

CHEMISTRY

Key Features

Focus Areas

- elements, chemical reactions, and bonds,
- conservation of mass,
- conservation of energy, and
- nuclear processes.

By the end of Chemistry studies, students can

- 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.
- Explain simple chemical reactions based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
- Explain the structure, properties, and transformations of matter, as well as the contact forces between material objects due to the attraction and repulsion between electric charges.
- Support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
- Provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
- Illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

Home to School Connections

Questions you can ask your learner could include:

- What elements are in products we use daily?
- Why do some clothes stick together when they come out of the dryer?
- How does a spark trigger the explosion of fireworks?

- How is energy transferred?
- Why are gamma rays harmful to human cells?
- What is the difference between fission and fusion?

Questions you can ask your learner's teacher could include:

- What math concepts are utilized in chemistry?
- What safety precautions are taken in the laboratory?
- What kind of post-secondary educational and career opportunities could this course inspire my learner to explore?

Activities and learning you can do outside of the classroom to support your learner could include:

- Place one type of candy in different liquids to observe reaction rates. Liquids could include water, clear soda, vinegar, salt water, baking soda water or dish soap water. You can also try different types of candy in the various liquids to see if any react more than others. Discuss the ingredients of the candy and how you know that a reaction is taking place.
- Boiling water can be used as a talking point for water surface tension, strength of forces between particles, boiling point, and the movement of the H₂O molecules. Use a thermometer to measure the temperature of water before, during and after it boils.
- Making ice cream in a bag demonstrates a change in temperature with a chemical reaction. Discuss how an ice cream machine makes the process easier and more efficient with an increase in the number of products and a decrease in temperature.
- Adhesive toe warmers and glow sticks are two examples of chemical reactions contained within a system. Describe what happens during the reaction.
- Research how nuclear power provides energy for electricity in our homes.
- The Manhattan Project was created to develop nuclear weapons. Read and view information on the project to gain a clearer understanding of the nuclear process and the impact on society.

- Pharmaceuticals (medicines) are designed with a specific molecular structure for a specific function in the body.
- Products are manufactured with a specific chemical structure to serve a particular function. Identify products in your daily life that demonstrate molecular interaction such as diapers, oil absorbing sheets for the face, water filters.
- There is a multitude of technology used for diagnosis and treatment of medical conditions. Some examples include x-rays, computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine, positron emission tomography (PET), ultrasound, and electromagnetic radiation. Discuss the chemistry behind these various technologies and how they are used to maintain the health of individuals.

Resources

- American Chemical Society (ACS) High School Chemistry Resources (<https://www.acs.org/education/resources/highschool.html>)
- Bozeman Science (<https://www.bozemanscience.com/>)
- ChemCollective (<https://chemcollective.org/>)
- CK-12 Foundation (<https://www.ck12.org/student/>)
- Discus (<https://www.scdiscus.org/>)
- Exploratorium (<https://www.exploratorium.edu/>)
- Khan Academy (<https://www.khanacademy.org/>)
- PBS LearningMedia (<https://scetv.pbslearningmedia.org/>)