

1. What are bio plastic. What are the different types of bio plastic. Explain how PLA bio plastic are manufactured with flow chart

Bio plastics are a type of plastic that is derived from renewable biomass sources, such as plants, rather than fossil fuels. They are considered more environmentally friendly than traditional plastics because they have a reduced carbon footprint and are biodegradable or compostable.

There are several types of bio plastics, but one of the most common ones is called polylactic acid (PLA). PLA is made from fermented plant sugars, usually derived from crops like corn or sugarcane. Here is a simplified flow chart explaining the manufacturing process of PLA bio plastic:

Biomass Extraction: Renewable crops like corn or sugarcane are harvested to extract the plant sugars, which serve as the raw material for PLA production.

Fermentation: The extracted plant sugars are then subjected to a fermentation process using specific microorganisms. These microorganisms convert the sugars into lactic acid through a series of chemical reactions.

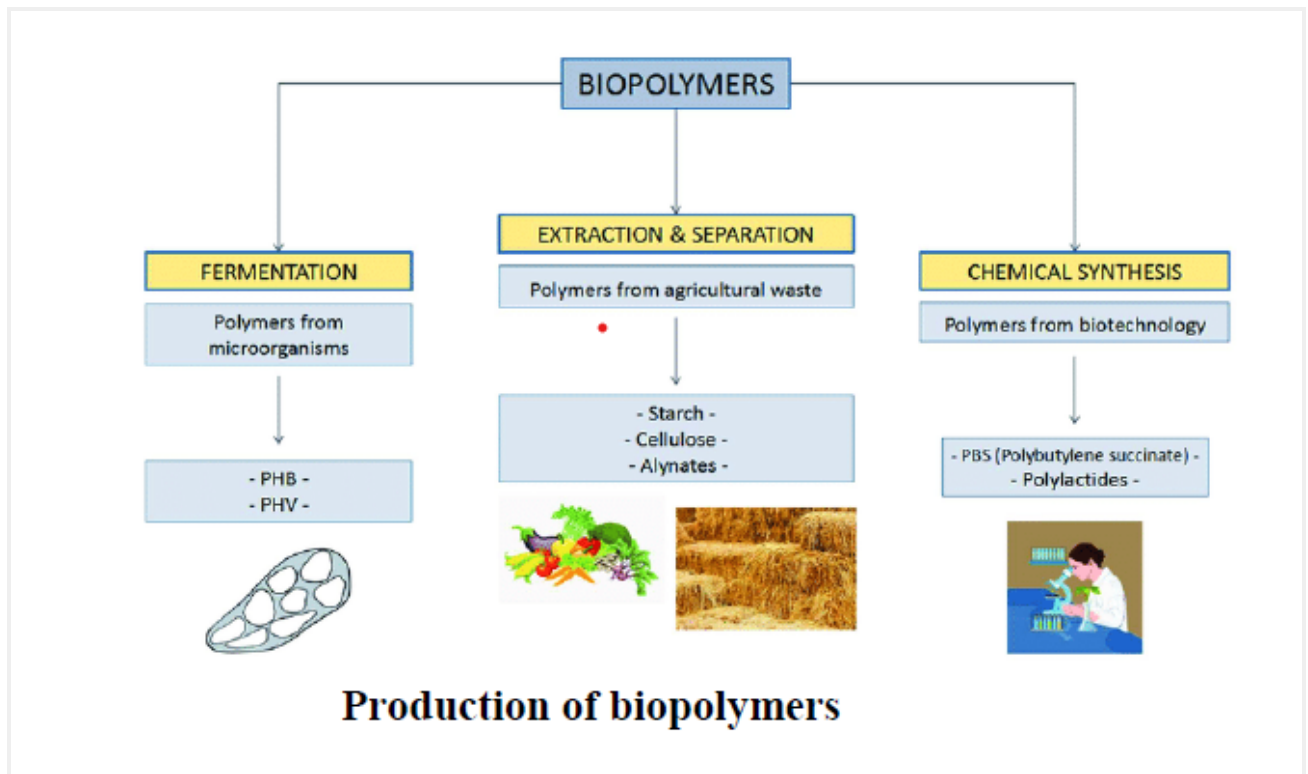
Purification: The lactic acid produced in the fermentation process is purified to remove impurities and unwanted by-products.

Polymerization: The purified lactic acid is further processed through a polymerization reaction. Under controlled conditions, the lactic acid molecules are linked together to form long chains, creating polylactic acid (PLA) polymer.

Pelletization: The resulting PLA polymer is then converted into small pellets or granules, which are easier to handle and transport.

Processing: The PLA pellets can be melted and shaped using various processing methods, such as injection molding or extrusion, to create different products like packaging materials, disposable cutlery, or food containers.

It's important to note that this flow chart is a simplified representation of the PLA bio plastic manufacturing process, and the actual production methods may involve additional steps or variations based on specific requirements or technologies employed by different manufacturers.



2.Explain with a neat sketch how human eye works as a camera system

The human eye functions as a remarkable camera system, allowing us to perceive the world around us. Here is a simplified explanation of how the human eye works, accompanied by a neat sketch:

Cornea: The process begins at the cornea, which is the transparent outer layer of the eye. The cornea helps focus light onto the retina and acts as a protective covering.

Iris and Pupil: Behind the cornea is the iris, which controls the size of the pupil. The pupil is the dark circular opening in the center of the iris that regulates the amount of light entering the eye. In bright conditions, the pupil constricts, and in low-light conditions, it dilates to allow more light in.

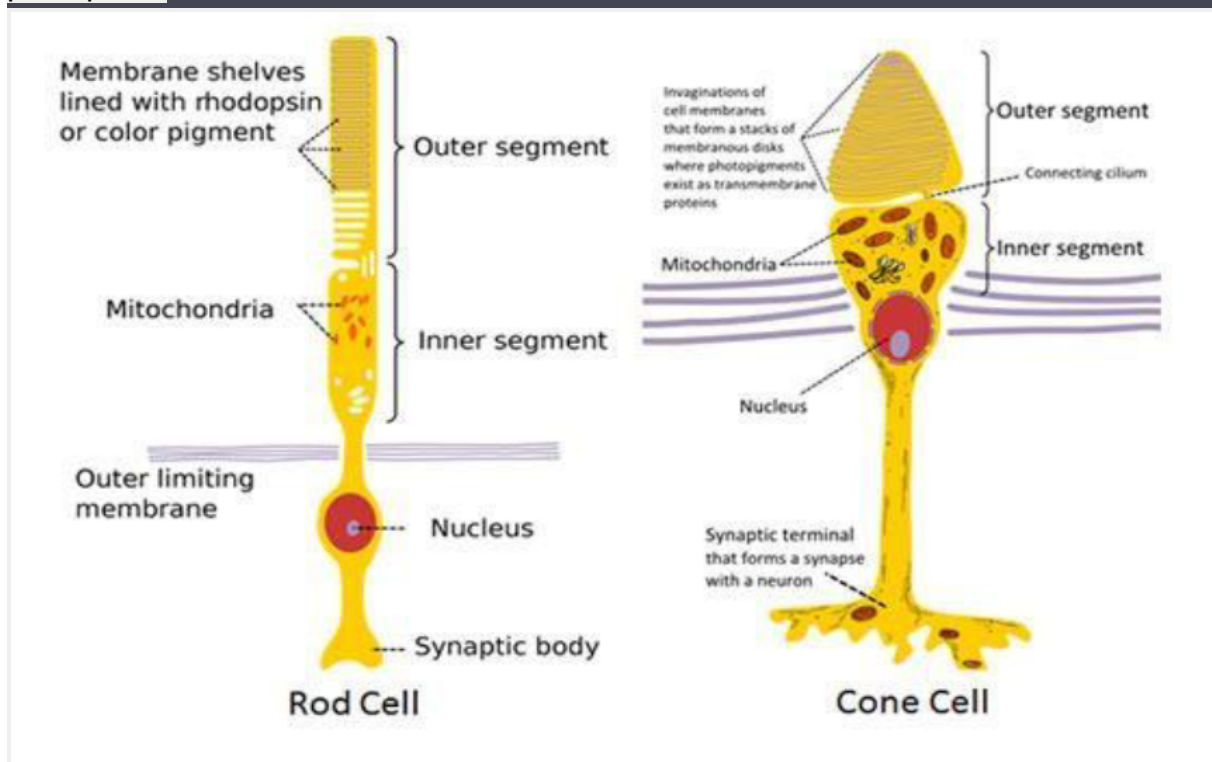
Lens: Light passes through the pupil and reaches the lens, which is located behind the iris. The lens further focuses the incoming light onto the retina. To visualize this, imagine a convex lens that converges light rays.

Retina: The retina is a thin layer of tissue at the back of the eye. It contains millions of light-sensitive cells called photoreceptors, specifically rods and cones. Rods are responsible for vision in low-light conditions, while cones enable color vision and work better in brighter light.

Photoreceptors: The focused light forms an inverted image on the retina, with the help of the lens. Photoreceptors in the retina detect the light and convert it into electrical signals that can be processed by the brain.

Optic Nerve: The electrical signals generated by the photoreceptors are transmitted to the brain through the optic nerve. The optic nerve carries the visual information to the visual cortex in the brain, where it is interpreted, allowing us to see and perceive the world.

This simplified sketch represents the basic components and process involved in the functioning of the human eye as a camera system. However, it is important to note that the actual anatomy and physiological processes in the eye are more complex, involving additional structures and mechanisms to ensure clear vision and perception.



3. What are the application for RT PCR with a near sketch

Real-time polymerase chain reaction (RT-PCR) is a powerful molecular biology technique used to amplify and detect specific DNA or RNA sequences in a sample. It has numerous applications across various fields. Here are some common applications of RT-PCR, along with a sketch illustrating its usage:

Gene Expression Analysis: RT-PCR can be used to measure the expression levels of specific genes in different tissues or under various conditions. It helps researchers understand which genes are active and how their expression is regulated.

Disease Diagnosis: RT-PCR plays a crucial role in diagnosing infectious diseases caused by viruses or bacteria. By detecting the presence of their genetic material, such as viral RNA or bacterial DNA, in patient samples (such

as blood or respiratory secretions), RT-PCR can identify the specific pathogen responsible for the infection.

Viral Load Quantification: RT-PCR enables the quantification of viral or pathogen load in clinical samples. It helps monitor the progression of viral infections, such as HIV or hepatitis, and evaluate the effectiveness of antiviral therapies.

Genetic Testing: RT-PCR is utilized in genetic testing to detect mutations or variations in DNA sequences associated with genetic disorders. It enables the identification of specific genetic markers or mutations, aiding in diagnostic and prognostic applications.

Food Safety and GMO Detection: RT-PCR can be employed to detect genetically modified organisms (GMOs) in food products, ensuring compliance with labeling regulations. It helps verify the presence or absence of specific genetic markers associated with GMOs.

Forensic Analysis: RT-PCR is used in forensic DNA analysis to amplify and detect specific DNA sequences from crime scene samples. It aids in DNA profiling, identification of suspects, and resolving paternity disputes.

The sketch accompanying this explanation can represent a laboratory setting with a thermal cycler, which is the instrument used for carrying out the PCR process. The thermal cycler consists of wells or tubes containing the reaction mixture, including the DNA or RNA template, primers, nucleotides, and DNA polymerase. The thermal cycler's heating and cooling cycles facilitate DNA denaturation, primer annealing, and DNA synthesis, resulting in the amplification of the target sequence. The amplified DNA products can then be detected and analyzed using specialized detection methods, such as fluorescent probes or gel electrophoresis.

4. Explain the various parts of human brain and describe it's functions

The human brain is a complex organ composed of various parts, each with specific structures and functions. Here is an overview of the main parts of the human brain and their associated functions:

Cerebrum: The cerebrum is the largest part of the brain, divided into two hemispheres (left and right) connected by the corpus callosum. It is responsible for higher cognitive functions, such as consciousness, perception, memory, language, reasoning, and problem-solving.

Cerebral Cortex: The cerebral cortex is the outer layer of the cerebrum and plays a critical role in sensory perception, voluntary movement, and higher mental processes. It is divided into four lobes: frontal, parietal, temporal, and occipital lobes.

- **Frontal Lobe:** The frontal lobe is associated with executive functions, decision-making, problem-solving, planning, and motor control.
- **Parietal Lobe:** The parietal lobe processes sensory information, including touch, temperature, and spatial awareness.
- **Temporal Lobe:** The temporal lobe is involved in auditory processing, language comprehension, and memory formation.
- **Occipital Lobe:** The occipital lobe is primarily responsible for visual processing and interpreting visual information.

Cerebellum: The cerebellum is located at the back of the brain, below the cerebrum. It is essential for motor coordination, balance, posture, and skilled movements. It also contributes to cognitive functions like attention and language.

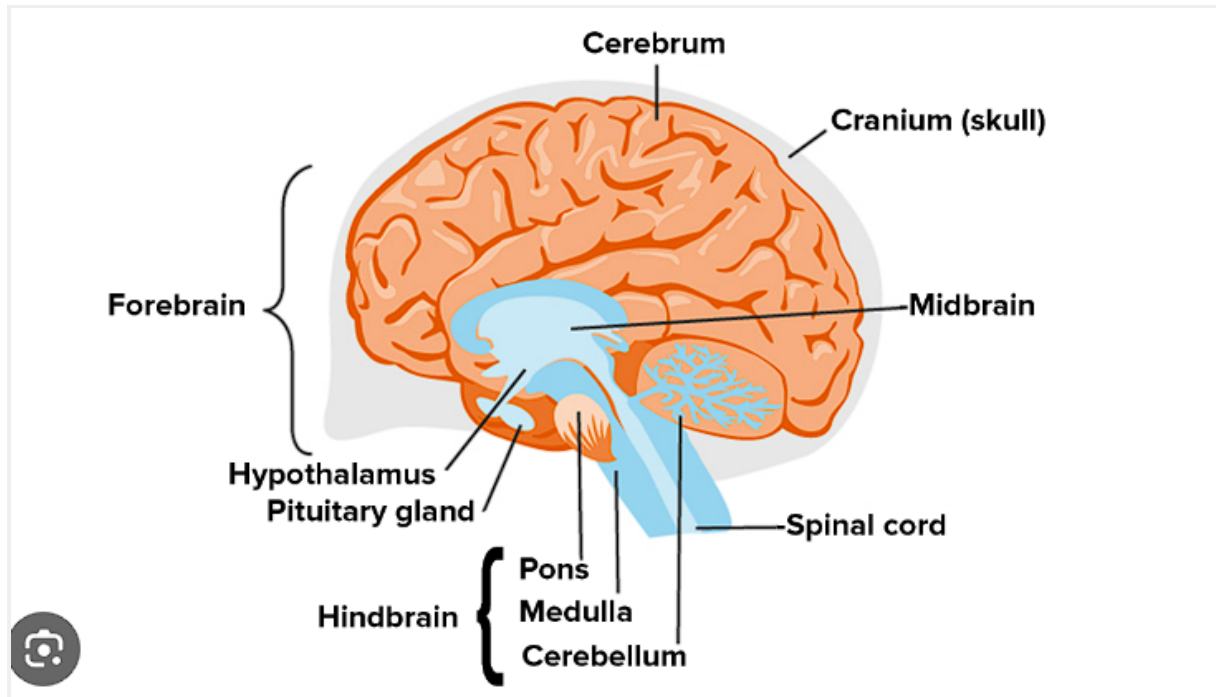
Brainstem: The brainstem is the lower part of the brain, connecting the brain to the spinal cord. It consists of the midbrain, pons, and medulla oblongata.

- **Midbrain:** The midbrain is involved in sensory processing, regulation of sleep and wake cycles, and motor control.
- **Pons:** The pons relays signals between the cerebrum and cerebellum, and it helps regulate breathing, sleep, and facial movements.
- **Medulla Oblongata:** The medulla oblongata controls vital autonomic functions, including heart rate, blood pressure, breathing, and digestion.

Limbic System: The limbic system, located deep within the brain, is associated with emotions, memory, and motivation.

- **Hippocampus:** The hippocampus is vital for memory formation and spatial navigation.
- **Amygdala:** The amygdala plays a crucial role in emotional processing, fear response, and memory consolidation.
- **Hypothalamus:** The hypothalamus regulates various bodily functions, including temperature, hunger, thirst, sleep, and hormone release.
- **Thalamus:** The thalamus acts as a relay station, receiving sensory information and directing it to the appropriate areas of the cerebral cortex.

These are just a few key parts of the human brain and their functions. The brain is a highly intricate organ with interconnected regions, and its functions are often complex and intertwined. Each region collaborates to enable our thoughts, behaviors, emotions, and overall functioning as individuals.



5. Explain the various functions and components of cardio vascular system

The cardiovascular system, also known as the circulatory system, is responsible for the transportation of oxygen, nutrients, hormones, and waste products throughout the body. It comprises the heart, blood vessels, and blood. Here is an explanation of the various functions and components of the cardiovascular system:

Heart: The heart is a muscular organ that acts as a pump, propelling blood throughout the body. It consists of four chambers: two atria and two ventricles. The functions of the heart include:

- **Pumping Blood:** The heart contracts and relaxes rhythmically to pump oxygenated blood to the body's tissues and organs and deoxygenated blood to the lungs for oxygenation.
- **Maintaining Blood Pressure:** The heart generates enough force to ensure proper blood flow and maintain blood pressure to deliver oxygen and nutrients to the tissues.

Blood Vessels: Blood vessels are a network of tubes that carry blood to and from different parts of the body. There are three main types of blood vessels:

- **Arteries:** Arteries carry oxygenated blood away from the heart to the tissues. They have thick, muscular walls that help withstand the pressure generated by the heart's pumping action.

- **Veins:** Veins carry deoxygenated blood from the tissues back to the heart. They have thinner walls compared to arteries and contain valves that prevent backward flow of blood.
- **Capillaries:** Capillaries are tiny, thin-walled vessels that connect arteries and veins. They allow for the exchange of oxygen, nutrients, and waste products between the blood and surrounding tissues.

Blood: Blood is a specialized fluid that circulates throughout the body. It consists of different components:

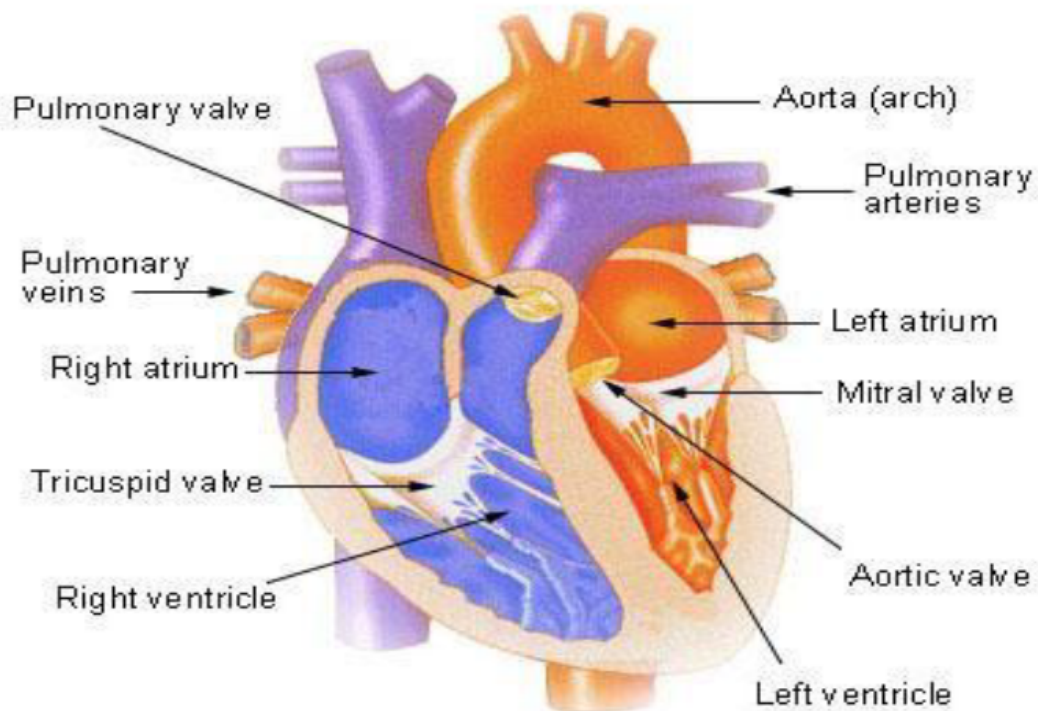
- **Red Blood Cells (RBCs):** RBCs, also known as erythrocytes, carry oxygen from the lungs to the body's tissues and transport carbon dioxide, a waste product, back to the lungs for elimination.
- **White Blood Cells (WBCs):** WBCs, or leukocytes, are involved in the body's immune response, defending against pathogens and foreign substances.
- **Platelets:** Platelets are small cell fragments that help in blood clotting to prevent excessive bleeding when a blood vessel is damaged.
- **Plasma:** Plasma is the liquid component of blood that carries nutrients, hormones, waste products, and other substances throughout the body.

The functions of the cardiovascular system include:

- **Transportation:** The cardiovascular system transports oxygen from the lungs to body tissues and carries carbon dioxide from tissues to the lungs for elimination. It also delivers nutrients, hormones, and other essential substances to cells and removes waste products for excretion.
- **Regulation:** The cardiovascular system helps regulate body temperature, pH balance, and fluid balance by adjusting blood flow and vessel diameter.
- **Immune Response:** The circulatory system aids in the body's immune response by transporting immune cells and antibodies to combat infections and diseases.
- **Blood Clotting:** When a blood vessel is damaged, the cardiovascular system initiates clotting mechanisms to prevent excessive bleeding and promote wound healing.

The components and functions of the cardiovascular system work together to ensure the proper functioning and well-being of the body's cells, tissues, and organs.

Internal View of the Heart



6. What is a bio molecule. Explain major types of bio molecule in detail

Bio molecules, also known as biological molecules, are the building blocks of life. They are the molecules found in living organisms that are essential for their structure, function, and various biological processes. There are four major types of biomolecules: carbohydrates, lipids, proteins, and nucleic acids. Let's explore each type in detail:

Carbohydrates: Carbohydrates are organic compounds made up of carbon, hydrogen, and oxygen atoms. They are classified based on their size into monosaccharides, disaccharides, and polysaccharides. Carbohydrates serve as a primary source of energy and play roles in cell structure and recognition. Examples include glucose, sucrose, and cellulose.

Lipids: Lipids are hydrophobic molecules that include fats, oils, phospholipids, and steroids. They are composed of carbon, hydrogen, and oxygen atoms. Lipids have diverse functions, such as energy storage, insulation, protection, and structural components of cell membranes. Examples include triglycerides, phospholipids, and cholesterol.

Proteins: Proteins are complex biomolecules composed of amino acids linked together by peptide bonds. They consist of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur atoms. Proteins are involved in numerous biological processes, such as enzyme catalysis, transport, structure, defense,

and communication. Examples include enzymes, antibodies, hemoglobin, and collagen.

Nucleic Acids: Nucleic acids are macromolecules that store and transmit genetic information. The two primary types of nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). They consist of nucleotides, which are composed of a sugar, a phosphate group, and a nitrogenous base. DNA carries the genetic instructions for the development, functioning, and reproduction of organisms, while RNA is involved in protein synthesis and gene expression.

- DNA: DNA contains a double helix structure and stores genetic information in the form of a sequence of nucleotides (adenine, thymine, cytosine, and guanine).
- RNA: RNA is single-stranded and involved in various processes, including transcription (mRNA), translation (tRNA, rRNA), and regulation of gene expression.

These four major types of biomolecules work together to support the structure, function, and regulation of living organisms. They interact and participate in biochemical reactions, ensuring the proper functioning of cells, tissues, and organs.

7. Discuss the role of nucleic acid in the human body. With the neat sketch explain the structure of DNA and RNA

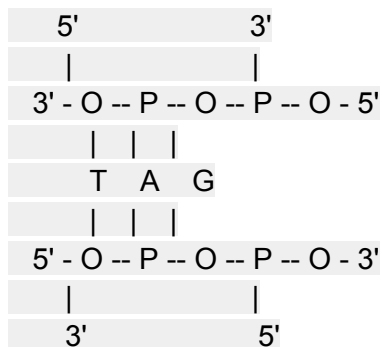
Nucleic acids, specifically DNA (deoxyribonucleic acid) and RNA (ribonucleic acid), play crucial roles in the human body. Here are the key roles of nucleic acids:

Storage and Transmission of Genetic Information: DNA carries and stores the genetic instructions necessary for the development, growth, and functioning of living organisms. It holds the blueprint for the synthesis of proteins and the regulation of cellular activities. During cell division, DNA is replicated and passed on to daughter cells, ensuring the transmission of genetic information from one generation to the next.

Protein Synthesis: RNA is involved in the synthesis of proteins, which are essential for the structure, function, and regulation of cells and tissues. Messenger RNA (mRNA) carries the genetic information from DNA to ribosomes, where proteins are synthesized through a process called translation. Transfer RNA (tRNA) delivers specific amino acids to the ribosomes, enabling the assembly of proteins based on the mRNA template. Ribosomal RNA (rRNA) is a component of ribosomes, which are the cellular machinery responsible for protein synthesis.

Now, let's explore the structure of DNA and RNA:

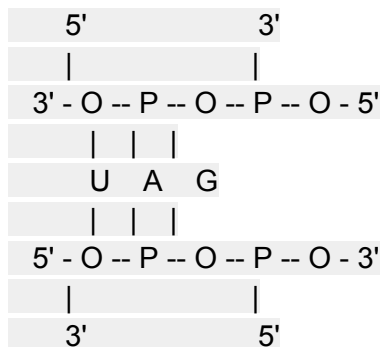
Structure of DNA: DNA has a double helix structure, as illustrated in the following sketch:



DNA consists of two strands that are complementary and antiparallel. The two strands are held together by hydrogen bonds between specific base pairs: adenine (A) pairs with thymine (T), and guanine (G) pairs with cytosine (C).

- The sugar-phosphate backbone runs along the outside of the DNA molecule. The sugar molecule in DNA is deoxyribose.
- The DNA molecule has a 5' (five prime) end and a 3' (three prime) end, referring to the carbon atoms in the deoxyribose sugar.

Structure of RNA: RNA has a single-stranded structure, as shown in the following sketch:



- RNA consists of a single strand of nucleotides. The sugar molecule in RNA is ribose.
- Similar to DNA, RNA also has a 5' end and a 3' end, determined by the carbon atoms in the ribose sugar.
- In RNA, uracil (U) replaces thymine (T) as the complementary base to adenine (A).

The structure of DNA and RNA, with their specific sequences of nucleotides, allows for the storage, transmission, and expression of genetic information in the human body.

