



Q.1 What is Heterotrophic nutrition ,Name It's types with examples

Heterotrophic nutrition: The word 'heterotroph' is derived from two Greek words-heteros (other) and trophe (nutrition). Unlike autotrophes, which manufacture their own food, heterotrophic organisms obtain food from other organisms. As heterotrophs depend on other organisms for their food, they are also called consumers. All animals, non- green plants like and fungi come under this category. Consumers which consume herbs and other plants are called herbivores, and those which consume animals are called carnivores. After taking complex organic materials as food, heterotrophs break them into simple molecules with the help of biological catalysts, i.e., enzymes and utilize them for their own metabolism. Depending upon the mode of living and the mode of intake of food, heterotrophs may be parasitic, saprotrophic or holozoic.

Parasitic nutrition: Parasitic organisms, or parasites, live on or inside other living organisms, called hosts, and obtain their food from them. The host does not get any benefit from the parasite. This mode of nutrition is called parasitic nutrition.

Different parasites, like Cuscuta (akash-bel), hookworms, tapeworms, leeches, etc., have different modes of feeding, depending upon habit, habitat and modifications.

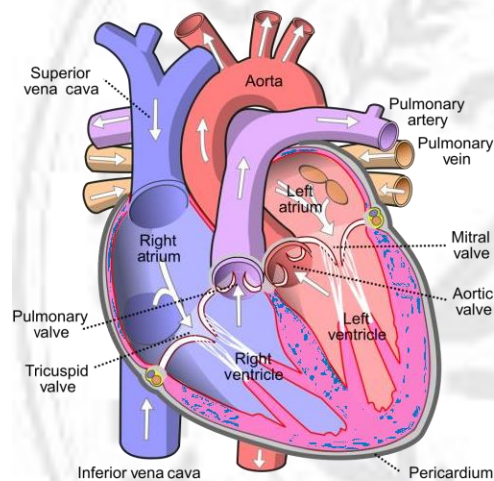
Saprotrophic nutrition: (Gr: Sapro=rotten, Trophic=nutrition) Saprotrophic organisms, or saprotrophes, derive their food from dead and decaying organic material. This mode of nutrition is called saprotrophic nutrition. They secrete enzymes that are released on food material outside their body. These enzymes break down complex food into simple forms. Common examples of saprotrophes are fungi (moulds, mushrooms, yeasts) and many bacteria.

Holozoic nutrition: (Gr:Holo=Whole, Zoikos=of animal) In holozoic nutrition complex organic substances are ingested (taken in) without their being degraded or decomposed. After intake, such food is digested by enzymes produced within the organism. Digested food is absorbed into the body and the undigested product is egested (expelled out) from the body. This kind of nutrition is found mainly in non- parasitic animals-simple ones like Amoeba and complex ones like human beings.

Q.2 Explain the structure of human heart with the help of labeled diagram

Heart:

Heart is the major organ of Circulatory system. It is a muscular pump which keeps the blood circulating through out the body. It is located in the thorax slightly at the left side. It is enclosed in a fibrous bag like protective cover called Pericardium. It is conical in shape externally. The space between pericardium and heart is pericardial cavity which is filled with a fluid called pericardial fluid. This fluid reduces friction and Pericardium protects the heart, prevent it from over extension. Internally, it consists of four chambers, the upper two are thin walled called atria (sing: artrium) the lower two are thick walled called ventricles. Atria are completely separated from each other by a septum called interatrial septum. Similarly, the two ventricles are also separated from each other by a muscular partition called inter-ventricle septum. Each atrium is connected with its ventricle by an auriculo-ventricular aperture. The right atrium and right ventricle are connected by Tricuspid Valve. Similarly, left atrium and left ventricle are connected by bicuspid valve. These valves prevent the backward flow of blood from the ventricles to the atria. Two main blood vessels are arising from ventricles to carry blood from heart to all parts of the body.





Q.3 Write a detailed note on Animal tissues.

Animal tissues: Humans and other large multicellular animals are made up of four basic types of tissue: epithelial tissue, connective tissue, muscular tissue and nervous tissue.

1. **Epithelial tissue:** Epithelial tissue covers the surface of the body, lines the spaces inside the body and forms glands. For instance, the outer layer of your skin is an epithelial tissue and the lining of small intestine are made up of epithelial tissues. Epithelial cells are polarized, means that they have a top and a bottom side.

Simple squamous epithelium is found in the alveoli of lungs, and its structure is important for the exchange of gases between the blood and lungs. Simple cuboidal epithelia line the lumen of collecting ducts in the kidney and are present in the thyroid gland around the follicles that secrete thyroid hormones.

Simple columnar epithelia are found in the female reproductive system and in the digestive tract. Stratified epithelia consist of more than one layer of cells and only one layer is in direct contact with the basement membrane. Stratified squamous epithelia are found in skin, with many dead, keratinized cells providing protection against water and nutrient loss. Stratified cuboidal epithelia are found surrounding the ducts of many glands, including mammary glands in the breast and salivary glands in the mouth. Stratified columnar epithelia are rare, found predominantly in some organs of the reproductive system.

Transitional epithelia are a special subset of stratified epithelia. They are exclusively found in the excretory system.

CONNECTIVE TISSUE:

This tissue which connects or binds the different types of cells called connective tissues. They also bind other tissues of the body with each other. Connective tissue holds structures in the body together, such as tendons. Cartilage is a type of supporting connective tissue. It is a dense connective tissue. Cartilage has limited ground substance and can range from semisolid to a flexible matrix. Bone is another type of supporting connective tissue. Bone can either be compact (dense) or spongy (cancellous), and contains the osteoblasts or osteocytes cells. Adipose is another type of supporting connective tissue that provides cushions and stores excess energy and fat. Blood referred to as connective tissue. It is a type of fluid connective tissue.

Muscle tissues:
Muscle tissue contains the cells that are responsible for the contraction of muscles. There are three types of muscular tissues

i.e. cardiac, smooth, and skeletal.

Skeletal muscle, which is also called striated (striped) muscle, is what we refer to as muscle in everyday life. Skeletal muscle is attached to bones by tendons. For instance, the muscles in your legs and your arms are skeletal muscle. Cardiac muscle is found only in the walls of the heart. Like skeletal muscle, cardiac muscle is striated, or striped. But it's not under voluntary control, so thankfully! you don't need to think about making your heart beat. Smooth muscle is found in the walls of blood vessels, as well as in the walls of the digestive tract, the uterus, the urinary bladder, and various other internal structures. Smooth muscle is un-striated, (unstriated), it is involuntary, not under conscious control. That means you don't have to think about moving food through your digestive tract!

Nervous tissues:

Nervous tissue is composed of neurons, which transmit information to other cells. Nervous tissue is found in the brain, spinal cord, and nerves. It is responsible for coordinating and controlling many body activities. It stimulates muscle contraction, creates an awareness of the environment, and plays a major role in emotions, memory, and reasoning. To do all these things, cells in nervous tissue need to be able to communicate with each other by way of electrical nerve impulses.



Q.4 What is transpiration? Explain the importance of transpiration.

TRANSPIRATION:

Plants absorb water continuously from soil. Some of its quantity is utilized in photosynthesis and other metabolic functions while the rest is retained in the cell to maintain turgidity of the cell. Some water is removed in the form of vapours. This loss of internal water of the plant in the form of vapours from the aerial part of the plant is called transpiration. Transpiration mainly takes place through special pores guarded by specialized guard cells called stomata (sing: stoma).

Significance of transpiration: Transpiration maintains a low concentration of water and a high concentration of solutes in the cell, i.e. high solute potential. The high solute potential of leaf cells attracts more water and draws more water from the xylem. This continuous withdrawal of water from the xylem develops a deficit of water in the xylem which develops a pull or tension called transpiration pull. As a result of this transpiration pull and water attraction for other water molecules, i.e. cohesion of water, water is pulled upward in the xylem vessels through a continuous column called the transpiration stream, which helps in the ascent of sap. By active transpiration, transpiration pull is created which helps in the ascent of sap. The experiment shows that most of the water vapour is lost from the surface where stomata are present. Surface area of leaf is also an important factor for the rate of transpiration, because the larger size leaves

have a high number of stomata which increases the rate of transpiration. Desert plants require to save their water so they have smaller size leaves or their leaves become spines to reduce the number of stomata as well as the rate of transpiration.

Stomata and its opening/closing mechanism: Stomata are the pores usually found in the leaf epidermis surrounded by two kidney-shaped guard cells. These cells contain chloroplasts while other epidermal cells do not. The guard cells control the opening and closing of stomata. The inner wall of guard cells is thick and inelastic whereas the outer wall is thin, elastic and permeable. The changes in the turgidity of guard cells control the opening and closing of stomata. Stomata open when the guard cells become turgid and close when the guard cells become flaccid. The turgidity of guard cells is regulated by the concentration of solutes present in it which mainly depends upon the rate of photosynthesis. Opening and closing of stomata is one of the important factors to control the rate of transpiration. The stomata remain open during the sunny day, as a result the rate of transpiration increases. But at night they are closed, hence transpiration also stops. Fig: 9.5 Diagram showing opening and closing of stoma. Guard cells, Nucleus, vacuole, Chloroplast, Epidermal cell, Inner thick wall, Outer thin wall, Closed Stoma, Opened Stoma. Transpiration also increases the rate of absorption because the loss at one end increases the demand on the other end. Transpiration gets rid of the excess amount of water from the plant. Transpiration helps in maintaining the temperature of the plant for its metabolism and survival because evaporation causes cooling. Opening and closing of stomata is also regulated by transpiration, which indirectly influences upon the rate of photosynthesis and respiration. Every year a number of plants die in hot summer days due to excessive loss of water from aerial parts which results in wilting and dehydration and ultimately may lead to the death of the plant in extreme conditions. Transpiration is considered as a necessary element for the plant due to its advantages which are discussed above but on the other hand, it is also considered as an evil for the plant because millions of plants die every year due to excessive transpiration.



Q.5 What is photosynthesis? Write a detailed note on Light reaction.

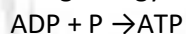
Photosynthesis is the fundamental process in which basic organic molecules and O₂ are reproduced for all bio-molecules and living organisms. This process is carried out by chlorophyll containing organisms like plants, algae, some protozoans and some bacteria. The word photo means light and synthesis means to prepare. Plants utilize simple inorganic molecules carbon dioxide (CO₂) and water (H₂O) which react by using light energy in the presence of pigments like Chlorophyll to form glucose and oxygen.

Light Reaction or Light Dependent Reaction

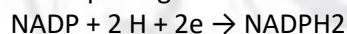
The term light reaction or light dependent reaction is used due to the reason that during this phase of photosynthesis light energy is captured and converted into chemical energy. Some of the light is utilized to split water into oxygen and H⁺ with e⁻ (electrons), this splitting of water is called Photolysis. Oxygen which is produced during photolysis is released in the environment whereas H⁺ together with CO₂ are used in building Glucose. In chloroplast, different pigments absorb light of different wave lengths. Among them chlorophyll is the main light capturing molecule in thylakoid membrane which absorbs violet, blue and red light but reflects green therefore it appears green. In the thylakoid membrane other pigments and electron carrier molecules form highly organized assemblies in a series called photosystems. Each thylakoid contains thousands of copies of two different kind of photosystems called photosystems I and II. Each consists of two major parts, a light harvesting complex and an electron transport system.

The conversion of light energy takes place when the chlorophyll of reaction center receives energy. One of the electrons from chlorophyll "a" molecule leaves and jumps over the electron transport system. This energized electron moves from one carrier to next. The electron releases energy, when it comes down, this energy drives reactions and produces two energy rich compounds.

These are: i) ATP (Adenosine Triphosphate) ii) NADPH (Reduced Nicotinamide Adenosine Dinucleotide Phosphate) 2 ADP is the compound which is already present in cell. It combines with phosphate by using energy of photon released from when moving through e⁻ carriers in photosynthesis.



NADP also present in chloroplast is reduced into NADPH by 2 accepting Hydrogen ions (H⁺), released from splitting of water.



ATP and NADPH both are energy rich compounds which provide 2 energy, Hydrogen (H⁺) and e⁻ for the conversion of atmospheric CO₂ into 2 - carbohydrates in chloroplast during light independent Phase of photosynthesis



Q.6 What is biological method? Write in detail the steps involved in the biological method

BIOLOGICAL METHOD As you know that biology is the branch of science concerned with the study of living things, or organisms. The system of advancing knowledge by formulating a question, collecting data about it through observation and experiment, and testing a hypothetical answer about living things is called biological method.

Observation: The first step is to identify the reason of the problem followed by the formulation of a question about what has been observed. The solution of biological problem starts with observation. Your observation can be on anything from plant movement to animal behavior. An observation is a statement of knowledge gained through the senses (qualitative) or through the use of scientific equipment (quantitative).

Hypothesis: Hypothesis is a key component of the scientific process. It is defined as “the intelligent guess made by a scientist in the form of statement”. It is important to note that a hypothesis must be testable. That means, you should be able to test your hypothesis through experimentation. Your hypothesis must either be supported or falsified by your experiment

Reasoning: Biologists collect information about the problem and formulate the hypothesis by using a reasoning process i.e. 'inductive reasoning and deductive reasoning'.

Experiment: Once a problem has been observed and a hypothesis is suggested, the next step in the scientific method is to design an experiment based on reasoning.

Experiment is a practical performance of a scientist to identify the real cause of a problem based on inductive and or deductive reasoning. A key assumption is that the experiment will be repeated many times by other scientists.

Result The results are where you report what happened in the experiment. That includes detailing all observations and data made during your experiment. Result verifies the hypothesis. In the case of malaria, it was found that all the malaria patients (experimental group) had Plasmodium in their blood whereas the blood samples of healthy persons (control group) were free from Plasmodium.

Conclusion: The final step of the scientific method is developing conclusion. This is where all the results from the experiment are analyzed and a determination is reached about the hypothesis. If your hypothesis was supported, it's great. If not, repeat the experiment or think of other ways to improve your procedure.

Theory: Scientists use the word “theory” in a very different way than non-scientists.

When many people say “I have a theory”, they really mean “I have a guess”. Scientific theories, on the other hand, are well-tested and highly reliable scientific explanations of natural phenomena. They unify many repeated observations and data collected from lots of experiments.

For example: Theory of Evolution. Law and principle: A scientific law is a uniform or constant fact of nature, it is virtually an irrefutable theory. Biology is short in laws due to the puzzling nature of life.