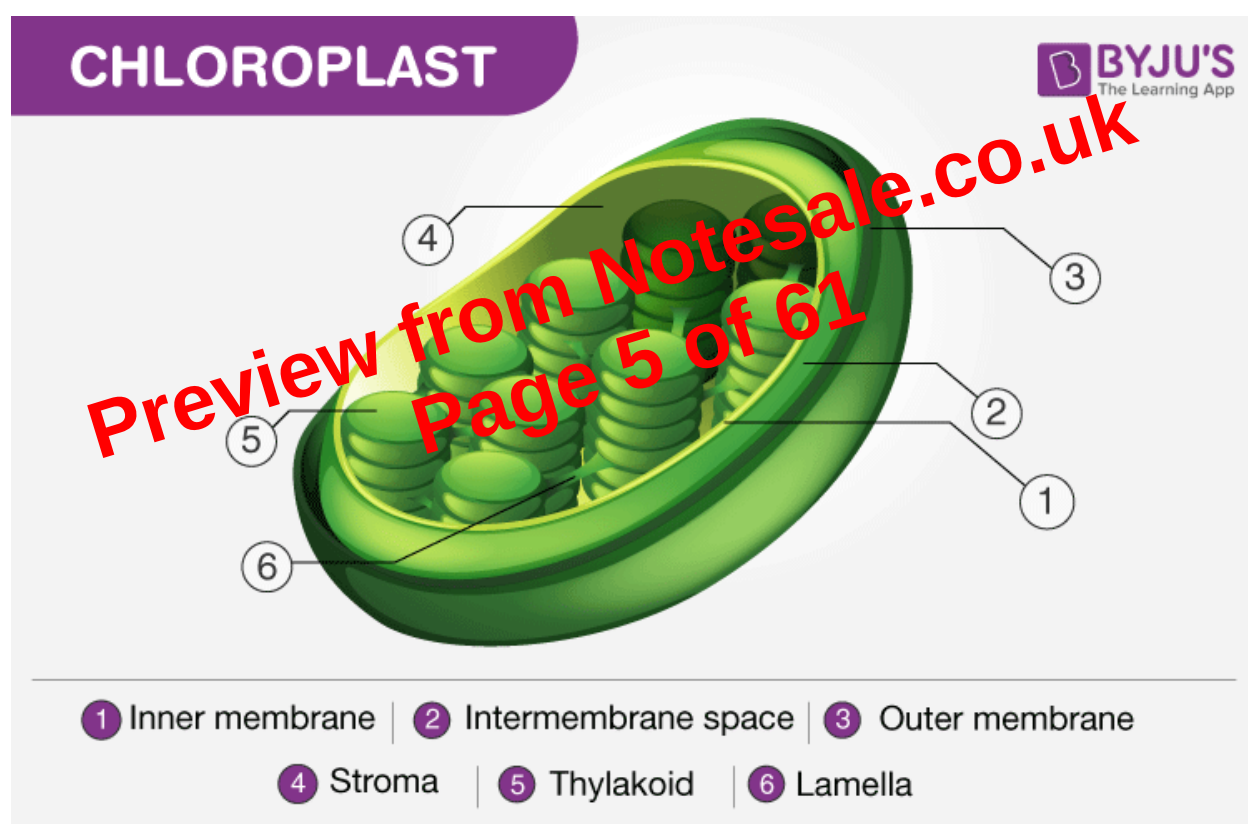


that perform photosynthesis contain various other forms of chlorophyll such as chlorophyll-c1, chlorophyll-c2, chlorophyll-d and chlorophyll-f.

Process of Photosynthesis

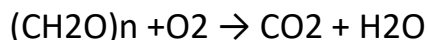
At the cellular level, the photosynthesis process takes place in cell organelles called chloroplasts. These organelles contain a green-coloured pigment called chlorophyll, which is responsible for the characteristic green colouration of the leaves. As already stated, photosynthesis occurs in the leaves and the specialized cell organelles responsible for this process is called the chloroplast. Structurally, a leaf comprises a petiole, epidermis and a lamina. The lamina is used for absorption of sunlight and carbon dioxide during photosynthesis.



“Photosynthesis Steps:”

- During the process of photosynthesis, carbon dioxide enters through the stomata, water is absorbed by the root hairs from the soil and is carried to the leaves through the xylem vessels. Chlorophyll absorbs the light energy from the sun to split water molecules into hydrogen and oxygen.

dioxide through respiration. The role of decomposers is to eat the dead organism and return the carbon from their body back into the atmosphere. The equation for this process is:



Oceanic Carbon Cycle

This is essentially a carbon cycle but in the sea. Ecologically, oceans take in more carbon than it gives out. Hence, it is called a “carbon sink.” Marine animals convert carbon to calcium carbonate and this forms the raw building materials require to create hard shells, similar to the ones found in clams and oysters. When organisms with calcium carbonate shells die, their body decomposes, leaving behind their hard shells. These accumulate on the seafloor and are eventually broken down by the waves and compacted under enormous pressure, forming limestone. When these limestone rocks are exposed to air, they get weathered and the carbon is released back into the atmosphere as carbon dioxide.

Importance of Carbon Cycle

Even though carbon dioxide is found in small traces in the atmosphere, it plays a vital role in balancing the energy and traps the long-wave radiations from the sun. Therefore, it acts like a blanket over the planet. If the carbon cycle is disturbed it will result in serious consequences such as climatic changes and global warming. Carbon is an integral component of every life form on earth. From proteins and lipids to even our DNA. Furthermore, all known life on earth is based on carbon. Hence, the carbon cycle, along with the nitrogen cycle and oxygen cycle, plays a vital role in the existence of life on earth.

Key Points on Carbon Cycle

- Carbon cycle explains the movement of carbon between the earth's biosphere, geosphere, hydrosphere and atmosphere.
- Carbon is an important element of life.
- Carbon dioxide in the atmosphere is taken up by green plants and other photosynthetic organisms and is converted into organic molecules that travel through the food chain. Carbon atoms are then released as carbon dioxide when organisms respire.

Nitrogen Cycle is a biogeochemical process through which nitrogen is converted into many forms, consecutively passing from the atmosphere to the soil to the organism and back into the atmosphere. It involves several processes such as nitrogen fixation, nitrification, denitrification, decay, and putrefaction. Nitrogen gas exists in both organic and inorganic forms. Organic nitrogen exists in living organisms, and they get passed through the food chain by the consumption of other living organisms. Inorganic forms of nitrogen are found in abundance in the atmosphere. This nitrogen is made available to plants by symbiotic bacteria which can convert the inert nitrogen into a usable form – such as nitrites and nitrates. Nitrogen undergoes various types of transformation to maintain a balance in the ecosystem. Furthermore, this process extends to various biomes, with the marine nitrogen cycle being one of the most complicated biogeochemical cycles.

Nitrogen Cycle Explained – Stages of Nitrogen Cycle

The process of the Nitrogen Cycle consists of the following steps- Nitrogen fixation, Nitrification, Assimilation, Ammonification, and Denitrification. These processes take place in several stages and are explained below:

Nitrogen Fixation Process

It is the initial step of the nitrogen cycle. Here, Atmospheric nitrogen (N_2) which is primarily available in an inert form, is converted into the usable form -ammonia (NH_3). During the process of Nitrogen fixation, the inert form of nitrogen gas is deposited into soils from the atmosphere and surface waters, mainly through precipitation. The entire process of Nitrogen fixation is completed by symbiotic bacteria, which are known as Diazotrophs. Azotobacter and Rhizobium also have a major role in this process. These bacteria consist of a nitrogenase enzyme, which has the capability to combine gaseous nitrogen with hydrogen to form ammonia. Nitrogen fixation can occur either by atmospheric fixation- which involves lightening, or industrial fixation by manufacturing ammonia under high temperature and pressure conditions. This can also be fixed through man-made processes, primarily industrial processes that create ammonia and nitrogen-rich fertilizers.

Types of Nitrogen Fixation

- Nitrogen is an integral component of the cell and it forms many crucial compounds and important biomolecules.

Nitrogen is also cycled by human activities such as the combustion of fuels and the use of nitrogen fertilizers. These processes increase the levels of nitrogen-containing compounds in the atmosphere. The fertilizers containing nitrogen are washed away in lakes, and rivers and result in eutrophication.

Conclusion

- Nitrogen is abundant in the atmosphere, but it is unusable to plants or animals unless it is converted into nitrogen compounds.
- Nitrogen-fixing bacteria play a crucial role in fixing atmospheric nitrogen into nitrogen compounds that can be used by plants.
- The plants absorb the usable nitrogen compounds from the soil through their roots. Then, these nitrogen compounds are used for the production of proteins and other compounds in the plant cell.
- Animals assimilate nitrogen by consuming these plants or other animals that contain nitrogen. Human consume proteins from these plants and animals. The nitrogen then assimilates into our body system.
- During the final stages of the nitrogen cycle, bacteria and fungi help decompose organic matter, where the nitrogenous compounds get dissolved into the soil which is again used by the plants.
- Some bacteria then convert these nitrogenous compounds in the soil and turn it into nitrogen gas. Eventually, it goes back to the atmosphere.
- These sets of processes repeat continuously and thus maintain the percentage of nitrogen in the atmosphere.

Frequently Asked Questions

Why is nitrogen important for life?

Nitrogen constitutes many cellular components and is essential in many biological processes. For instance, the amino acids contain nitrogen and form building blocks that make up various components of the human body such as hair, tissues and muscles.

Why do plants need nitrogen?

- Mitosis was discovered by Walther Flamming, while meiosis was discovered by Oscar Hertwig.
- Cytokinesis occurs only in telophase during mitosis, while it occurs in Telophase 1 and telophase 2 during meiosis.
- The primary function of mitosis is general growth and repair. It is also used for cell reproduction.
- Tetrad formation is not observed in mitosis. Tetrad formation is observed in meiosis.
- Meiosis, on the other hand, aims to provide genetic diversity through sexual reproduction.
- Asexual mode of reproduction is observed for mitosis. Sexual mode of reproduction is observed for meiosis.

4. State a few similarities between mitosis and meiosis.

The similarities between mitosis and meiosis are as follows:

- Mitosis and meiosis take place in the cell nuclei.
- Both involve cell division.
- Both the processes occur in the M-phase of the cell cycle.
- In both cycles, the stages are common – prophase, metaphase, anaphase, and telophase.
- Synthesis of DNA occurs in both.

5. Flora and Fauna

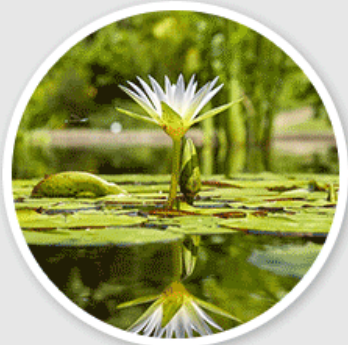
Flora refers to all plant life while fauna refers to all animal life. There are over 8.7 million species of living organisms identified to date and more being discovered every day. Life is so abundant that every nook and corner of the planet is teeming with life.

Introduction to Flora and Fauna

The ecosystem is a complex, interconnected network comprising biotic and abiotic elements. Biotic elements include all living organisms such as plants, animals, and microorganisms. Abiotic components, on the other hand, include non-living entities that are vital for the survival of life and these include soil, water, climate, etc. Among all biotic elements, Flora and Fauna are the most fascinating ones.

Let us have a detailed look at the flora and fauna meaning and their importance.

FLORA AND FAUNA



FLORA
Flora is the plant life occurring in a particular region or time.

FAUNA
Fauna is all of the animal life of any particular region or time.

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Flora and Fauna Meaning

In a nutshell, the term flora relates to all plant life and the term fauna represents all animal life. Let us dive deeper into these terms, exploring their origins and etymologies.

Flora Meaning

The term flora in Latin means “Goddess of the Flower.” Flora is a collective term for a group of plant life found in a particular region. The whole plant kingdom is represented by this name. Flora is classified and differentiated based on many factors. The best one among them is the area in which they grow or are found. Some grow in desert regions or in water, some are found in hilly areas while some are endemic to a specific geographic location. According to the place at which they grow, they have adaptations also. For example, Cactus plants are naturally seen in

deserts. They have adaptations like modified leaves or prickles to preserve water and protect themselves from predators. The agricultural flora consists of plants cultivated by men for their use. Horticulture is the practice of growing ornamental and decorative flowers, which are also known as garden flora.

Fauna Meaning

Fauna represents the animal life indigenous to a region. There are many explanations regarding the origin of the word. As per Roman mythology, Fauna or “Faunus” is the name of the goddess of fertility. Another source is “Fauns” which means “Forest spirits.”

The animal kingdom comprises a variety of animal life forms. Hence, the classification of fauna is much more complex than the floral division. Therefore, for ease of classification;

- Birds are categorized under the name Avifauna.
- Fishes under Pisci Fauna.
- Microorganisms including bacteria and virus are generally considered under the animal kingdom, they are known as Microfauna.
- All unknown and undiscovered animals are named as cryptofauna.

Since time immemorial, there have been accounts of animals that have been thought to exist but have eluded the scientific community, thereby classifying them as cryptofauna or cryptids. Most of these reports are just tall tales but until recently, a few have documented through actual physical evidence and scientific scrutiny. One such example is the colossal squid. This cryptid has been allegedly been sighted since the 17th and 18th century, often being cited in the diaries and logbooks of sailors. It wasn't until the 21st century when conclusive proof was found in the form of a live specimen being entangled in a fishing net. It was taken in and studied by scientists who concluded that it was a new species of squid. Since then, there has been undisputed confirmation about the existence of giant squids. The earth is beautiful because of all these life forms. Other life forms depend on them for various resources and exploit them.

Introduction to the Human Heart

The human heart is one of the most important organs responsible for sustaining life. It is a muscular organ with four chambers. The size of the heart is the size of about a clenched fist. The human heart functions throughout a person's lifespan and is one of the most robust and hardest working muscles in the human body. Besides humans, most other animals also possess a heart that pumps blood throughout their bodies. Even invertebrates such as grasshoppers possess a heart like pumping organ, though they do not function the same way a human heart does.

Position of Heart in Human Body

The human heart is located between the lungs in the thoracic cavity, slightly towards the left of the sternum (breastbone). It is derived from the embryonic mesodermal germ layer.

The Function of the Heart

The function of the heart in any organism is to maintain a constant flow of blood throughout the body. This replenishes oxygen and circulates nutrients among the cells and tissues.

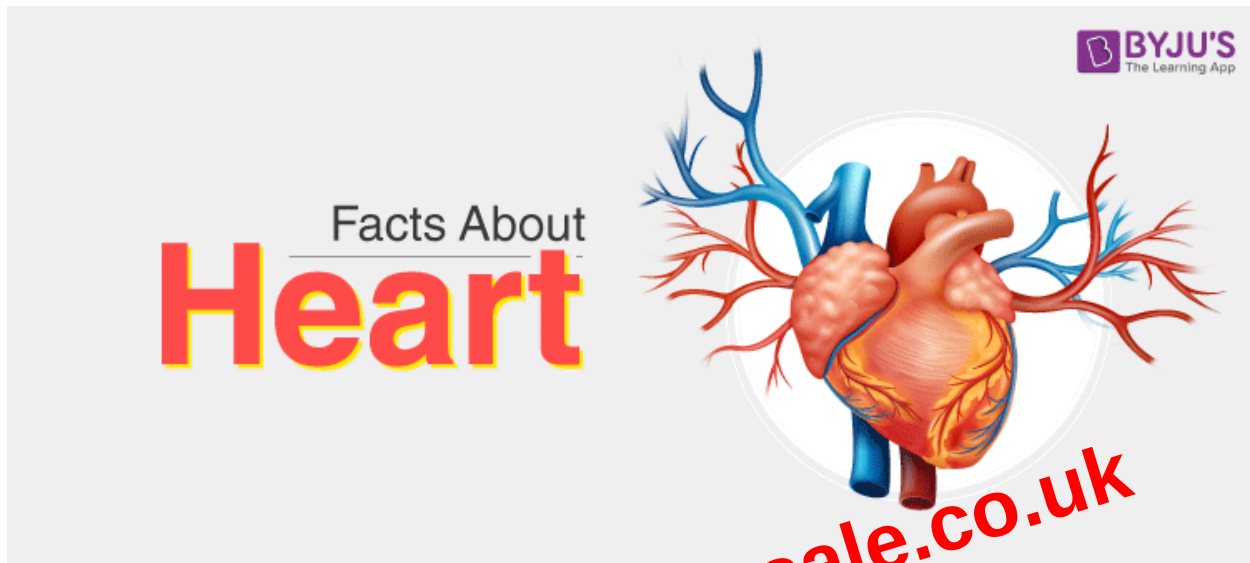
Following are the main functions of the heart:

- One of the primary functions of the human heart is to pump blood throughout the body.
- Blood delivers oxygen, hormones, glucose, and other components to various parts of the body, including the human heart.
- The heart also ensures that adequate blood pressure is maintained in the body

There are two types of circulation within the body, namely pulmonary circulation and systemic circulation.

- Semilunar valves are located between the left ventricle and the aorta. It is also found between the pulmonary artery and the right ventricle.

Facts about Human Heart



- The heart pumps around 6,000-1,500 liters of blood in a day throughout the body.
- The heart is situated at the center of the chest and points slightly towards the left.
- On average, the heart beats about 100,000 times a day, i.e., around 3 billion beats in a lifetime.
- The average male heart weighs around 280 to 340 grams (10 to 12 ounces). In females, it weighs around 230 to 280 grams (8 to 10 ounces).
- An adult's heart beats about 60 to 100 times per minute, and a newborn baby's heart beats at a faster pace than an adult which is about 90 to 190 beats per minute.

Frequently Asked Questions

1. What is pulmonary circulation? Explain.

Pulmonary circulation is a type of blood circulation responsible for carrying deoxygenated blood away from the heart, and to the lungs, where it is oxygenated. The system then brings oxygenated blood back to the heart to be pumped throughout the body.

- Eyes
- Ears
- Nose
- Tongue
- Skin

These five sense organs contain receptors that relay information through the sensory neurons to the appropriate places within the nervous system. The receptors could be classified into two parts viz. the general and special receptors. The former is present throughout the body while the latter includes chemoreceptors, photoreceptors and mechanoreceptors.

