South Central College

CHEM 110 Chemistry for the Health Sciences

Course Outcome Summary

Course Information

Description Key concepts of general, organic, and biological chemistry are introduced in an integrated approach with applications from the medical fields. The course is designed to prepare students for Anatomy, Physiology, and Microbiology or to be utilized as a general Liberal Arts and Sciences course. Limited mathematical approach; this course does not meet the requirements of a prerequisite for Chem 120. Lecture and a 2 hour lab are included. (Prerequisite: MATH 0085 or a score of 75.5 or higher on the Elementary Algebra portion of the Accuplacer test; READ 0090 or a score of 77.5 or higher on the reading portion of the Accuplacer test.) (MNTC 3: Natural Sciences, 2: Critical Thinking)

Types of Instruction

Instruction Type	Credits/Hours
Lecture	3 / 48
Lab	1 / 32

Pre/Corequisites

Prerequisite: MATH 0085 or a score of 75.5 or higher on the Elementary Algebra portion of the Accuplacer test; READ 0090 or a score of 77.5 or higher on the reading portion of the Accuplacer test.

Institutional Core Competencies

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. Solve chemistry word problems.

Learning Objectives

Use the metric system of measurement in problem solving.
Calculate formula mass, molecular mass, and formula mass.
Convert between grams and moles using dimensional analysis.
Solve drug dosage and dilution problems.
Solve density problems.
Express answers with the correct number of significant figures.
Solve problems using conversion factors and dimensional analysis.

2. Examine the basic structure and properties of the atom.

Learning Objectives

Use the periodic table to calculate the number of protons, neutrons, and electrons in atoms, ions, and isotopes.
Given an atom, describe its electron structure.

3. Relate electron structure to chemical bonding.

Learning Objectives

Determine the formula unit for an ionic compound.
Interpret molecular formulas.
Draw Lewis dot structures of compounds.

4. Integrate chemical concepts with topics in organic and biochemistry.

Learning Objectives

Describe the difference between macro and micro nutrients.
Describe the role of hydrogen bonding in macromolecular structure (e.g., DNA, proteins).
Describe the movement of molecules across a cell membrane.
Recognize radioisotopes used in medicine and understand the processes of radiation therapy and radiation sickness.
Distinguish between electrolytes and nonelectrolytes.
Identify a given solution as being isotonic, hypertonic, or hypotonic and the impact on cellular structure (e.g., proper IV concentrations, crenation, hemolysis).

5. Describe the relationship between molecular shape and intermolecular attractions.

Learning Objectives

Use VSEPR theory to determine molecular shape.
Determine molecular polarity based on the types of covalent bond present and the molecular shape.
Relate types of intermolecular attractions to the physical properties of a molecule.
Interpret three-dimensional representations of molecules.

6. Determine the role of energy in relation to physical state.

Learning Objectives

Explain changes of state and the properties of each phase using the kinetic molecular theory (e.g., hot/cold packs, steam burns).
Use the gas laws to explain concepts in medicine such as blood pressure, hyperbaric chambers, and gases in anesthesia.

7. Relate the properties of solutions and colloids to medical applications.

Learning Objectives

Interpret concentrations given in a blood test.
Calculate concentrations and dosages of medicines.
Describe how osmosis, dialysis, and diffusion and active transport are used to control the movement of substances (e.g., solutes, ions, gases) across a membrane.

8. Explore the structure and physical properties of alkanes, alkenes, alkynes, and aromatic hydrocarbons.

Learning Objectives

Recognize conformations, structural isomers, and geometric isomers.
Describe a biological application of cis-trans isomerism (e.g., isomerization in the chemistry of vision, dietary trans fats).

9. Identify common organic functional groups and relate their importance to biochemistry.

Learning Objectives

Given an organic functional group, draw its structure and identify its solubility properties.
Identify biochemically important structures such as glucose, cholesterol, triglycerides, and ATP.
Identify functional groups in well-known medical compounds such as aspirin, codeine, morphine, Prozac, and penicillin.
Recognize the importance of the derivatives of phosphoric acid to biochemistry.

10. Describe the relevance of chemical reactions to human health.

Learning Objectives

Balance chemical equations and show that mass and energy are conserved.
Interpret simple combustion reactions of organic compounds.
Differentiate between catabolic and anabolic pathways and describe their role in energy transfer (e.g., illustrate with examples of exercise, weight loss and starvation).
Determine the role of temperature, concentration, and catalysts on the rate of a reaction.

11. Recognize the importance of acid-base reactions in body chemistry.

Learning Objectives

Describe the properties of acids and bases.
Calculate pH when given concentration of the hydronium or hydroxide ion.
Describe how the body responds to changes in pH and maintains acid-base homeostasis.
Understand the buffer system in the blood and buffer capacity.
Describe the importance of ionized molecules (e.g., acid/base drug behavior, membrane permeability, biochemical pathways).
Use LeChatelier's principle to predict consequences of changes in equilibrium (e.g., acidosis, alkalosis).

12. Recognize the role of functional groups in biochemical reactions.

Learning Objectives

Identify basic types of reactions carried out by cells: oxidation-reduction, hydration-dehydration, acyl group transfer, and phophoryl group transfer.
Describe the role of vitamins, antioxidants, and free radicals in health.

13. Confirm the relationship between protein structure and function.

Learning Objectives

Describe the effects of a change in structure of a protein (e.g., point mutations, sickle-cell anemia).
Distinguish fibrous proteins, globular proteins, and membrane proteins by structure, function, and solubility.
Give examples of denaturing proteins.
Define essential amino acids.
Describe the function of enzymes and optimal conditions for activity (e.g., the effects of pH, temperature, ionic strength).
Understand the role of inhibitors on enzyme function (e.g., cyanide poisoning).
Understand how physiological environment can alter protein function (e.g., carbon monoxide poisoning).

14. Describe the role of carbohydrates in the human body.

Learning Objectives

Identify types of carbohydrates and functions (e.g., blood glucose as fuel, glycogen as storage).
Identify blood type by carbohydrate markers.
Describe carbohydrate catabolism.

15. Examine the structure and function of lipids.

Learning Objectives

Identify the major categories of lipids and functions (e.g., steroids and prostaglandins).
Predict melting points of fatty acids based on their structures.
Identify trans fats and describe their effect on health.
Explain fatty acid catabolism.
Understand the importance of essential and nonessential fatty acids.
Understand the role of lipid in cell membrane structure.

16. Summarize the method by which cellular respiration generates energy.

Learning Objectives

Identify the chemical reactions of the citric acid cycle.
Identify the key parts of a mitochondrion and their function.
Describe the flow of electrons through the electron transport chain.
Explain the phosphorylation of ADP to ATP.
Describe the effect of exercise on the conversion of fatty acids into acetyl CoA.

17. Show understanding of processes involving nucleotides and nucleic acids.

Learning Objectives
Describe the structure and function of DNA.
Summarize DNA replication.
Summarize protein synthesis.
Identify the role of nucleic acids in disease (e.g., HIV, gene mutations).

18. Formulate and test hypotheses in the laboratory.

Learning Objectives
Recognize variables that need to be controlled.
Use observations and prior knowledge to create valid hypotheses.
Design an experiment using given parameters.
Use equipment appropriately.
Discuss experimental procedures with a lab partner.

19. Draw conclusions based on laboratory data and analysis of that data.

Learning Objectives
Analyze data using graphs and equations.
Analyze sources of error and uncertainty.
Write lab reports to communicate experimental findings, analyses, interpretations and conclusions.
Discuss findings with a lab partner or in a group setting.

20. Develop laboratory skills.

Learning Objectives
Perform laboratory procedures in a safe and efficient manner.
Use laboratory equipment and materials in a safe and efficient manner.
Know and use safe laboratory practices.

SCC Accessibility Statement

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