Fundamentals of chemistry

matter	Matter refers to anything that has mass and occupies space. It can exist in various states, including solid, liquid, and gas.
elements	Elements are the simplest form of matter that cannot be broken down into simpler substances by chemical means.
atoms	Atoms are incredibly small and are the building blocks of all matter.They consist of a nucleus containing protons and neutrons, with electrons orbiting around the nucleus.

Bonding of atoms

ion	atom or molecule that has gained or lost one or more electrons, resulting in a net electric charge.
cation	When an atom loses electrons, it becomes positively charged
anion	gains electrons, it becomes negatively charged
ionic bond	electrostatic attraction between oppositely charged ions
covalent bond	chemical bond formed by the sharing of electron pairs between atoms.
polar covalent bond	electrons are unequally shared between the two atoms creating a dipole moment
non-polar covalent bond	electrons are equally shared between the two atoms, leading to no significant difference in electronegativity.

Atomic Structure

electrons	Electrons are negatively charged subatomic particles that orbit the nucleus of an atom. They determine the chemical behavior of an element and are involved in the formation of chemical bonds.
neutrons	Neutrons are electrically neutral subatomic particles located in the nucleus of an atom.
protons	Protons are positively charged subatomic particles found in the nucleus of an atom.
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Atomic Structure (cont)

isotopes	isotope refers to variants of an element that contain the same number of protons but differ in the number of neutrons.
atomic number	number of protons in the nucleus of an atom.
atomic mass	determined by the sum of its protons and neutrons.

Organic Substances

Carbohydrates	provide energy that cells require and also contribute to cell structure. basic building blocks are simple sugar molecules
Lipids	triglycerides, phospholipids, steriods, supply energy and build cell parts.

Organic Substances (cont)

Proteins	serve as structural materials, energy sources, hormones, cell surface receptors, and enzymes.

Inorganic Substances

Water	solvent in which chemical reactions occur. water transport chemicals and heat.
Oxygen	releases energy from glucose and drives metabolism
Carbon Dioxide	produced when metabolism releases energy
Salts	Inorganic elements such as iron, magnesium, phosphorus, and sulfur are essential for various cellular functions, including enzyme cofactors, structural components, and energy transfer.

Chemical Reactions

synthesis	A + B → AB
decomp-ostion	AB → A + B
exchange reactions	involves the exchange of atoms or groups of atoms between two compounds.

Cellular Transport

Facilitated Diffusion	Facilitated diffusion uses membrane proteins that function as carriers to move molecules (such as glucose) across the cell membrane.
Active Transport	Moves substances from an area of lower concentration to an area of higher concentration. Requires transport protein pumps and ATP

Cellular Transport (cont)

Hypertonic solution	higher osmotic pressure than body fluids
isotonic	A solution with the same osmotic pressure as body fluids
Hypotonic solution	lower osmotic pressure
Osmosis	movement of water olecules from an area of higher cont. to an area lower cont. across a selectivley permeable membrane.
Filtration	Pushing of molecules through a memebrane containing openings of a certain size

Acids and Bases

Acid	An acid is a substance that can donate a proton or accept an electron pair in reacti-ons.Acids have a pH value less than 7.
Base	substance that can accept a proton or donate an electron pair in reactions.
pH	pH is a measure of the acidity or alkalinity of a solution.
Electr olytes	Electrolytes are substances that dissociate into ions in solution, enabling them to conduct electricity. Both acids and bases can be electrolytes as they produce ions in solution.

Acids and Bases (cont)

Buffers	A buffer is a solution that resists changes in pH when an acid or base is added to it. Buffers are typically composed of a weak acid and its conjugate base, or a weak base and its conjugate acid, and help maintain the pH of a solution within a specific range.

Endocytosis & Exocytosis

Endocy tosis	process by which a cell takes in substances from the external environment. It involves the formation of a small pocket or indentation in the cell membrane, which then engulfs the substance and forms a vesicle around it. This vesicle is then transported into the cell, where the substance can be processed or utilized.

Endocytosis & Exocytosis (cont)

Exocytosis	process by which a cell releases substances to the external enviro-nment. It involves the fusion of a vesicle containing the substance with the cell membrane, resulting in the release of the substance outside the cell. This process is often used to secrete molecules such as hormones, enzymes, or waste products.