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**Chemistry of Life**

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### Introduction

All living organisms, including plants, are composed of various chemical elements and compounds that form the basis of cellular structure and biological functions. These chemical substances interact in a highly organized manner within the cell to maintain life processes such as growth, metabolism, cell division, photosynthesis, and respiration. Therefore, understanding the chemistry of life is essential for studying plant structure and function.

### Chemical Elements in Living Organisms

Living organisms are composed of several chemical elements found in nature, but only a limited number of these elements are present in large amounts in biological systems.

### Major Elements

The four most abundant elements in living organisms are:

Carbon (C)

Hydrogen (H)

Oxygen (O)

Nitrogen (N)



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These elements constitute the majority of the chemical composition of living cells and are essential components of biological molecules.

### **Other Essential Elements**

In addition to the major elements, several other elements are required in smaller quantities but are still essential for life. These include:

Phosphorus (P)

Sulfur (S)

Calcium (Ca)

Potassium (K)

Sodium (Na)

Magnesium (Mg)

Iron (Fe)

These elements play important roles in metabolic reactions, enzyme activity, and maintaining cellular functions.



### Water

Water is the main component of living cells and may constitute about 70–90% of the total weight of plant cells. It acts as an excellent solvent and plays an essential role in transporting nutrients and minerals within the plant.

Water also participates in many biochemical reactions and helps regulate temperature. In plant cells, water maintains turgor pressure, which is important for cell rigidity and plant support. In addition, water is a key reactant in photosynthesis.

### Carbohydrates

Carbohydrates are organic compounds composed mainly of carbon, hydrogen, and oxygen. They are the primary source of energy in living organisms. In plants, carbohydrates are produced during photosynthesis and may be stored as starch. Some carbohydrates have structural roles, such as cellulose, which is the main component of the plant cell wall and provides mechanical strength to plant tissues.



### Proteins

Proteins are complex organic molecules made up of amino acids linked together by peptide bonds. They perform many vital functions within cells. Many proteins function as enzymes, which accelerate biochemical reactions necessary for life. Proteins also play structural roles and participate in regulating metabolic activities inside the cell.

### Lipids

Lipids are organic molecules that are insoluble in water but soluble in organic solvents. They include fats, oils, and phospholipids. Lipids serve mainly as energy storage molecules and are important components of cell membranes. In plants, lipids are commonly found in seeds where they serve as an energy reserve during germination.

### Nucleic Acids

Nucleic acids are biological molecules responsible for storing and transmitting genetic information. The two main types are DNA and RNA.



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DNA contains the genetic instructions that determine the characteristics of living organisms, while RNA plays an important role in protein synthesis and the transfer of genetic information within the cell.