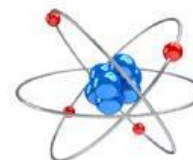


READING COMPREHENSION

The Building Blocks of Matter

ATOMIC STRUCTURE



The universe is made up of **Matter** and **Energy**. Atoms are the basic units of matter. Understanding atomic structure is like unlocking the secrets of the universe.

WHAT ARE ATOMS?

Atoms are **submicroscopic particles** that uniquely define chemical elements. They are made up of smaller subparticles: **Protons**, **Neutrons**, and **Electrons**. All atoms are not the same. The number of protons in an atom determines what element you have.

PROTONS AND NEUTRONS

The **Nucleus** (plural: nuclei) is the centre of the atom. It is made up of protons and neutrons packed tightly together. **Protons** have a **positive charge**, while **Neutrons** are neutral, they have **no charge**. The number of protons in an atom determines its identity; for example, all hydrogen atoms have one proton, and oxygen atoms have eight.

ISOTOPES

Some chemical elements can have different versions with **varying numbers of neutrons** in their nuclei. These are called **Isotopes**. They have the **same chemical properties**, but their different number of neutrons result in **different atomic masses**.

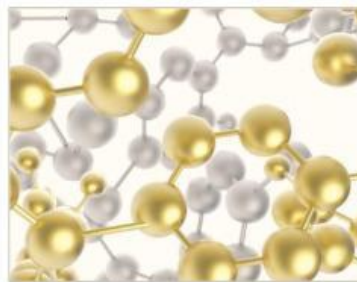
ELECTRONS

Electrons are subparticles with a negative charge. They zoom around the nucleus in **specific energy levels** called **electron shells or orbits**. The **valence shell is the outermost electron shell**. It is especially important because it determines how atoms interact with each other during **chemical reactions** and **bonding**.

THE ELECTRIC FORCE

It is the **attractive force between the electrons and the nucleus**. Particles that have opposite charges attract each other. Particles that have like charges repel each other.

Atoms can bond with each other to form **molecules, crystals, and other structures**. There are different types of bonds, including **covalent bonds** (where atoms share electrons) and **ionic bonds** (where atoms transfer electrons). These bonds create the diversity of materials and substances we find in the world.



An **Ion** is an atom or molecule that has lost or gained one or more electrons, and carry a **net electric charge**. An **Anion** is an atom with a **negative charge**; it has more electrons than protons. A **Cation** is an atom with a **positive charge**; it has fewer electrons than protons.

There are **118 known chemical elements** that have been identified as of 2023. They are organized in a chart called the **Periodic Table**. Each element is represented by a **unique symbol**, like H for hydrogen and O for oxygen. They are **arranged according to their atomic number, electronic configuration and physical and chemical properties**.

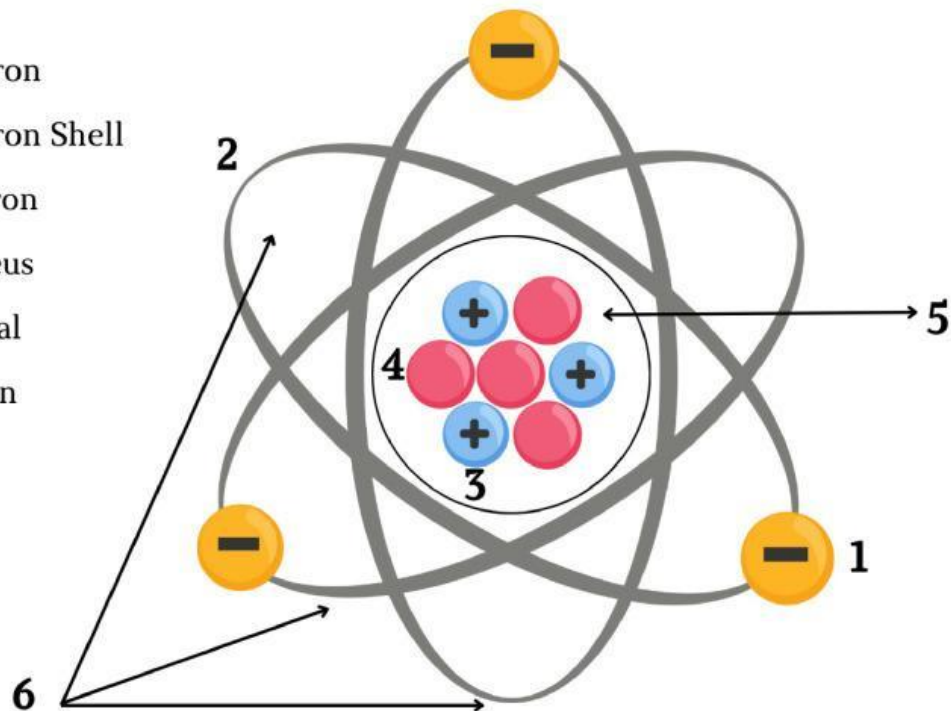
A color-coded periodic table of elements. The elements are arranged in their standard periodic table layout. The colors are: Group 1 (orange), Group 2 (purple), Groups 3-10 (blue), Groups 11-12 (purple), Group 13 (yellow), Group 14 (green), Group 15 (green), Group 16 (green), Group 17 (orange), Group 18 (orange), Lanthanides (blue), and Actinides (blue).

In **Nuclear Fission**, **atoms are split apart**, which releases energy. Nuclear power plants use nuclear fission of uranium atoms. In **Nuclear Fusion**, energy is produced through **joining atoms together**. Hydrogen atoms fuse into helium inside of the sun and the stars.

ATOMIC STRUCTURE

Activity 1. Identify the Parts of an Atom. Write the number next to the word or expression.

- Electron
- Electron Shell
- Neutron
- Nucleus
- Orbital
- Proton



Activity 2. Match the words or expressions with the definitions.

- Positively charged particles found in the nucleus of an atom.
- Neutral particles located in the nucleus of an atom.
- Negatively charged particles orbiting around the nucleus.
- The center of an atom that contains protons and neutrons
- Atom or molecule with a net electric charge due to the loss or gain of one or more electrons.
- A variation of an element that possesses the same atomic number but a different mass number.