

Unit 3 - Atomic Structure and Electrons

Content Area: **Science**
Course(s): **Chemistry CP**
Time Period: **November**
Length: **6 weeks**
Status: **Published**

Transfer Skills

Identification of atomic particles and describe their interrelationships. Electrons determine the important chemical properties and behavior of atoms. Students will learn about history of the atom, chemists and their theories, the parts of the atom, ions and isotopes, quantum mechanical model, electron configurations and the rules about writing them, wavelength, frequency, energy, photons, and the electromagnetic spectrum.

Enduring Understandings

The modern model of the atom has evolved over a long period of time through the work of many scientists.

All matter is made of atoms.

The majority of the mass of an atom is in the nucleus.

Each electron has its own distinct amount of energy.

Electron placement drives behavior.

Essential Questions

How has the model of the atom evolved?

How does the structure and composition of the atom influence its chemical and physical properties?

How are atoms of one element different from atoms of another element?

How does the electron behave?

How does the quantum mechanical model describe the arrangement of electrons in atoms?

What happens when electrons in atoms absorb or release energy?

Content

Cathode ray, isotope, atomic number, mass number, electron cloud model, atomic orbital, Auf Bau principle,

Pauli Exclusion, Hunds Rule, Lewis Dot, Valence electron, ground state, Heisenberg uncertainty principle, quantum mechanical model, wavelength, frequency, photon, photoelectric effect, electromagnetic spectrum

Skills

Explain the structure of matter using Dalton's Theory and Bohr's Model, Rutherford, and Thompson theories

Deduce and infer atomic structure data from the periodic table.

Compare protons, neutrons, and electrons with regard to mass, charge, and location in the atom.

Distinguish between atoms, ions, and isotopes.

Given the wavelength of an electromagnetic wave, calculate the frequency and vice versa.

Calculate the energy of a photon associated with a given wavelength or frequency.

Write the electron configuration of elements.

Resources

Standards

SCI.9-12.5.1.12.A.1	Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
SCI.9-12.5.1.12.B.1	Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.
SCI.9-12.5.1.12.B.2	Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.
SCI.9-12.5.1.12.B.3	Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.
SCI.9-12.5.1.12.B.4	Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.
SCI.9-12.5.2.12.A.1	Use atomic models to predict the behaviors of atoms in interactions.
SCI.9-12.5.2.12.A.4	Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes.
SCI.9-12.5.2.12.A.b	Differences in the physical properties of solids, liquids, and gases are explained by the ways in which the atoms, ions, or molecules of the substances are arranged, and by the strength of the forces of attraction between the atoms, ions, or molecules.
SCI.9-12.5.2.12.A.d	In a neutral atom, the positively charged nucleus is surrounded by the same number of

negatively charged electrons. Atoms of an element whose nuclei have different numbers of neutrons are called isotopes.

SCI.9-12.5.2.12.B.1

Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form.

SCI.9-12.5.2.12.B.a

An atom's electron configuration, particularly of the outermost electrons, determines how the atom interacts with other atoms. Chemical bonds are the interactions between atoms that hold them together in molecules or between oppositely charged ions.

SCI.9-12.5.2.12.B.b

A large number of important reactions involve the transfer of either electrons or hydrogen ions between reacting ions, molecules, or atoms. In other chemical reactions, atoms interact with one another by sharing electrons to create a bond.