

NOTES Biology - X

- Q1 Define these terms → a. Food, b. Nutrition
c. Nutrients d. Autotrophic nutrition e. Heterotrophic nutrition.
- Q2 What are the functions of teeth, tongue and saliva in Animal nutrition?
- Q3 Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms?
- Q4 What are outside raw materials used for by an organism?
- Q5 What are the significance of food or nutrition in living organisms?
- Q6 What are life processes? Explain each one.
- Q7 What are the adaptations of leaf for photosynthesis?
- Q8 Write a short note on different types of heterotrophic nutrition.
- Q9 Explain with neat & well labelled diagram different steps of nutrition in Amoeba.
- Q10 Explain with well labelled diagram of human alimentary canal, steps of digestion in human beings.

How do we tell the difference between what is alive and what is not alive? If we see a dog running, or a cow chewing cud, or a man shouting loudly on the street, we know that these are living beings. What if the dog or the cow or the man were asleep? We would still think that they were alive, but how did we know that? We see them breathing, and we know that they are alive. What about plants? How do we know that they are alive? We see them green, some of us will say. But what about plants that have leaves of colours other than green? They grow over time, so we know that they are alive, some will say. In other words, we tend to think of some sort of movement, either growth-related or not, as common evidence for being alive. But a plant that is not visibly growing is still alive, and some animals can breathe without visible movement. So using visible movement as the defining characteristic of life is not enough.

Movements over very small scales will be invisible to the naked eye – movements of molecules, for example. Is this invisible molecular movement necessary for life? If we ask this question to professional biologists, they will say yes. In fact, viruses do not show any molecular movement in them (until they infect some cell), and that is partly why there is a controversy about whether they are truly alive or not.

Why are molecular movements needed for life? We have seen in earlier classes that living organisms are well-organised structures; they can have tissues, tissues have cells, cells have smaller components in them, and so on. Because of the effects of the environment, this organised, ordered nature of living structures is very likely to keep breaking down over time. If order breaks down, the organism will no longer be alive. So living creatures must keep repairing and maintaining their structures. Since all these structures are made up of molecules, they must move molecules around all the time.

What are the maintenance processes in living organisms? Let us explore.

6.1 WHAT ARE LIFE PROCESSES?

The maintenance functions of living organisms must go on even when they are not doing anything particular. Even when we are just sitting in

class, even the processes which to
The processes which are needed to prevent damage
life processes.

Since these maintenance processes are needed to prevent damage and break-down, energy is needed for them. This energy comes from outside the body of the individual organism. So there must be a process to transfer a source of energy from outside the body of the organism, which we call food, to the inside, a process we commonly call nutrition. If the body size of the organisms is to grow, additional raw material will also be needed from outside. Since life on earth depends on carbon-based molecules, most of these food sources are also carbon-based, depending on the complexity of these carbon sources, different organisms can then use different kinds of nutritional processes.

The outside sources of energy could be quite varied, since the environment is not under the control of the individual organism. These sources of energy, therefore, need to be broken down or built up in the body, and must be finally converted to a uniform source of energy that can be used for the various molecular movements needed for maintaining living structures, as well as to the kind of molecules the body needs to grow. For this, a series of chemical reactions in the body are necessary. Oxidising-reducing reactions are some of the most common chemical means to break-down molecules. For this, many organisms use oxygen sourced from outside the body. The process of acquiring oxygen from outside the body, and to use it in the process of break-down of food sources for cellular needs, is what we call respiration.

In the case of a single-celled organism, no specific organs for taking in food, exchange of gases or removal of wastes may be needed because the entire surface of the organism is in contact with the environment. But what happens when the body size of the organism increases and the body design becomes more complex? In multi-cellular organisms, all the cells may not be in direct contact with the surrounding environment. Thus, simple diffusion will not meet the requirements of all the cells.

We have seen previously how, in multi-cellular organisms, various body parts have specialised in the functions they perform. We are familiar with the idea of these specialised tissues, and with their organisation in the body of the organism. It is therefore not surprising that the uptake of food and of oxygen will also be the function of specialised tissues. However, this poses a problem, since the food and oxygen are now taken up at one place in the body of the organisms, while all parts of the body need them. This situation creates a need for a transportation system for carrying food and oxygen from one place to another in the body.

When chemical reactions use the carbon source and the oxygen for energy generation, they create by-products that are not only useless for the cells of the body, but could even be harmful. These waste by-products are therefore needed to be removed from the body and discarded outside by a process called excretion.

life one by one
HOW IS OUR CELLULAR LIFE MAINTAINED?
1. WHAT ARE THE SOURCES OF ENERGY?
2. WHAT ARE THE SOURCES OF RAW MATERIALS?
3. WHAT ARE THE SOURCES OF OXYGEN?

6.2 NUTRITION
When we walk or are not doing an state of order in o to grow, develop, the body. This so

How do living t
The general requ organisms, but it food material ob dioxide and wat plants and some These complex s before they can achieve this, org heterotrophs su heterotrophic or

6.2.1 Autotro
Carbon and en supplied by phot substances fr energy. This ma which is conver heterotrophs. Ca we will save, Ca which

class, even if we are just asleep, this maintenance job has to go on. The processes which together perform this maintenance job are life processes.

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1st Process

Metabolism

2nd -

Respiration

3rd

4th

5th

6th

7th

design in multi-cellular organisms are followed, a specialised tissue for excretion will be developed, which means that the transportation system will need to transport waste away from cells to this excretory tissue.

Let us consider these various processes, so essential to maintain life, one by one.

Q U E S T I O N S

1. Why is diffusion insufficient to meet the oxygen requirements of multi-cellular organisms like humans?
2. What criteria do we use to decide whether something is alive?
3. What are outside raw materials used for by an organism?
4. What processes would you consider essential for maintaining life?

6.2 NUTRITION

When we walk or ride a bicycle, we are using up energy. Even when we are not doing any apparent activity, energy is needed to maintain a state of order in our body. We also need materials from outside in order to grow, develop, synthesise protein and other substances needed in the body. This source of energy and materials is the food we eat.

How do living things get their food?

The general requirement for energy and materials is common in all organisms, but it is fulfilled in different ways. Some organisms use simple food material obtained from inorganic sources in the form of carbon dioxide and water. These organisms, the autotrophs, include green plants and some bacteria. Other organisms utilise complex substances. These complex substances have to be broken down into simpler ones before they can be used for the upkeep and growth of the body. To achieve this, organisms use bio-catalysts called enzymes. Thus, the heterotrophs survival depends directly or indirectly on autotrophs. Heterotrophic organisms include animals and fungi.

6.2.1 Autotrophic Nutrition

Carbon and energy requirements of the autotrophic organism are fulfilled by photosynthesis. It is the process by which autotrophs take in substances from the outside and convert them into stored forms of energy. This material is taken in the form of carbon dioxide and water which is converted into carbohydrates in the presence of sunlight and chlorophyll. Carbohydrates are utilised for providing energy to the plant. We will study how this takes place in the next section. The carbohydrates which are not used immediately are stored in the form of starch, which serves as the internal energy reserve to be used as and when required by the plant. A somewhat similar situation is seen in us where some of the energy derived from the food we eat is stored in our body in the form of glycogen.



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