7.4.1 THE LIVING WORLD[M7]

7.4.1.1 Living Things

Living things display all of the following characteristics:

Movement in which energy provided by food is used
Responsiveness to their surroundings
Assimilation the conversion of non-living food into living material
Growth with development
Reproduction

Some non-living things may have one or more of these properties, but only living things have all of them.

Living things take many different forms and can be divided into five groups—plants and animals, the two main groups, and bacteria, fungi and viruses.

7.4.1.2 Plants

The bodies of living things comprise structures with special functions. Flowering plants, for example, have roots, stems, leaves, flowers, and fruit.

Plants are generally fixed in one place by their roots.

Green leaves on plants make sugar from water obtained, through their roots, from the soil, and carbon dioxide from the air. This process is facilitated by a chemical substance known as chlorophyll, and is known as **photosynthesis**. Chlorophyll in the leaves of green plants (it is chlorophyll that give leaves their green colour) enables them to absorb energy from sunlight to make their own food, at the same time releasing oxygen into the atmosphere.

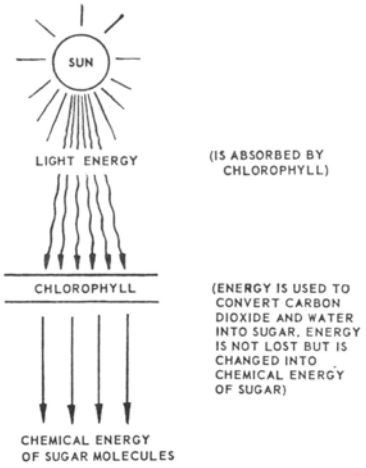

Figure 7.2 The energy pathway in photosynthesis

The sugar produced in the leaves is then transported to all the other parts of the plant and may be converted to starch as a temporary food reserve. Some is broken down in a process called **respiration**, to carbon dioxide and water, releasing the energy stored in the sugar for living activities.

The important thing about green plants is that they make their own food. They take in simple soluble molecules—carbon dioxide from the air, and water and salts from the soil. From these raw materials they make the complex compounds, such as carbohydrates and proteins which are their food.

The processes that occur in a green plant are illustrated in Figure 7.3. Water and salts are taken in by the roots and transported to the leaves and branches. Some of the water is used in photosynthesis, the rest evaporates, mainly from the leaves into the air. Sugar, produced via photosynthesis, moves to all parts of the plant, where it is used to make new roots, stems, leaves and fruit.

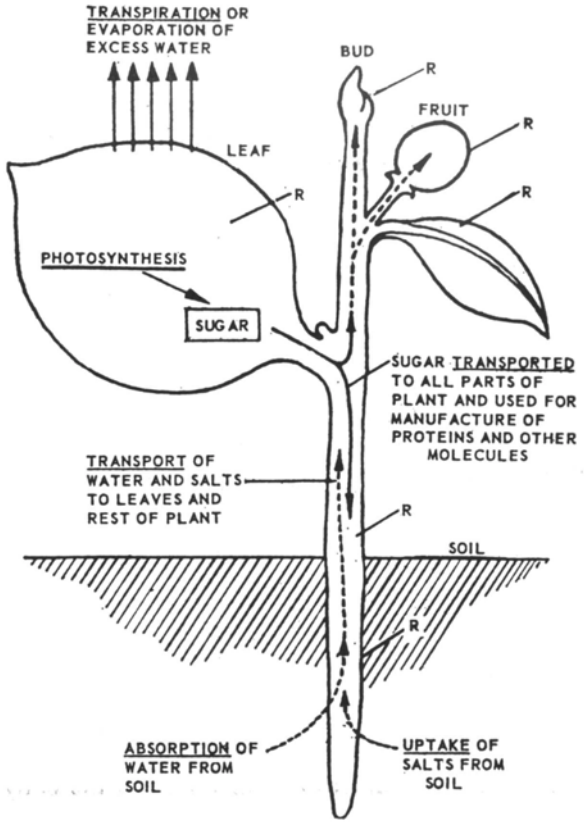

Figure 7.3 Diagram showing some important processes of a plant. R represents respiration which occurs in all living parts of the plant

7.4.1.3 Animals

The bodies of animals also comprise structures having special functions. Most animals have a mouth for the intake of food, a digestive tract, reproductive organs, and means of locomotion and waste elimination.

Animals cannot manufacture their own food—they obtain food by eating plants and other animals. In order to hunt their food, animals can generally move freely.

7.4.1.3.1 Mammals

Let us consider a mammal, as a particular kind of animal, in more detail. It has a complex body that is maintained at the one temperature, whatever the surrounding temperature may be, and is thus known as a warm-blooded animal. Most mammals have hair that traps air and acts as a layer of insulating material, preventing too great a loss of heat. Human beings are mammals, as are animals such as horses, cows, pigs, goats, sheep, rabbits, dogs, cats, rats and mice.

Mammals have complex bodies, although they perform only four basic functions.

1. Mammals have to catch their own food, and escape being caught by other mammals. Therefore they have:
   - **Limbs, muscles, and bones**, providing a system for the movement of the body;
   - **A system of sense organs**—including eyes, ears, tongue, nose, skin, and in most cases whiskers—which enables it to respond to its surroundings and seek food.

2. Mammals eat solid food, but the organs of their body can use only soluble food, so they have:
   - **An alimentary system**—running from mouth to anus—to change solid food by digestion into soluble food, which can be absorbed by the blood;
   - **A transport system**—heart, arteries, and veins—to transport blood containing soluble food and oxygen to all parts of the body, where respiration occurs, and to collect waste products for removal;
   - **A breathing system**—the lungs—to supply oxygen from the air to the blood and to remove carbon dioxide from the blood;
   - **An excretory system**—the lungs and the kidneys—to remove waste products—carbon dioxide, water, and other chemical substances—from the blood.
3. The body acts as a whole, and thus, for coordinating the activities of the body a mammal has a **nervous system**—nerves, spinal chord, and brain—to enable all parts to act together as a whole.
4. Mammals reproduce themselves, and thus have a **reproductive system**—the sex organs—to enable them to reproduce with mammals of the opposite sex.

7.4.1.5 Variations on a Plan

Plants and animals, because they are alive, have characteristics in common, but they also show differences due to the different ways in which they obtain their food. There is also a tremendous variety of plants and animals.

All living things are confined to a narrow region of the surface of the earth, where there are appropriate levels of sunlight, carbon dioxide, water, oxygen, certain mineral salts, and a temperature range between 0°C and 45°C. Thus, living things are found in that part of the earth having:

- an appropriate **source of external energy**;
- an appropriate **supply of raw materials**.

On a larger scale, the living world comprises two groups of organisms:

- **autotrophic**—the green plants and photosynthetic bacteria—which manufacture food by photosynthesis;
- **heterotrophic**—fungi, most bacteria and the entire animal kingdom—which depend, either directly or indirectly, upon the green plants for their food.

The variety of life reflects the **adaptations of living** things to the way they obtain their food and energy, although photosynthesis, energy and the sun play a most critical role for all living matter.