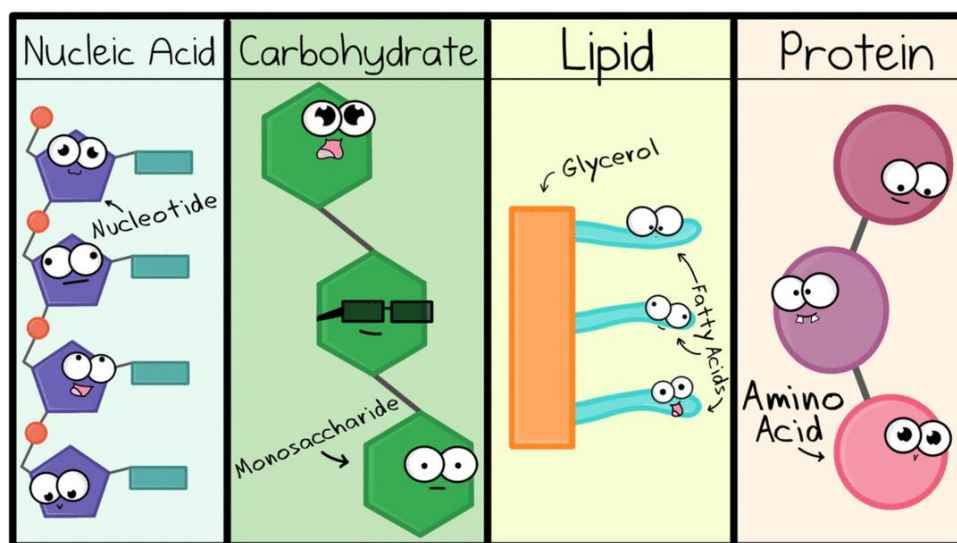


Module 2

The Fundamentals of Building Blocks of Life

- Life can be conceptualized as the coexistence of all living things that adhere to the particular rules of nature as well as the presence of a living thing. The fundamental components of all living things are atoms, molecules at the chemical and biochemical levels and cells at the biological level. Ancient scholars widely held the concept that the entire Universe is made up of tiny, non-divided components like atoms, but the philosophers' viewpoints on the fundamental ingredient varied.
- Nearly all life forms are largely composed of just four fundamental elements: hydrogen, oxygen, nitrogen, and carbon. Organic materials, which have carbon elements, make up life. Carbon is necessary for life because it combines with other atoms to produce huge, complex compounds like protein, carbohydrates, lipids, and nucleic acid.
- Proteins serve as the building blocks for cellular growth, maintenance, and reproduction in living things. They are incredibly diverse and vital to life. Proteins are the building blocks of life's tissues, muscles, and other structural elements. Furthermore, enzymes, which govern chemical reactions in all living systems, are proteins.
- Carbohydrates and lipids are two other essential macromolecules of living things that are required for life. They largely provide energy for the costs of creation, maintenance, and reproduction.



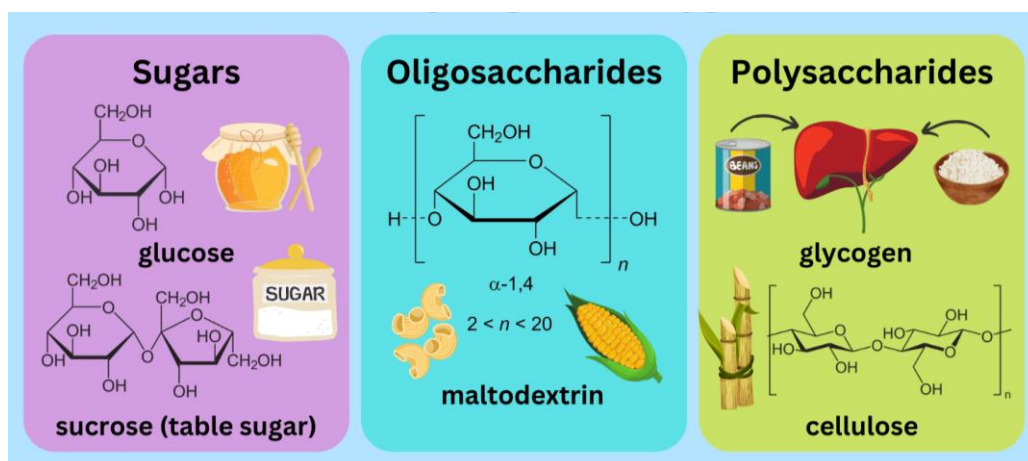
- Nitrogen-based substances are the building blocks of DNA, the blueprint for all life on Earth. Nitrogen is also necessary for life. A nucleotide is the fundamental chemical unit in a nucleic acid, which serves as the basis for both DNA and RNA (ribonucleic acid). Nucleotides, which are composed of a pentose sugar, a phosphate group, and a nitrogen-containing base, are the precursor to nucleic acids.
- DNA is the blueprint for all life on Earth, and all major structures required for life to function and reproduce can be built with the help of DNA.

Unity in Diversity of Life

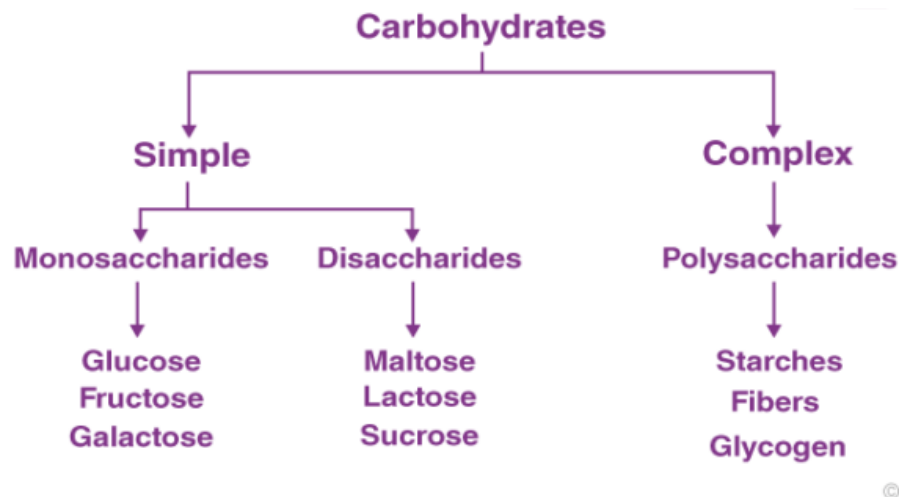
- Despite the diversity of life, there is a fundamental unity in the molecules that make up living organisms.
- All living organisms are made up of cells, which are composed of molecules such as carbohydrates, amino acids (building block of proteins), nucleic acids, and lipids.
- These molecules are used to build and maintain the structure of cells, as well as to carry out the chemical reactions necessary for life.

1. Carbohydrates

- A class of chemical substances known as carbohydrates can be found in foods and living tissues as starch, cellulose, and sugars. Carbohydrates contain oxygen and hydrogen in a 2:1 ratio, just like water. Usually, it decomposes within the body of the animal to release energy.
- Chemically, "optically active polyhydroxy aldehydes or ketones or the compounds which produce units of such type on hydrolysis" is how carbohydrates are defined. This means that carbohydrates are made up of molecules that have a specific chemical structure, with multiple hydroxyl (-OH) groups and either an aldehyde or a ketone group.



- The sucrose disaccharide, which can be obtained from either sugar cane or beets, is the substance that most people refer to as "sugar". Sucrose is made up of glucose and fructose molecules linked together. The sweetest disaccharide is sucrose. It has a sweetness level that is roughly three times that of maltose and six times that of lactose.
- Corn syrup, which is made when the polysaccharides in cornflour are broken down, has recently taken the place of sucrose in numerous consumer products. Corn syrup is primarily composed of glucose molecules, which are only around 70% as sweet as sucrose.
- In addition to sucrose and glucose, other common carbohydrates found in food include fructose, lactose, and maltose. These can be found in fruits, dairy products, and grains, respectively. Carbohydrates are an important source of energy for the body, and they play a critical role in various physiological processes.

Classification of Carbohydrates:**Simple (Small) Carbohydrates:**

- Simple carbohydrates are a type of carbohydrate that consist of one or two sugar molecules, also known as **monosaccharides** and **disaccharides**, respectively. These naturally occurring sugars are found in a variety of foods, including vegetables, fruit, and milk. Honey is a natural sugar alternative that is also considered a simple carbohydrate.
- Because they are less complex than other types of carbohydrates, simple carbohydrates are easier for the body to process. They are derived from foods that are naturally sweet, such as fruits and sugary foods. However, consuming too many simple carbohydrates can lead to certain health issues, such as insulin resistance and weight gain.
- Monosaccharides are the smallest type of simple carbohydrate, as they contain just one sugar unit. Examples of monosaccharides include glucose, fructose, and galactose.

Monosaccharides:

Monosaccharides are a type of carbohydrate that cannot be broken down into simpler units of polyhydroxy aldehyde or ketone. They are the simplest form of carbohydrate and are sometimes referred to as simple sugars.

A monosaccharide is classified as an aldose if it contains an aldehyde group and as a ketose if it contains a keto group. Examples of aldose monosaccharides include glucose and galactose, while examples of ketose monosaccharides include fructose.

Monosaccharides play an important role in cellular metabolism and are a primary source of energy for the body. They are also used in the synthesis of more complex carbohydrates, such as disaccharides and polysaccharides.

Disaccharide:

Disaccharides are a type of carbohydrate that are composed of two monosaccharide units linked together by a glycosidic bond. Upon hydrolysis, the glycosidic bond is broken, and the disaccharide is split into two separate monosaccharides.

The two monosaccharides that make up a disaccharide can be either the same or different. One of the most well-known disaccharides is sucrose, which is composed of glucose and fructose units linked together. When sucrose is hydrolyzed, it breaks down into its constituent monosaccharides of glucose and fructose.

Two other important disaccharides are maltose and lactose. Maltose is composed of two glucose units linked together, while lactose is composed of a glucose unit and a galactose unit linked together. Lactose is often referred to as milk sugar because it is found in milk and dairy products.

In summary, disaccharides are a type of carbohydrate composed of two monosaccharide units linked together by a glycosidic bond. Sucrose, maltose, and lactose are three important disaccharides commonly found in foods.

Complex (Large) Carbohydrates:

- Complex carbohydrates, also known as polysaccharides, are a type of carbohydrate that consist of many sugar molecules linked together in long chains. They are found in foods such as grains, potatoes, and beans, and can be either branched or unbranched.

Polysaccharides

Polysaccharides are a type of complex carbohydrate that consist of many sugar molecules linked together in long chains. They can be classified based on their composition and their function.

Based on composition, polysaccharides can be classified into two main categories: homo- and heteropolysaccharides. Homopolysaccharides are composed of a single type of monosaccharide unit, while heteropolysaccharides are composed of more than one type of monosaccharide unit.

Examples of homopolysaccharides include starch, glycogen, and cellulose. Starch and glycogen are storage polysaccharides found in plants and animals, respectively, while cellulose is a structural polysaccharide found in plant cell walls.

Examples of heteropolysaccharides include chondroitin sulphate, which is found in cartilage, and heparin, which is an anticoagulant found in the body.

Based on function, polysaccharides can be classified into two main categories: structural and storage polysaccharides. Structural polysaccharides provide support and rigidity to cells and tissues, while storage polysaccharides are used to store energy.

Examples of structural polysaccharides include cellulose, chitin, and peptidoglycan. Cellulose is found in plant cell walls, chitin is found in the exoskeletons of insects and crustaceans, and peptidoglycan is found in bacterial cell walls.

Examples of storage polysaccharides include starch and glycogen, which store energy in plants and animals, respectively.

In summary, polysaccharides can be classified based on their composition as homo- or heteropolysaccharides and based on their function as structural or storage

polysaccharides. They play important roles in various physiological processes and are a critical source of energy for the body.

Function of carbohydrates

Carbohydrates are essential for the proper functioning of the body and to provide it with energy. The amount of carbohydrates a person needs may vary depending on their lifestyle, weight, and level of activity. Consuming more complex carbohydrates and fewer refined carbohydrates can help ensure a healthy diet. Making wise carbohydrate choices can also help maintain healthy blood glucose levels and reduce the risk of related health problems.

Carbohydrates serve different functions in body:

- Glucose, also known as blood glucose, is the primary source of energy for the body and is present in the body as rings.
- Fructose, also known as levulose, is found in foods such as fruit, honey, and corn syrup. It enters the small intestine and travels to the liver, where it is processed by the glycolytic pathway to become glucose.
- Lactose is a disaccharide composed of glucose and galactose. It is found in milk and dairy products and is either stored as glycogen or converted into glucose in the liver.
- Ribose is a crucial sugar that is a component of ATP, which provides energy for cellular processes, and other compounds.

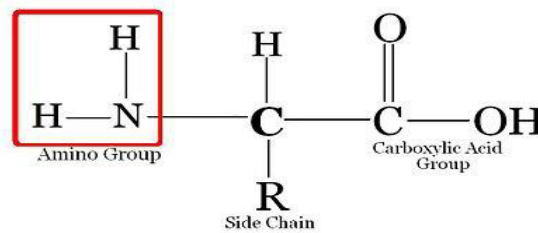
Other important functions in the human body, including:

- Providing energy for the body and maintaining healthy blood glucose levels.
- Preventing the breakdown of fatty acids to avoid ketosis.
- Playing a key role in biological recognition processes.
- Serving as a sweetening and flavouring agent in foods.
- Providing dietary fibre, which is important for healthy digestion and can have other health benefits as well.

2. Proteins

- Proteins are among the most important macromolecules found in living organisms, characterized by their large size and high molecular weight. The term "protein" was coined by Gerardus Johannes Mulder in 1802 and originates from the Greek meaning "of first rank." Proteins constitute the second most abundant component in cells after water, accounting for roughly 12% by weight. As a result, proteins form the majority of a cell's structural framework.
- Chemically, proteins consist of carbon, hydrogen, oxygen, nitrogen and sulphur. Additional elements like phosphorus and others occur in some proteins. Proteins exhibit a high degree of order, comprising linear polymers of amino acids joined by peptide bonds. Polypeptides refer to the linear amino acid polymers that make up proteins. Multiple polypeptide chains may exist within a single protein. Many amino acids in a polypeptide are sequentially linked through a peptide bond (-CO-NH-) formed between the carboxyl and amino groups of successive amino acids.
- Proteins are composed of monomers known as amino acids. Each amino acid contains an amino group (-NH₂), an acidic carboxyl group (-COOH), and a side chain (R group). Amino acids are

referred to as -amino acids due to the presence of the amino group on the carbon adjacent to the carboxylic acid group. In nature, there are 20 different amino acids that can be combined in various ways to create numerous proteins. Each protein has a unique sequence of amino acids.



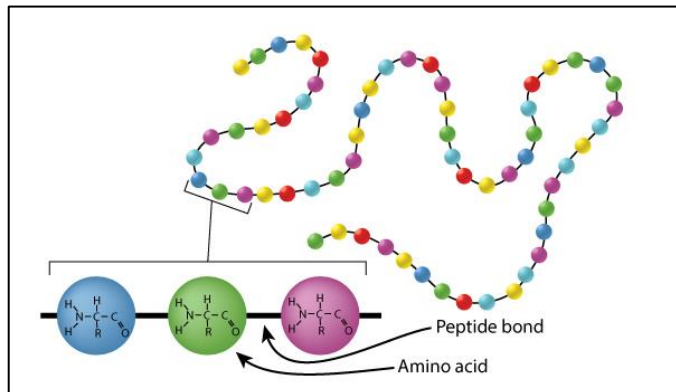
- The body can produce some amino acids, which are referred to as non-essential amino acids. However, there are other amino acids that the body cannot synthesize and must obtain through the diet, which are called essential amino acids. It is important to consume foods that contain these essential amino acids to ensure proper protein synthesis in the body.

Structure Level of Protein (Protein Folding):

Proteins have four distinct structural levels: primary, secondary, tertiary, and quaternary structures.

Primary Structure:

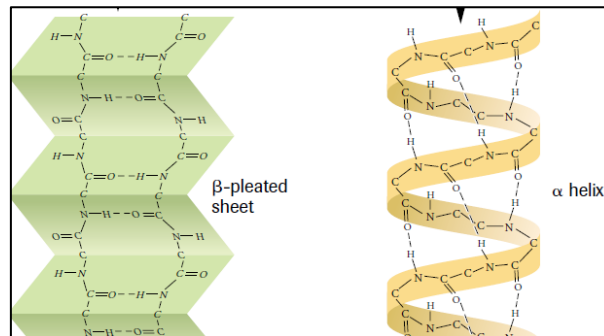
- The primary structure of a protein is determined by the sequence of amino acids in its polypeptide chain. This sequence is determined by the transcription and translation processes used by DNA.
- The primary structure is essential for a protein to function but does not guarantee its functionality. The locations of bends, folds, and connections between various lengths of the chain are determined by the amino acid sequence.



Secondary Structure:

- Polypeptide chains often exhibit a secondary structure that results from predictable coiling or folding. This structure is maintained by intra or intermolecular hydrogen bonds between the amino acids of the same or different polypeptide chains.
- The two types of secondary structure are β -pleated sheets and α -helices. In the α -helix structure, the polypeptide chain is spirally coiled, often in a right-handed way. The helix forms random coils where it is less regular in some locations. In a helix, an amino acid's carbonyl ($\text{C}=\text{O}$) is hydrogen linked to an amino acid's amino H ($\text{N}-\text{H}$) that is four amino acids along the chain.

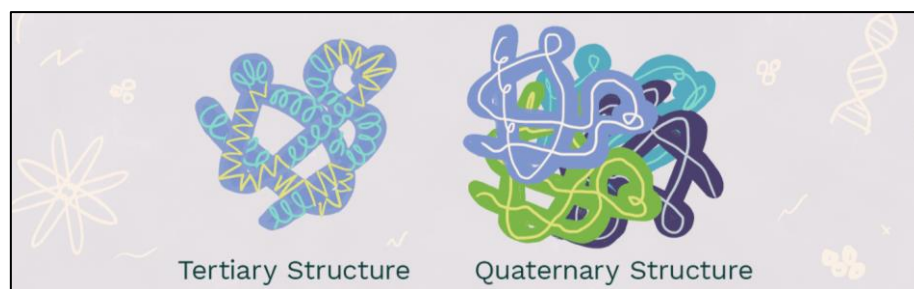
- In contrast, the β -pleated sheet structure occurs when two or more polypeptide chain segments align closely to each other. The structure is maintained by hydrogen bonds between the carbonyl and amino groups of the backbone.



- The term "pleated sheet" or " β -pleated sheet" is frequently used to describe this secondary structure. The evolution, size, and geometry of secondary structure motifs are all heavily influenced by protein secondary structure.

Tertiary Structure:

- The tertiary structure of a protein refers to its overall three-dimensional structure. Further coiling and folding of the helical polypeptide molecules lead to a complex yet distinct structure.
- The protein molecule will flex and contort to find the state with the least amount of energy or maximum stability. Tertiary structure is principally determined by the interactions between the R groups of the amino acids that make up the protein. Hydrogen bonding, dipole-dipole interactions, and hydrophobic interactions produce characteristic shapes, which serve as molecular "safety pins" that firmly connect various polypeptide components. The biological activity of a protein is heavily reliant on its tertiary structure.



Quaternary Structure:

- Some proteins consist of multiple polypeptide chains, or subunits, which combine to form the protein's quaternary structure. The quaternary structure is present in large proteins such as hemoglobin, which has two α -chains and two β -chains, totaling four chains.

Functions of Proteins:

Proteins perform a number of functions in organisms. The main functions of proteins are as follows:

- **Structural Proteins:** Many proteins serve as building materials of cells and tissues. They take part in the formation of colloidal complex of protoplast, cell membranes, organelles, extracellular matrices, and fibres. Some proteins form supporting structures, e.g., elastin of ligaments, collagen of tendons, cartilages, bone, and connective tissue. Keratin is the major constituent of external protective structures of animals like hair, feathers, horny layers of skin, nails, claws, hoofs, etc.
- **Enzymes:** Many proteins function as enzymes to catalyze biochemical reactions that occur in the living world. Enzymes play a key role in metabolism. Every enzyme is specific in action, e.g., amylase, protease, RuBisCO (Ribulose-1,5-bisphosphate carboxylase/oxygenase), which is the most abundant enzyme found in plants and the principal enzyme involved in photosynthesis.
- **Carrier Proteins (Transport Proteins):** Some proteins act as carriers that bind and transport specific molecules across a membrane or in a body fluid. Haemoglobin of RBCs transports oxygen in the body. RBCs contain haemoglobin (Hb), which is made up of 4 polypeptide chains and contains an iron ion. Iron has a strong affinity for oxygen.

In the lungs, oxygen combines with haemoglobin to produce oxyhaemoglobin. In body cells, oxygen is released and is able to diffuse into body cells. Other examples include proteins such as myoglobin of muscles, which store oxygen, α -globulin of blood, which carries thyroxine and bilirubin, and β -globulin, which transports vitamins A, D, and K, cholesterol, and ions in the blood.

- **Receptors Proteins:** A number of proteins present on the external surface of the cell membrane act as receptor molecules. A receptor protein molecule receives chemical signals from outside a cell. When such chemical signals bind to a receptor, they cause some form of cellular/tissue response.

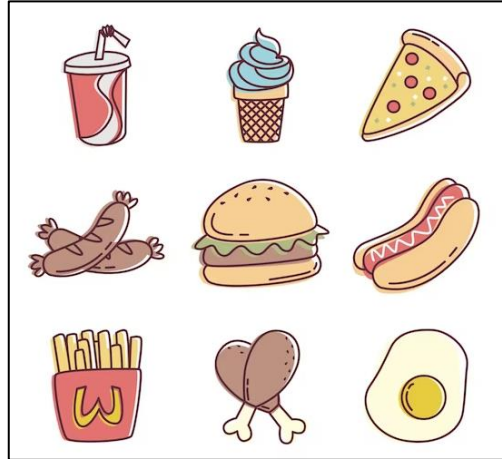
For example, when insulin is released in the blood, the receptor proteins present on cell membranes bind with this insulin. This binding changes the permeability of the cell membrane, and glucose can enter the cell through glucose channels.

- **Hormones:** Some hormones are proteinaceous, e.g., insulin (sugar metabolism-regulating hormone) and parathyroid hormone (calcium and phosphate transport-regulating hormone). Hormones play a key role in the regulation of metabolism.
- **Contractile Proteins:** Myosin and actin make the muscle fibres contractile to bring about movements and locomotion. The contractile system is basically made up of the protein actin, but association with myosin is essential for contraction.
- **Defensive Proteins:** Some proteins act as antibodies (immunoglobulins) that participate in the defence mechanism of the body.
- **Storage Proteins:** These occur in milk, eggs, and seeds to nourish the young ones. They include casein of milk, albumin of egg white, and glutelin in cereals.

3. Lipids

The framework for the construction and operation of living cells is composed of lipids, which are organic molecules containing hydrogen, carbon, and oxygen atoms. Lipids play a crucial role in the body, making it essential to understand their structure and function to solve several metabolism-related problems.

- They constitute 18-25% of adult body mass and are hydrophobic due to their insolubility in polar solvents like water. Fatty substances, lipids serve several purposes in the body. They form a part of cell membranes and aid in regulating the entry and exit of molecules from cells. Lipids also support hormone production, vitamin absorption, and energy movement and storage.
- Lipid metabolism involves oxidizing fatty acids to generate energy and synthesizing new lipids from smaller molecules. This metabolism is associated with carbohydrate metabolism as glucose products are converted into lipids.
- Lipids play an important role in biological systems because they are a major component of the cell membrane, which acts as a mechanical barrier that separates a cell from its surroundings and regulates the exchange of molecules between the cell and its environment.



Some crucial properties of lipids are:

- Lipids are greasy or oily nonpolar molecules that are stored in fat cells in the body.
- A diverse class of substances known as lipids is mostly made up of hydrophobic tails and a polar head group.
- Lipids are organic compounds that are a source of energy and contribute to several living processes.
- Lipids are a class of chemicals that are characterized by their solubility in nonpolar solvents and insolubility in water.

Types of Lipids:

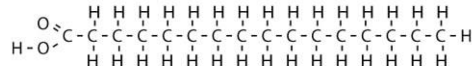
Lipids are classified into two main categories: simple lipids and complex lipids. Triglycerides are a type of simple lipid, while phospholipids, waxes, and steroids are all types of complex lipids.

1. Triglycerides: Fats and oils (simple lipid)
2. Phospholipids and sphingolipids (complex lipid)
3. Steroids (complex lipid)
4. Waxes (complex lipid)

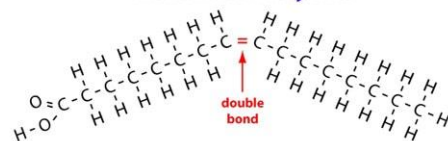
Triglycerides: Triglycerides are a type of simple lipid that are composed of a glycerol molecule and three fatty acids. They are the most common type of lipid found in the body and are primarily used as a source of energy.

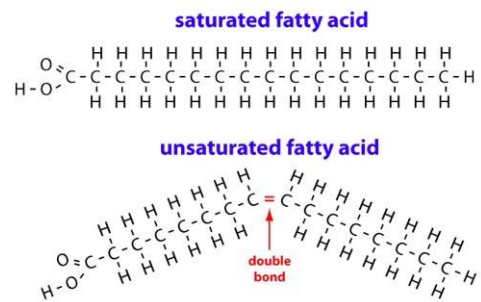
- Triglycerides can be classified into two main types based on the type of fatty acids they contain: saturated and unsaturated. Saturated triglycerides have only saturated fatty acids, which are solid at room temperature and are typically found in animal products such as meat and dairy. Unsaturated triglycerides have one or more unsaturated fatty acids, which are liquid at room temperature and are typically found in plant-based oils such as olive oil and sunflower oil.
- Triglyceride levels in the blood are often measured as part of a lipid profile to assess the risk of cardiovascular disease. High levels of triglycerides in the blood can be a sign of metabolic disorders such as obesity, type 2 diabetes, and metabolic syndrome.
 - Some examples of foods that are high in triglycerides include fatty meats, fried foods, sugary drinks, and processed snacks. Lifestyle changes such as a healthy diet, regular exercise, and weight loss can help to lower triglyceride levels and reduce the risk of health complications.

saturated fatty acid



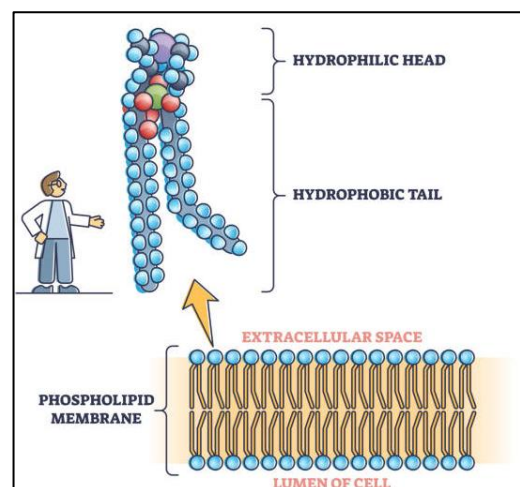
unsaturated fatty acid





Phospholipids:

- Phospholipids are a type of complex lipid and a major component of cell membranes. They have a unique structure with both hydrophobic and hydrophilic regions.
- Phospholipids are found in various biological membranes and play a critical role in maintaining membrane structure and function.
- Sphingolipids are another class of complex lipids that are important components of cell membranes, particularly in nerve tissue.
- They are composed of a sphingosine backbone, a fatty acid chain, and a polar head group, and are involved in several cellular processes such as cell signalling and membrane stability.



Steroids:

- Steroids are a class of complex lipids that play important roles in the body, including regulating metabolism, immune function, and reproductive processes.
- They have a unique structure consisting of four fused rings and vary in the functional groups attached to the rings.
- Examples of steroids include cholesterol, which is important for cell membrane structure and function, and hormone steroids such as testosterone and estrogen, which play roles in sexual development and reproductive function.

- Steroids are synthesized from cholesterol and other precursors in various tissues, including the adrenal glands, ovaries, and testes.
- Abnormal steroid levels or function can lead to a variety of health problems, including metabolic disorders, infertility, and cardiovascular disease.

Wax:

- Waxes are a type of lipid that serve as protective coatings found on the surface of plants and animals. They are composed of long-chain fatty acids and alcohols, and often have a high melting point due to their highly saturated structure.
- Examples of waxes include beeswax, which is produced by honeybees and used to make honeycomb, and carnauba wax, which is derived from the leaves of a Brazilian palm tree and used in various applications such as cosmetics, food, and automotive products.
- In animals, waxes serve a variety of functions such as waterproofing feathers, fur, and skin, and protecting against predators and parasites. In plants, waxes help to prevent water loss and protect against UV radiation, pathogens, and herbivores.

Functions of Lipids:

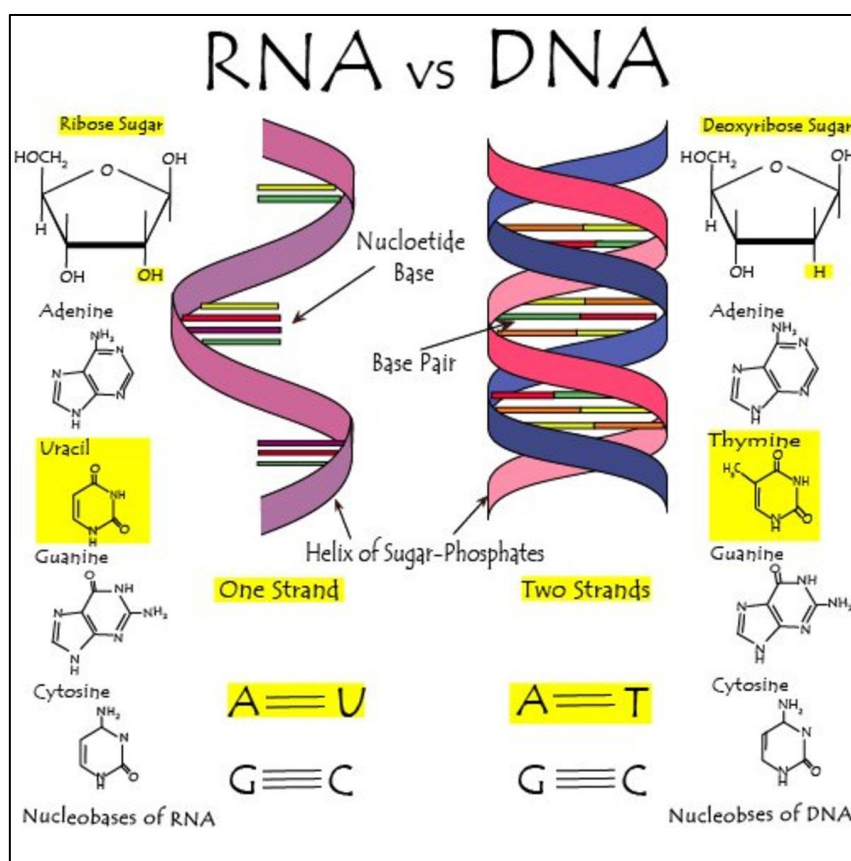
- Lipids provide more than twice as much energy per gram as carbohydrates and proteins.
- Excess dietary carbohydrates, proteins, fats, and oils are stored in adipose tissue, which provides thermal insulation and cushioning for the body.
- Hydrogenation of triglycerides can be used to produce useful products such as cooking oil, and saponification of triglycerides can be used to produce soaps.
- Phospholipids and glycolipids are major constituents of cell membranes and are involved in membrane structure and function. Phospholipids form lipid bilayers.
- Cholesterol is an important steroid that serves as a precursor for the synthesis of other steroids in the body.
- Other important steroids include sex hormones, vitamin D, adrenocortical hormones, bile acids, and bile salts.
- Lipoproteins play an important role in transporting lipids and other molecules in the blood, as well as in protein modification and recognition.
- Waxes form protective coatings on the skin, fur, and feathers of animals, as well as on the leaves and fruits of plants, and can help to prevent water loss and protect against environmental damage.

4. Nucleic acid:

Nucleic acid is a complex biomolecule that is essential for all forms of life. It is present in every cell of an organism and plays a crucial role in the storage and transmission of genetic information. Nucleic acid was first discovered in 1869 by Swiss biochemist Friedrich Miescher, who isolated a substance from the nuclei of white blood cells and named it "nuclein." Nucleic acid is composed of nucleotides, which are the building blocks of the molecule. Each nucleotide is composed of a sugar molecule (either ribose or deoxyribose), a phosphate group, and a nitrogenous base.

Types of Nucleic Acid:

- There are two types of nucleic acid: deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).
- DNA is a double-stranded, helical molecule composed of two complementary strands of nucleotides. Each strand consists of a sugar-phosphate backbone with nitrogenous bases extending from it. The nitrogenous bases in DNA are adenine (A), guanine (G), cytosine (C), and thymine (T). The base pairing in DNA is always A paired with T and G paired with C.



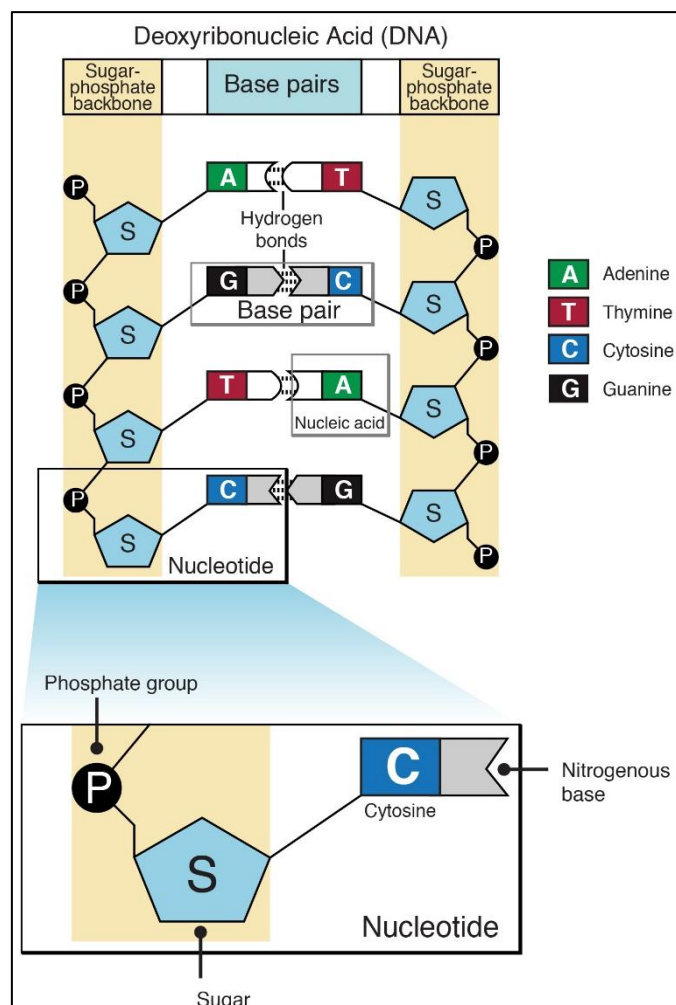
- DNA is the genetic material that carries the instructions for the development and function of all living organisms. It is primarily located in the nucleus of eukaryotic cells and in the nucleoid region of prokaryotic cells.
- RNA is a single-stranded molecule composed of nucleotides. It is involved in various cellular processes, including protein synthesis, gene regulation, and RNA processing. The nitrogenous bases in RNA are A, G, C, and uracil (U), which replaces thymine in DNA. There are several

types of RNA, including messenger RNA (mRNA), transfer RNA (tRNA), and ribosomal RNA (rRNA).

- mRNA is synthesized from DNA in the process of transcription and carries the genetic information from the DNA to the ribosome, where proteins are synthesized.
- tRNA is involved in protein synthesis by carrying amino acids to the ribosome, where they are incorporated into the growing protein chain.
- rRNA is a component of ribosomes, which are the cellular structures responsible for protein synthesis.
- RNA, on the other hand, is single-stranded and can have various structures. It is involved in the synthesis of proteins and carries genetic information from DNA to ribosomes, where proteins are synthesized.

Structure of Nucleic Acid:

- The structure of nucleic acid is based on the arrangement of nucleotides. Each nucleotide consists of a sugar molecule (either ribose or deoxyribose), a phosphate group, and a nitrogenous base.
- The nitrogenous bases in nucleic acid can be either purines (adenine and guanine) or pyrimidines (cytosine, thymine, and uracil). In DNA, the nitrogenous bases are adenine, guanine, cytosine, and thymine, while in RNA, uracil replaces thymine.
- The sugar and phosphate groups in nucleotides form the backbone of the nucleic acid molecule, while the nitrogenous bases extend from the backbone and interact with each other through hydrogen bonds to form base pairs.
- In DNA, the base pairs are always adenine paired with thymine and guanine paired with cytosine. The base pairing in RNA is similar, except that uracil pairs with adenine instead of thymine.



Function of Nucleic Acid:

- Nucleic acids are biomolecules that store and transmit genetic information in cells. They are composed of building blocks called nucleotides.
- There are two types of nucleic acids: DNA and RNA. DNA is double-stranded and contains the genetic instructions for an organism's traits. RNA is single-stranded and is involved in protein synthesis and other cellular processes.
- Nucleotides also have other functions in cells. They act as carriers of chemical energy (such as ATP and GTP) and function as coenzymes for dehydrogenases or oxidases. These processes are important for cellular metabolism and energy production.
- Nucleotides also have a role in cellular communications and signal transduction. They can act as intermediaries in signaling pathways and can regulate gene expression.
- Overall, nucleic acids and nucleotides play a crucial role in the proper functioning of cells and organisms.

In summary, nucleic acid is a complex biomolecule that plays a crucial role in the storage and transmission of genetic information. Its structure and function are intimately linked, and understanding these aspects is crucial for understanding genetics and cellular processes.

Assignment

- Q1. What are carbohydrates and how do they contribute to the body's energy needs?*
- Q2. What are the differences between simple and complex carbohydrates? What are some examples of each?*
- Q3. How do polysaccharides like starch, cellulose, and glycogen differ in structure and function? Where are they found in the body?*
- Q4. What are some health benefits of consuming complex carbohydrates like whole grains, fruits, and vegetables? How can consuming too many refined carbohydrates contribute to health problems?*
- Q5. What are proteins and what are they made of? What are the different levels of protein structure?*
- Q6. What are the two types of secondary structure in proteins? What is the tertiary structure of a protein and what determines it? What is the quaternary structure of a protein and when does it occur?*
- Q7. What are some of the functions of proteins in the body? How do proteins contribute to structural support, enzyme catalysis, transport, and defence?*
- Q8. What are lipids and why are they important in the body? How are lipids classified and what are some examples of each type?*
- Q9. What are phospholipids and why are they important in cell membranes? What are waxes and what are their functions in plants and animals?*
- Q10. How do lifestyle changes such as a healthy diet and exercise affect triglyceride levels in the body?*
- Q11. What is nucleic acid and what is its role in cells? What are the two types of nucleic acid and how do they differ in structure and function?*
- Q12. What are the building blocks of nucleic acid and how are they arranged to form the molecule?*
- Q13. What are some of the functions of nucleic acid and nucleotides in cells, including energy production, cellular communication, and gene regulation?*