Chemistry

Description

General Chemistry is an introductory chemistry course for 10th-12th grade students directed toward explaining the composition of matter. Students will explore the composition of matter and master key chemical principles, such as the periodic table, chemical bonding and stoichiometry, learning to predict and explain the outcomes of chemical reactions. Throughout the course, students will participate in various laboratory experiments designed to reinforce theoretical concepts and develop practical laboratory skills. Safety procedures and proper handling of chemicals will be emphasized. This course cultivates an appreciation for how chemistry influences our daily lives from cooking and medicine to transportation and technology and prepares students for future scientific endeavors.

Objectives and Learning Outcomes

In this course students will develop a comprehensive understanding of chemical principles and enhance their analytical and problem-solving skills.

Upon completion of this course, students will come closer to:

- Understanding atoms, molecules, and compounds, including their composition and properties.
- Understanding the trends and properties of different elements within the periodic table.
- Describing the properties and behavior of solids, liquids, gases, and plasma.
- Differentiating ionic, covalent, and metallic bonds, and how these bonds affect the properties of substances.
- Analyzing types of chemical reactions, balancing chemical equations, and predicting reaction outcomes.
- Applying knowledge to solve real-world problems and understanding the practical applications of chemistry.
- Formulating hypotheses, designing and conducting experiments, collecting and analyzing data, and drawing conclusions.
- Developing practical laboratory skills.

Materials

The following course materials are required:

- *General Chemistry* by John D. Mays, Novare Science and Math.
    - A physical text may be purchased from Classical Academic Press (https://classicalacademicpress.com).
    - A digital text may be purchased from Shelf It (http://shelfit.com).
- Laboratory notebook
    - This notebook is essential for documenting experiments, organizing thoughts, and collaborating effectively.
    - Laboratory notebooks will be provided by Bright Minds.
- 3-ring binder
    - This binder will be used to organize all course materials: class notes, handouts, homework, pre-lab assignments, quizzes, etc.

The following course materials are optional:

- Scientific calculator
    - Graphing functionality is not necessary.
    - Many cell phones have calculator apps that include basic scientific functionality.
    - Scientific calculators may be purchased on Amazon for under $30.
- Personal set of colored pencils
    - Colored pencils allow you to (1) create clear, detailed, and colorful diagrams of scientific concepts, making them easier to understand and remember, (2) color-code notes and charts, helping organize information visually, making it easier to review and study, and (3) highlight key concepts or important data, drawing attention to crucial information, aiding in better retention.
    - A class set of colored pencils will be provided by Bright Minds.

Prerequisites

- Completion of general science
    - A solid foundation in general science, usually covered in earlier grades, is essential.
- Mathematics proficiency
    - Algebra skills are required, as chemistry involves mathematical calculations and understanding formulas.
- Introductory physical science
    - A course in physical science (or introductory physics) can be helpful, as it provides background knowledge relevant to chemistry concepts.

Assessment and Evaluation

Additional details regarding these assessments and evaluations, along with a complete course schedule, will be provided in class.

- Homework Assignments
- Laboratory Reports
- Projects and Presentations
- Quizzes and Tests
- Final Exam

Expectations

These guidelines will help create a productive and safe learning environment where everyone can thrive and succeed in their studies.

Conduct

- Respectful Behavior
    - Respect your instructor, classmates, and classroom environment.
    - Listen attentively and follow instructions promptly.
    - Maintain a positive attitude about life and learning.
    - Refrain from disruptive behavior.
- Preparedness
    - Bring necessary materials to class (e.g., textbooks, notebooks, calculators, pencils).
    - Complete assignments on time.
    - Be punctual and ready to participate.

- Communication
    - Ask questions when you need clarification.
    - Participate in class discussions respectfully.
    - Inform the instructor of any issues or concerns.
- Technology
    - Electronic devices will be used for academic purposes only.
    - Cell phones will not be needed for class and are expected to be put away for the entirety of the class period, unless stated otherwise by the instructor.
- Safety
    - Follow all safety guidelines during laboratory activities.
    - Wear appropriate clothing to class and PPE (personal protective equipment) as required.
    - No eating, drinking, or unauthorized experiments in the lab.
- Academic Integrity
    - No cheating or plagiarism.
    - Collaborate ethically on group projects.
    - Cite sources properly in reports and assignments.

Performance

- Participation
    - Engage in class activities, discussions, and labs.
    - Work cooperatively in group settings.
    - Contribute meaningful input to group projects.
- Assignments
    - Submit homework, lab reports, and projects on time.
    - Ensure all work is neat, organized, and demonstrates thorough effort.
    - Seek help if you are having difficulty with the material.
- Laboratory Skills
    - Conduct experiments with precision and accuracy.
    - Record observations and data systematically.
    - Analyze results and draw logical conclusions.

NGSS Standards Alignment

Next Generation Science Standards

Science and Engineering Practices	
Asking questions and defining problems	X
Developing and using models	X
Planning and carrying out investigations	X
Analyzing and interpreting data	X
Using mathematics and computational thinking	X
Constructing explanations and designing solutions	
Engaging in argument from evidence	
Obtaining, evaluating, and communicating information	X

Crosscutting Concepts	
Patterns	
Cause and effect	X
Scale, proportion, and quantity	X
Systems and system models	
Energy and matter	X
Structure and function	X
Stability and change	X

Disciplinary Core Ideas
HS-PSC-1.1 Develop models to describe the atomic composition of simple molecules and extended structures.
HS-PSC-1.2 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PSC-1.5 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
PS-PSC-2.1 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
HS-PSC-2.2 Develop a model to illustrate that the energy transferred during an exothermic or endothermic chemical reaction is based on the bond energy difference between bonds broken (absorption of energy) and bonds formed (release of energy).
HS-PSC-2.4 Use mathematical representations to support the claim that the number and type of atoms, and therefore mass, are conserved during a chemical reaction.