousness; identify hormones and their effects (CS Bio 9b, 9c, 9d, 9e, 9i)
- 11.0 With respect to explaining how stability in an ecosystem is a balance between competing effects such as nutrient recycling, food webs, and composition of producers and decomposers,
- 11.1 Calculate how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death. (CS Bio 6c)
  - 11.2. Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles via photosynthesis and respiration. (CS Bio 6d)
  - 11.3. Diagram how producers, consumers, and decomposers in a food web store energy, and this can be represented in a food/energy pyramid. (CS Bio 6f)
  - 11.4. Analyze changes in the biodiversity of an ecosystem resulting from changes in climate, human activity, introduction of non-native species or changes in population size. (CS Bio 6b)

**INSTRUCTIONAL STRATEGIES AND TIMES:**

Individual work on assignments, including projects, research and experiments or teacher lecture and demonstration	50%
Teacher/student evaluation of student practice	5%
Media and technology	10%
Assessment	25%

**EVALUATION:**

1. Satisfactory completion of written assignments as evaluated by the instructor.
2. Satisfactory completion of teacher-made and/or standardized tests as evaluated by the instructor.
3. Satisfactory progress and participation in classroom activities as evaluated by the instructor.

**CONDITIONS FOR REPETITION:**

Students who have failed to meet the objectives because of insufficient attendance or inability to master content may repeat the course.

Approved:  
BOARD OF TRUSTEES  
March 21, 1974

Revised:  
July 12, 1983  
August 27, 1987  
December 14, 1995  
May 17, 2004 (Formerly titled: Life Science 1 and Life Science 2)  
February 15, 2011  
May 26, 2015  
October 26, 2015