

THE LIVING AND THE
NON-LIVING

SYLLABUS

Characteristics of living things : Need nutrition, respire to convert food into energy, made up of cells, respond to stimuli, undergo definite changes during their life, live for a definite period of time, reproduce more of their kind.

Differences between living and non-living things. Differences between plants and animals.

INTRODUCTION

How wonderful is our world. The wide range of things found around us are amazing. The habitats in which we find living organisms, be it high mountains, dense forests, lakes or deserts, seem to be amazing. Do you know that water, air and soil together sustain life on the earth? In addition, we see a vast variety of things around us everyday.

- At home, there are tables, chairs, books, utensils, clothes, mugs and so on.
- Some of you may have pets such as a dog or a cat. And, of course, there may be some unwanted forms like flies, mosquitoes, cockroaches and perhaps a lizard, too in your home.
- In our houses, we also have radios, T.V. sets, computers, telephones, etc.
- Outside, there are trees, crows, kites, etc. You may also see lamp posts, cars, bicycles, and so on.
- Away from your town, there may be



Fig. 1.1 Variety of things around us

hills and mountains. These in turn may have forests and rivers and lakes with fishes frogs, water plants, etc. Further away, there may be seas and oceans with whales and sharks, etc.

Like these, there are millions of different kinds of objects around us — some with life (**living things**) and some without life (**non-living things**) (Fig 1.1).

SCIENCE — A SYSTEMATIC STUDY OF DIFFERENT THINGS

Humans have always been curious to know about things and their characteristics. But, how to study them has been a difficult question as they are very different from each other. Scientists have made this difficult task easy for us. They have grouped the study of different kinds of things under the broad discipline — **Science**.

Science is the study of nature. It includes the study of earth, space, living and non-living things *i.e.* all material things and their behaviour. To know the characteristics of these things systematically we study them under three branches of Science *i.e.*, **Biology**, **Physics** and **Chemistry**.

Biology deals with the study of living-beings (Fig 1.2).

Physics explains solar system, the physical phenomena like gravitation, magnetism, electricity, etc.

Chemistry describes the composition

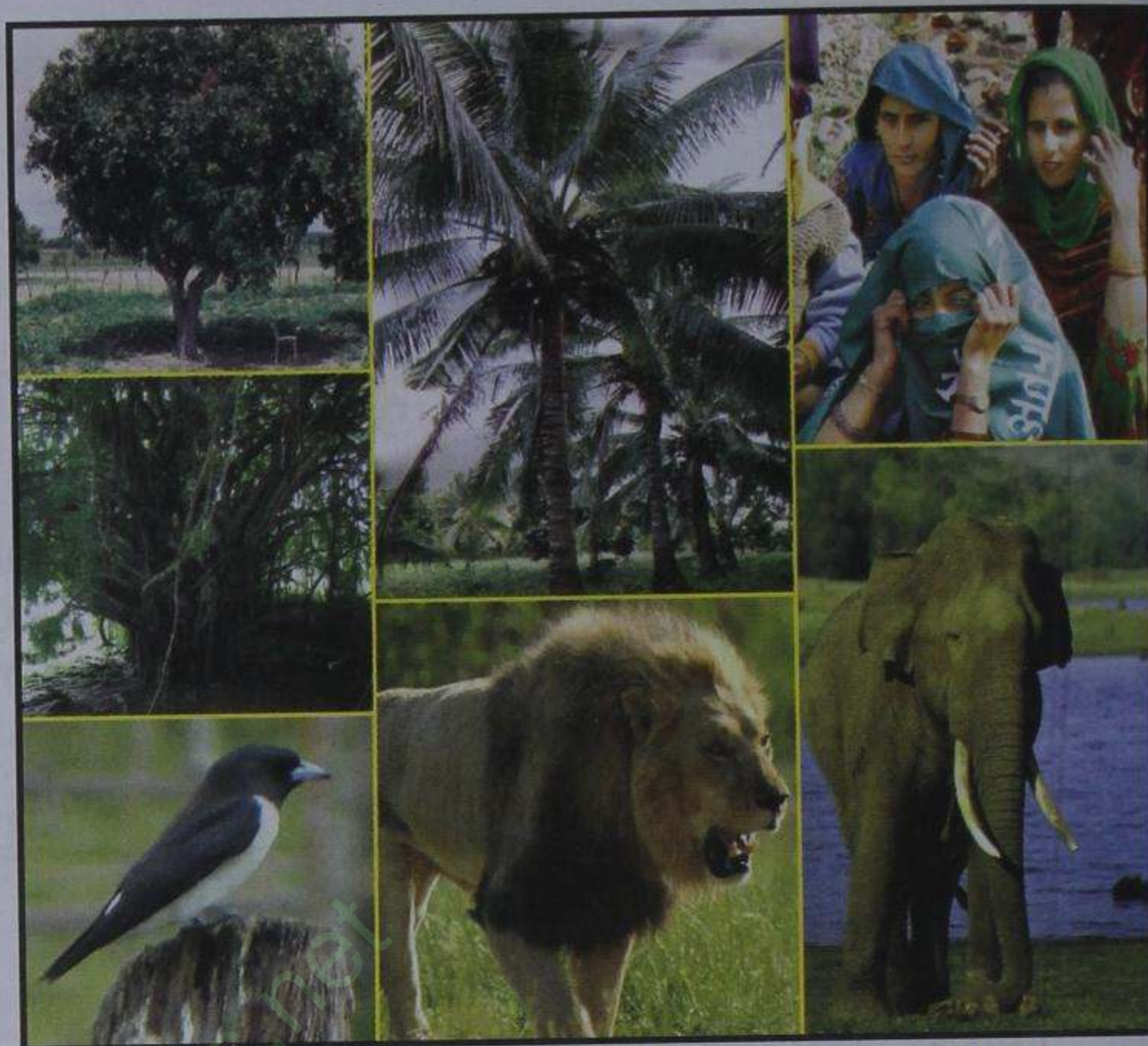


Fig. 1.2 Type of things we study in Biology — the plants and animals (including human beings)

and properties of the matter related to the substance that forms all the things whether living or non-living. Physics and chemistry will be taught to you separately in this class.

BIOLOGY

Biology (*bios* : life, *logos* : study) **deals with the study of living beings, and that is why it is also called the 'Life Science'.**

In biology you will study about living things *i.e.* the animals (Fig 1.3), the humans (Fig 1.4) and the plants (Fig 1.5).

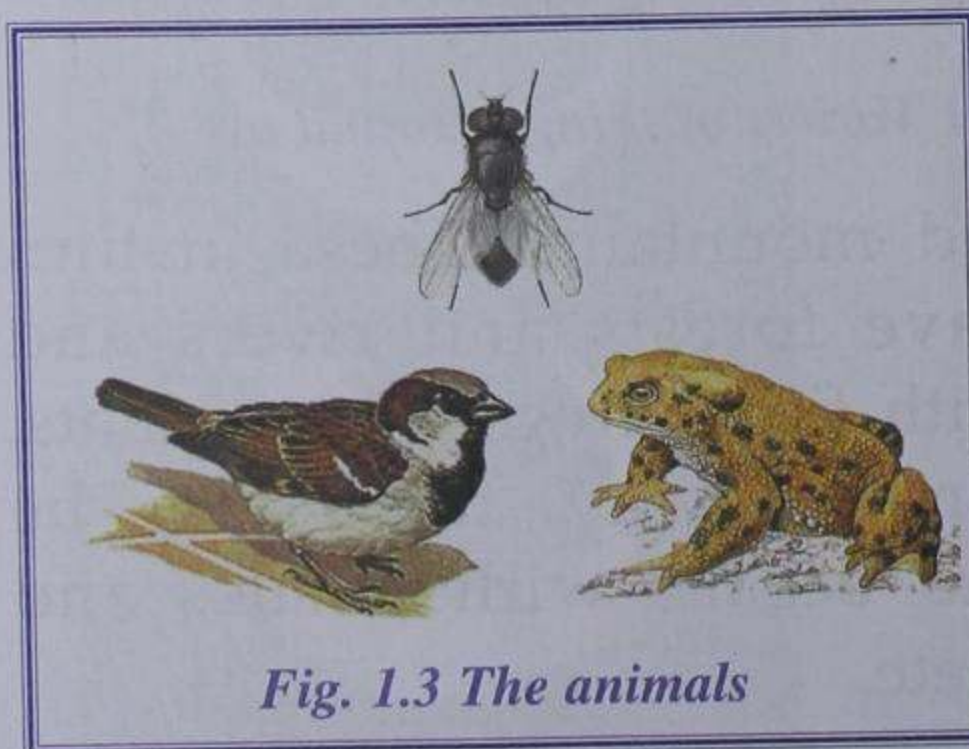


Fig. 1.3 The animals

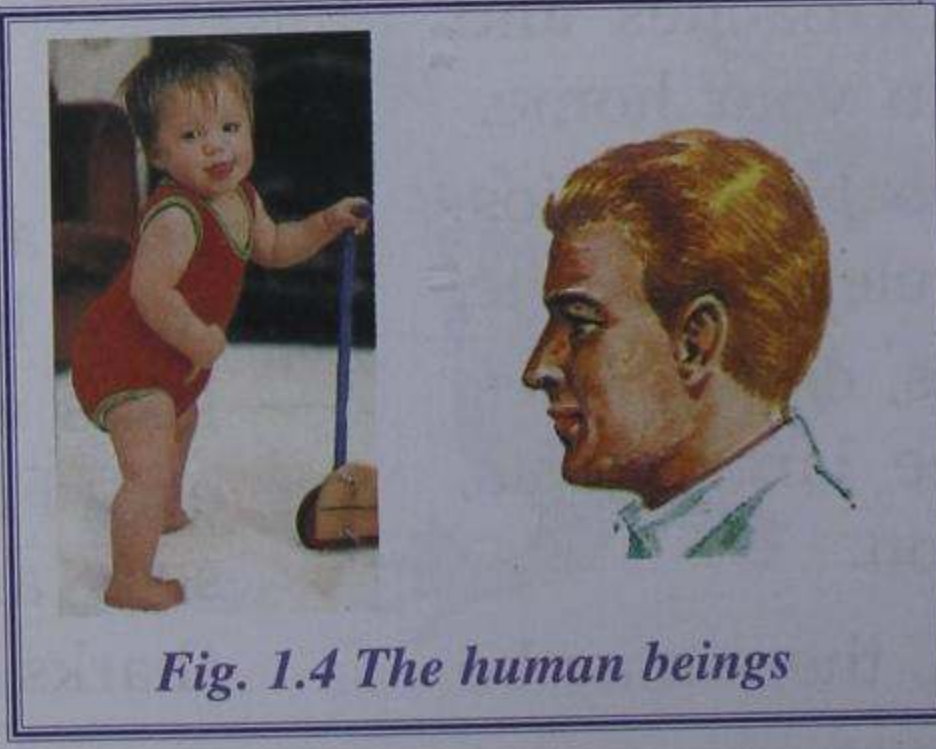


Fig. 1.4 The human beings



Fig. 1.5 The plants

Branches of Biology

For convenience biology is further divided into two branches :

1. **Zoology** — the study of animals including humans and their relationship with other organisms.
2. **Botany** — the study of plants and their relationship with other organisms.

Importance of Biology

The knowledge of biology helps to :

- **Know about the living things** - the structure and functioning of body parts of plants, animals, and humans.
- **Understand diseases** – their causes and control. This helps us to take proper care of our health and long life.
- **Learn the importance of plants and animals** and to conserve them as they are mutually dependent.
- **Grow better food crops** by using better variety of seeds, fertilizers and to protect them from diseases.
- **Control the growing population** of the world, especially in India, which would otherwise lead to the shortage of food, land and forest.
- **Control the pollution** of water, air and soil. Pollution is the cause of many dreadful diseases among plants, animals and humans.
- **Choose a career**, such as to be a **doctor**, a **pathologist**, a **veterinary doctor**, etc.

LIVING AND NON-LIVING THINGS

The world in which we live is made of two categories of things — living and

non-living. Let us know, how they differ from each other. It is necessary to know the characteristics of **living things**.



ACTIVITY 1

Examples of Living and Non-living.

In the table below, an example of a living and a non-living thing is given. From your common sense, complete the rest with the examples, which you have actually seen.

LIVING	NON-LIVING
1. Cow	1. Brick
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____

CHARACTERISTICS OF LIVING THINGS

1. Body made of cells
2. Movement
3. Growth
4. Fixed life-span
5. Nutrition
6. Respiration
7. Excretion
8. Responsiveness
9. Reproduction

1. Body Made of Cells

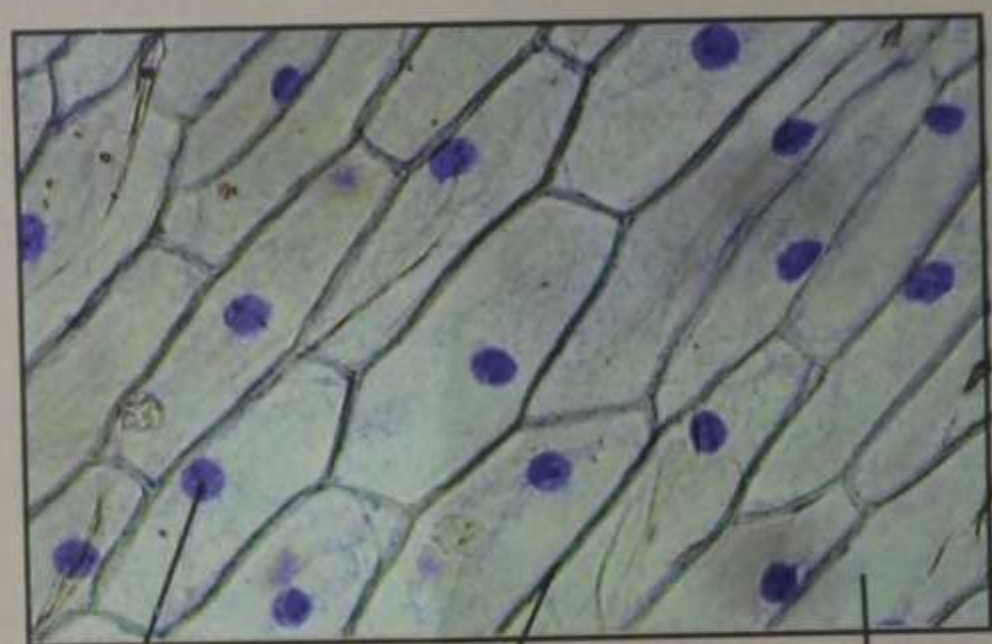
A cell is the basic unit of life. All living things are made up of cells.

The body of all plants and animals is made of cells. Your own body consists of billions and billions of **cells**. Each cell is like a compartment which contains a distinct round part called **nucleus**. The body of an elephant has several times more cells than a human who in turn has several times more cells than an ant or a lizard or a rose plant. These are called **multicellular organisms**. On the contrary,



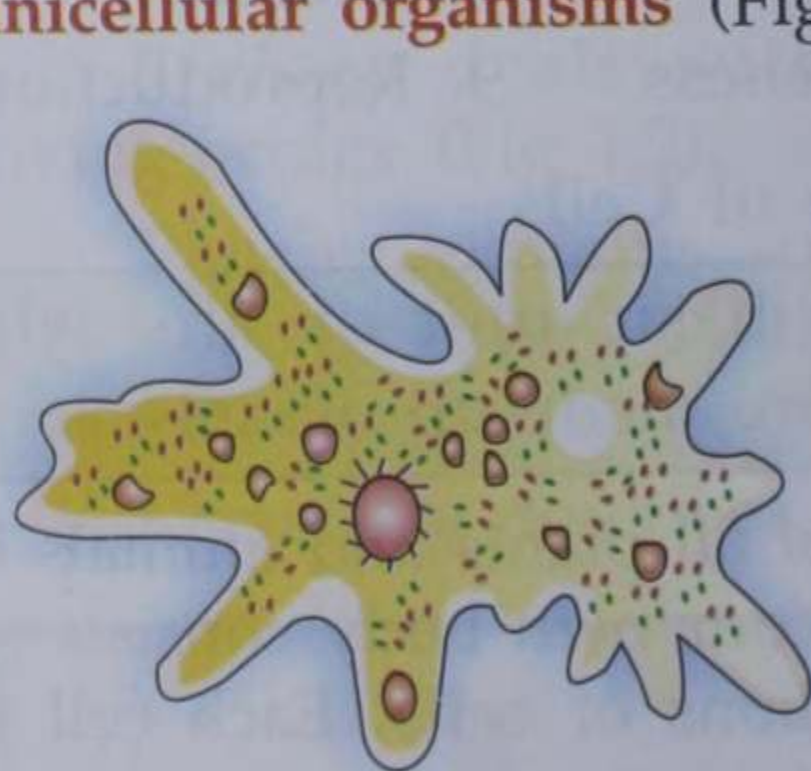
ACTIVITY 2

Take an onion, cut it into small parts. Separate the thin semi-transparent peel from its leaf. Place it on a slide. Put a drop of methylene blue on the peel. Then place a cover slip on it and observe under a microscope. You will observe irregular tiny compartments. These are called cells. Make a drawing of the cells you see.



Nucleus Cell Membrane Cytoplasm
Onion peel cells

there are some organisms, such as *Amoeba*, *Paramecium* and *Yeast* which are made of just one single cell and are called **unicellular organisms** (Fig. 1.6).



AMOEBA



PARAMECIUM

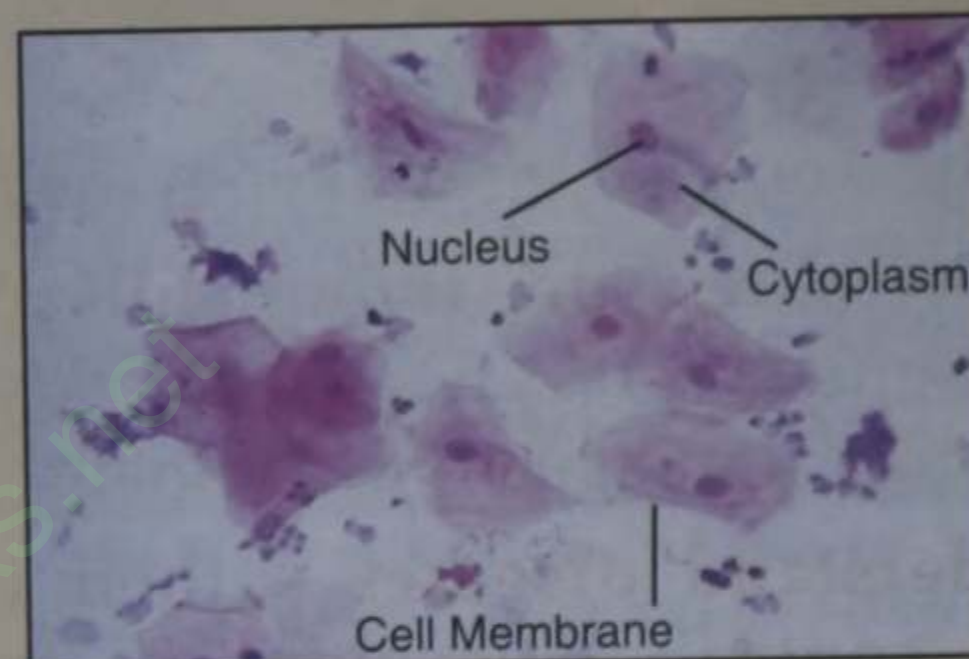
Fig. 1.6 Two different unicellular organisms

Living organism may either be many-celled (**multicellular**), or single-celled (**unicellular**).



ACTIVITY 3

With the help of a clean flat toothpick, gently scrape off from the surface of the inner lining of your cheek, and put it on a glass slide and put 1-2 drops of iodine solution. Now put a coverslip on it and observe under the microscope. Make a drawing of the cells.



Cheek cells

[This activity must be performed under the strict supervision of your teacher, or the teacher himself or herself should demonstrate this activity. This is important for safety reasons.]

Take a small sugar cube. Crush it with a hammer and observe it under a microscope. Do you find any compartments similar to those observed in Activity 2 or Activity 3.

The answer is 'NO', because non-living things are not made up of cells.

2. Movement

Both plants and animals show movement. Movement of animals is very easy to make out — they walk, run, swim or fly. Such movement from place to place is called **locomotion**. During locomotion, the entire body of an animal moves from one place to another. They

do so mainly to gather food, to avoid enemies and to search their mates, just as cows move about in search of grass. When disturbed, a frog jumps into the water, and so on.



Fig. 1.7 Moving or jumping animals

But, there are some animals which do not move from place to place. One such example is the sea-anemone (Fig. 1.8). The sea anemone remains attached to a rock or other hard object in the sea. Similarly, Hydra is found attached to weeds in pond water (Fig. 1.9). But, **their body parts show movement which is a characteristic of all living beings**. Think of the various movements of your body parts right now while reading this book — your heart, your lungs, your eyes, eye lids, etc.

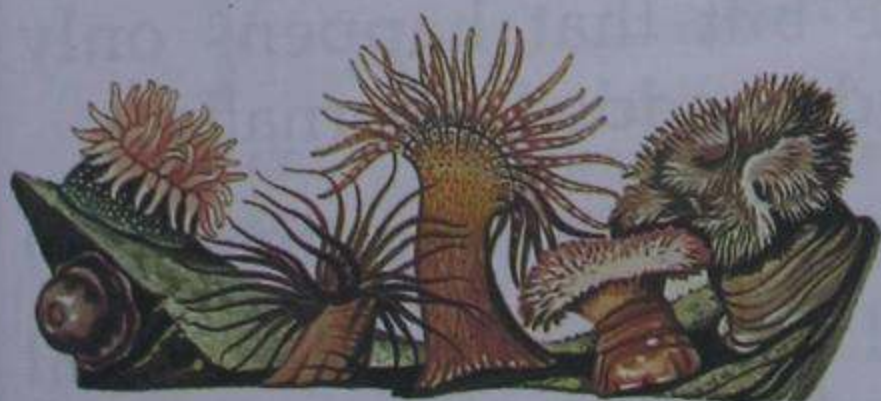


Fig. 1.8 Sea-anemone

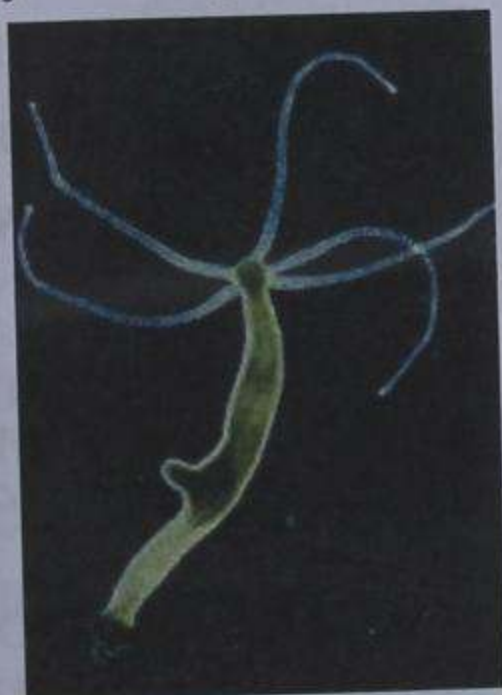


Fig. 1.9 Hydra

Plants do not move from one place to another. But they show movement of their parts.

- If you touch a leaf of the sensitive plant (*Lajwanti*), it droops. After a

few minutes, the wilted leaf recovers and stands erect (Fig. 1.10).



Fig. 1.10 Sensitive plant (*lajwanti*)

- Sunflower always turns towards the sun (Fig. 1.11).



Fig. 1.11 Sunflower

- There are many plants which fold their leaves or close the petals of their flowers at night and reopen next morning.

Some non-living things also move

- The hands of a clock move to show the change in time.
- The clouds move across the sky.
- The water of the river flows down.
- The car runs on the road.

How are these movements different from the movements of a living being ? (Clue — they move by mechanical force). Thus, the **non-living things are moved by some outside force** or energy such as battery.

3. Growth (From tiny to large)

When you were born, you were a small baby. Through the years, you have grown. Now you are a grown-up boy or girl, and in the years to come, you will be an adult human. Your bones become longer, muscles become larger, and the amount of blood in your body increases (Fig. 1.12).

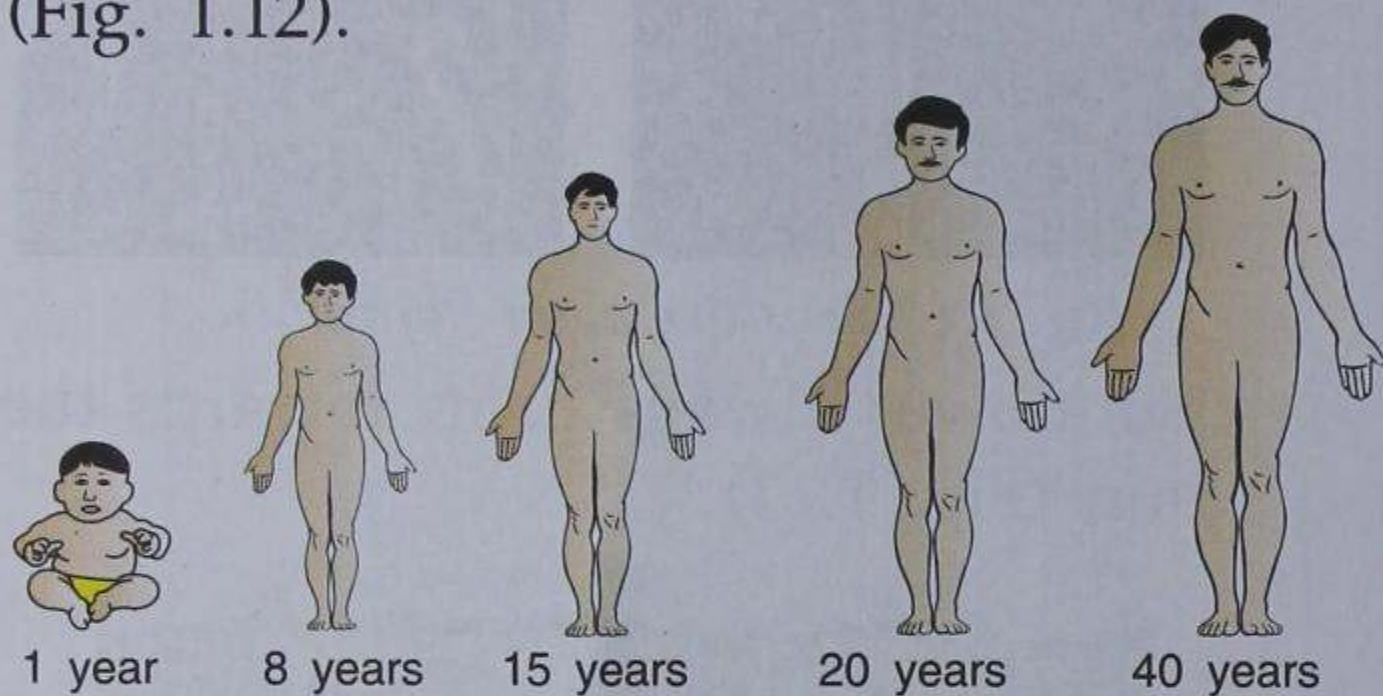


Fig. 1.12 Phases of growth in human beings

A tiny chick hatches from the egg. It gradually grows in size to become a mature hen (Fig. 1.13).

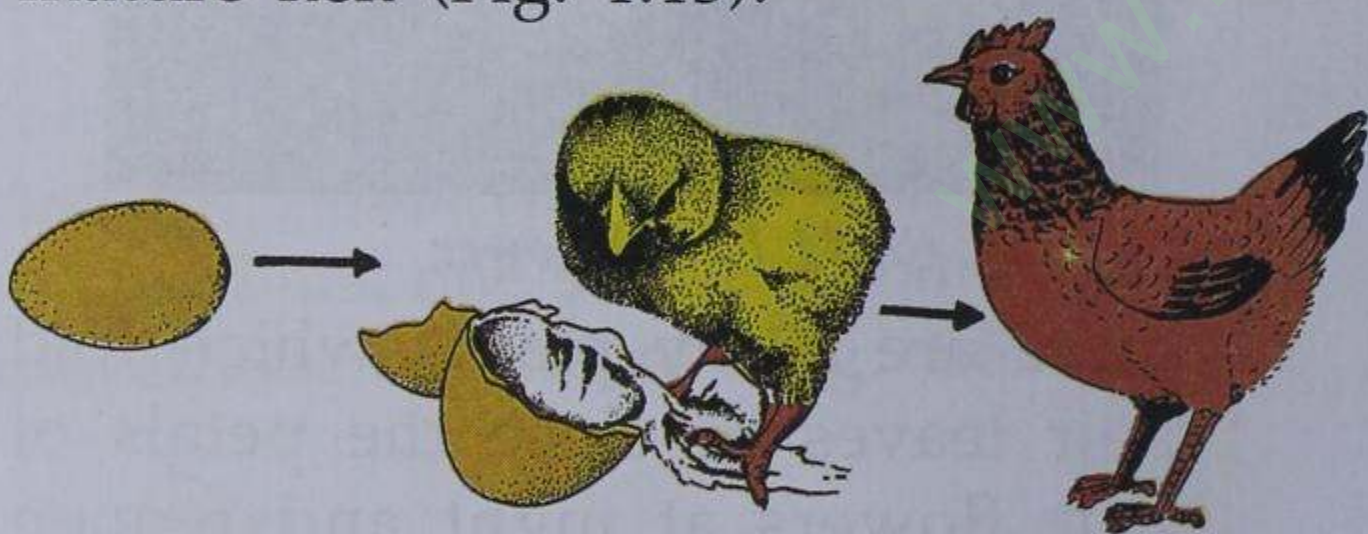


Fig. 1.13 A chick hatched from an egg grows into a hen

All animals grow only upto a certain age.

Growth in plants is faster and easier to observe (Fig. 1.14). Full grown plants do not grow taller

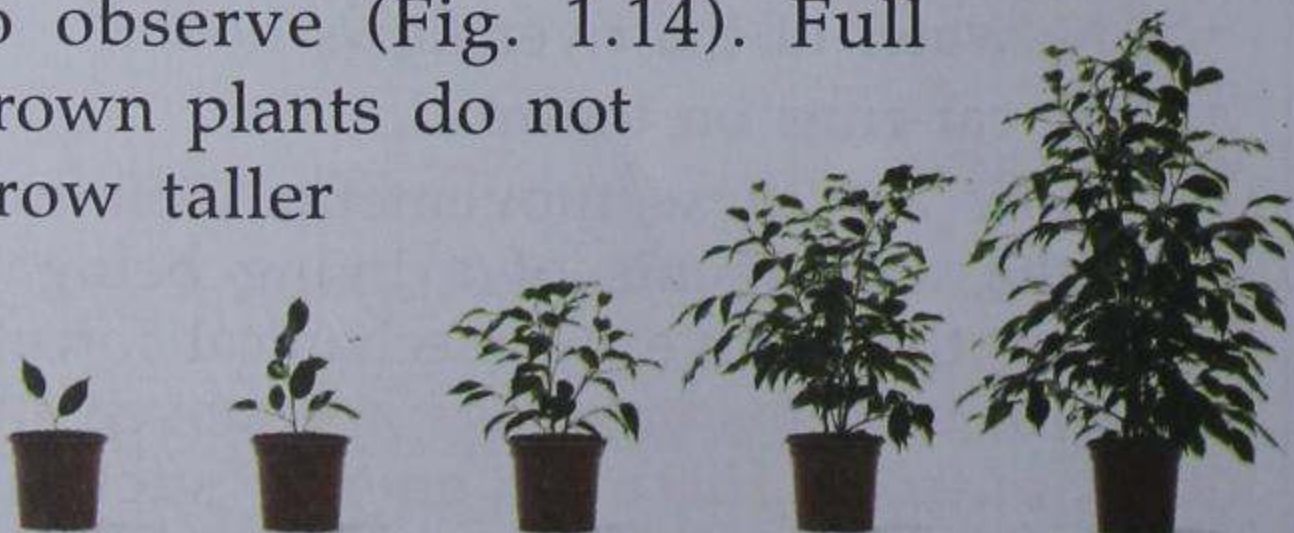


Fig. 1.14 Growth in a plant

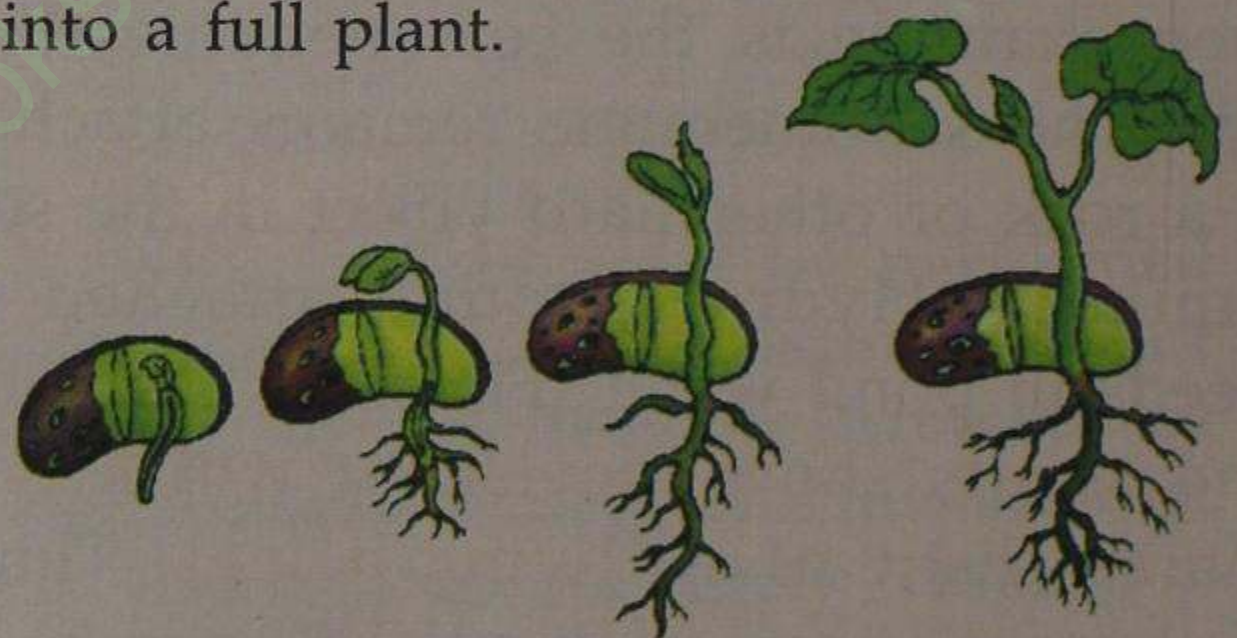
every year, they only produce new branches and leaves, and their trunks grow thicker.

All living things, plants and animals, grow.



ACTIVITY 4

Take a few bean or gram seeds. Sow them in moist soil in a flower pot. In two to three days, the seeds will sprout. Each seed will germinate into a tiny seedling or a baby plant. Observe the height of the seedling and count the number of leaves each day for two weeks. Water these plants at regular intervals. The seedling gradually grows into a full plant.



Germination of a bean seed

Has the chair or table which you have been using for a long period increased in size? **No, non-living things do not grow.** A heap of mud may increase in size but that happens only when more mud is added externally.

4. Fixed Life Span (How long they live)

The period from birth till natural death is called the life span. The marigold plant is a seasonal plant which lives for a few months only. The neem tree or a peepal tree grows and continues to live for many years. Some trees may live upto 100 years or even a thousand years, but no tree lives forever.

All animals live upto a certain age, after which they die.

The life span of some plants and animals are given in the Fig. 1.15.

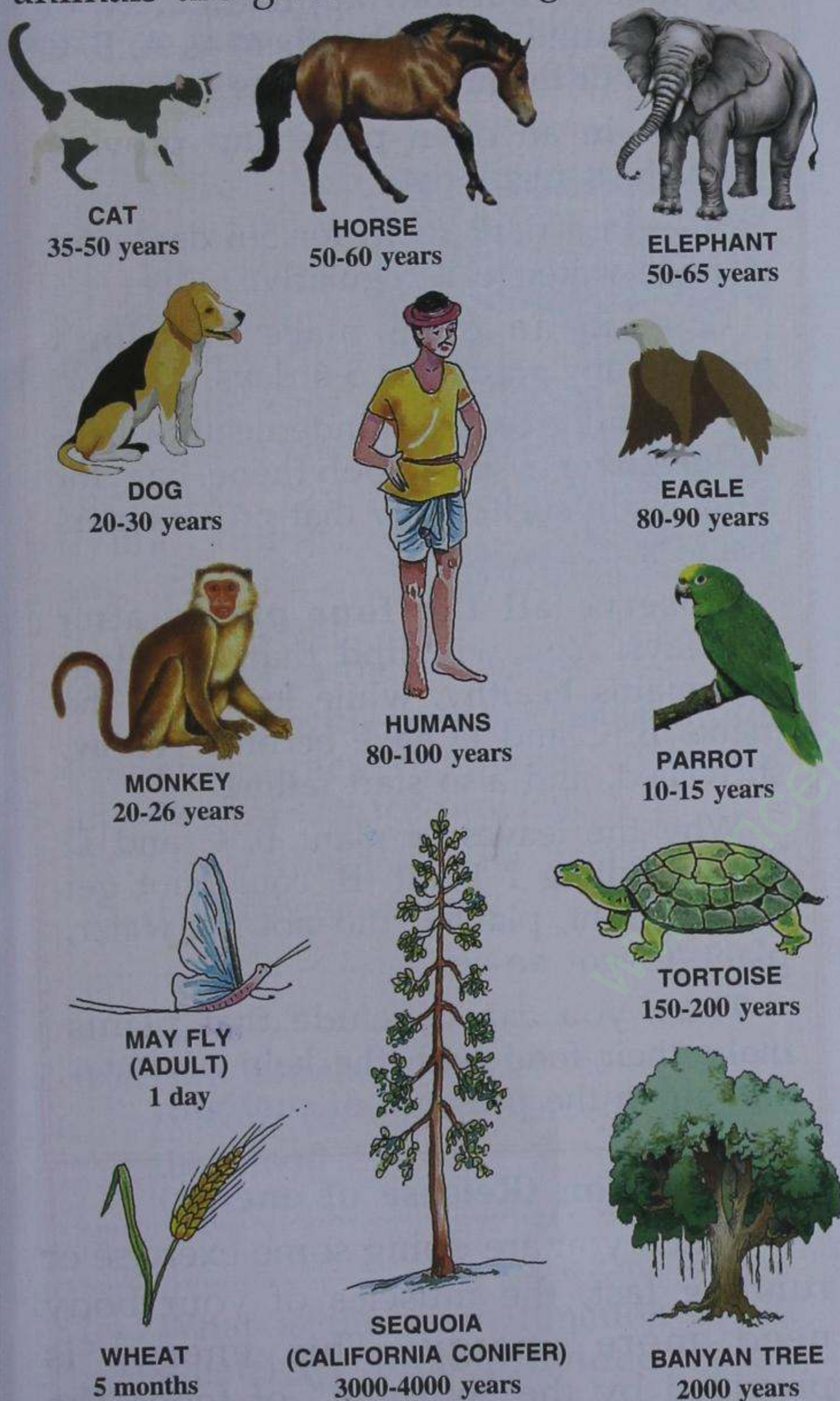


Fig. 1.15 Life span of some animals and plants

Generally, all things are categorised into living and non-living. But when we specifically study Biology, we categorise the things as **living, non-living and dead**. For example, you may call leather or a log of wood as non-living but biologically, they are called dead.

Dead — The Remnants of the Living

Think about the following :

- The pencil made of wood and “lead” (graphite carbon). Wood of the pencil was once a part of a tree.
- Your leather shoes. Its leather is made from the hide (skin) of an animal. Its laces are made of cotton fibre, both were once part of an animal and a plant respectively.
- A piece of dry bone left after eating chicken, was once a part of the animal’s body.

The above examples are of the **dead parts** of plants or animals. So we can say, that biologically, there are three categories of things : living, non-living and dead.



ACTIVITY 5

Name four “DEAD” things, other than those mentioned above :

1.
2.
3.
4.

5. Nutrition (Food)

When you starve for a day, by the evening you start feeling weak. But, when you take food, you feel energetic. Similarly, if you don’t provide any food to an animal, say a rabbit for some days, it will



Fig. 1.16 Rabbit eating one of its foods

become weak and may even die (Fig. 1.16). Similarly, a lizard obtains energy by eating insects (Fig. 1.17).



Fig. 1.17 Lizard feeds on insects

Green plants make their own food. They take in simple things like carbon dioxide and water and manufacture their food in the form of starch. Energy needed in this process, comes from sunlight. Thus the green plants are **autotrophs** (self food makers).

Some animals directly eat the plant parts and some feed on other animals which in turn eat plants. Animals are called **heterotrophs** i.e., they have different modes of nutrition, as they take their food directly or indirectly from plants.



Fig. 1.18 All animals need food, and their foods are different

All living beings need food to acquire energy. This energy is utilized by them to carry out their activities.

ACTIVITY 6



Take four healthy potted plants, say that of **Balsam**, approximately of the same size. Label them as A, B, C and D. Put them differently as follows :-

A — in an open place and provide water to it regularly.

B — in a dark room for 5-6 days and provide water to it regularly.

C — in an open place but don't provide any water for 5-6 days.

D — fully covered underneath a bell-jar or cover it by a polythene bag for 5-6 days in such a way that no air enters inside it.

Observe all the four plants after 5-6 days. You will find that the plant A remains healthy, while leaves of the plants B, C and D have become yellow, shrivelled, and also start falling.

Why the leaves of plant B, C and D started falling ? Plant 'B' could not get any sunlight, plant C did not get water, plant 'C' got no air.

Thus, you can conclude that plants make their food with the help of **water** and **air** in the presence of **sunlight**.

6. Respiration (Release of energy)

When you are doing some exercise or running fast, the muscles of your body need more energy. This energy is provided by the "burning" of food. The process of release of energy by the "burning" of food in your body is called **respiration**. We need "**oxygen**" for "burning" the food through the air we breathe in. Even while we are fast asleep, our chest constantly keeps rising and falling. Thus, we say that we are breathing. In fact, we all breathe non-stop

throughout the day and night. Likewise, all living beings, plants and animals, breathe. Animals breathe through the nose and the plants through the minute pores on their leaves and stem.

ACTIVITY 7



Visit the biology laboratory of your school and observe the aquarium kept there. Write the names of *two* living things, and *two* non-living things you observe in the aquarium.



Discuss with your teacher about the following questions, and write the answer in the space provided :

(a) From where are the fishes getting their oxygen supply ?

.....
.....

(b) How are the plants of the aquarium getting carbon dioxide to prepare their food ?

.....
.....

(c) What is the main function of the electricity bulb provided in the aquarium ?

.....
.....

7. Excretion (Removal of harmful, nitrogenous wastes)

Body activities of all organisms produce certain nitrogenous waste

substances. These are usually harmful and must be thrown out of the body. This is called **excretion**. The excretion in animals is usually in the form of **urine**. Plants throw out their waste products in the form of **gums** and **resins**, etc., with the help of special cells or from the entire plant surface (Fig. 1.19).



GUM



RESIN

Fig. 1.19 Plants excreting gum or resin

8. Responsiveness (Sensitivity)

Suppose you touch a hot plate, you immediately withdraw your hand. Here, the hot plate is the **stimulus**, and withdrawal of hand is the **response**.

Stimulus is a happening or a change in the surroundings which affects an individual. The reaction which an individual shows to the stimulus is called **responsiveness**.

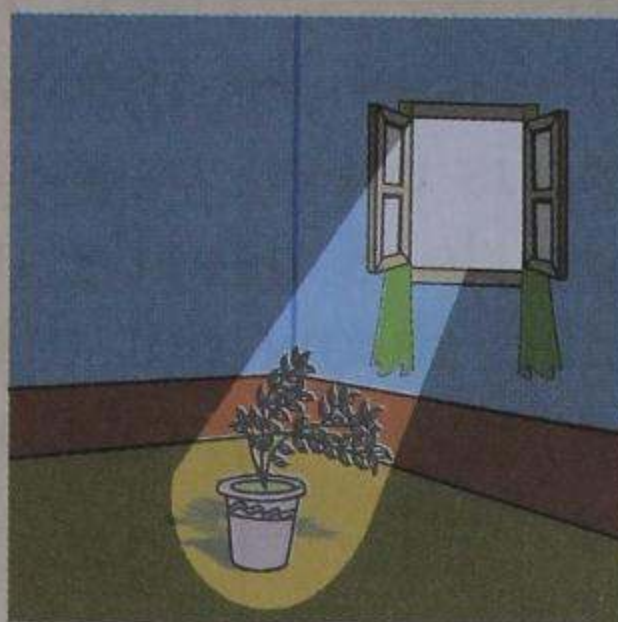
Some other examples are :

- The moment your teacher enters the class room, you immediately stand up as a mark of respect to him/her.
- Show a stick to a stray dog. The dog quickly runs away.
- The leaves of the sensitive plant like *Lajwanti* start drooping the moment you touch them.
- Plants grown in shade tend to bend towards light.



ACTIVITY 8

Take a healthy potted plant. Keep this pot inside a dark room by the side of an open window. After some days, you will notice that the plant bends towards the open window (that is, towards light). Here, the plant is showing a positive response to light. Can you think of the advantage which the plant gets from bending towards light?



The potted indoor plant grows towards light

In the above examples, showing the stick to the dog, touching the leaves, and the light falling on the plant from one side, are stimuli (plural of "stimulus"). Light, sound, heat, smell, touch, pressure, etc., are examples of various stimuli.

All living beings, plant or animal, react to stimuli.

9. Reproduction (Produce offsprings)

You have already learnt that every living being has a definite life-span, and it dies after a certain age. If an organism simply live and ultimately die, its race would come to an end. To continue their race, all living beings tend to produce their young ones.

You have seen that seeds, produced by plants, germinate and give rise to new plants. You also know that a cow gives birth to a calf and a bird lays eggs which produce chicks (Fig. 1.20).

All the plants and animals reproduce and give birth to their own kind.

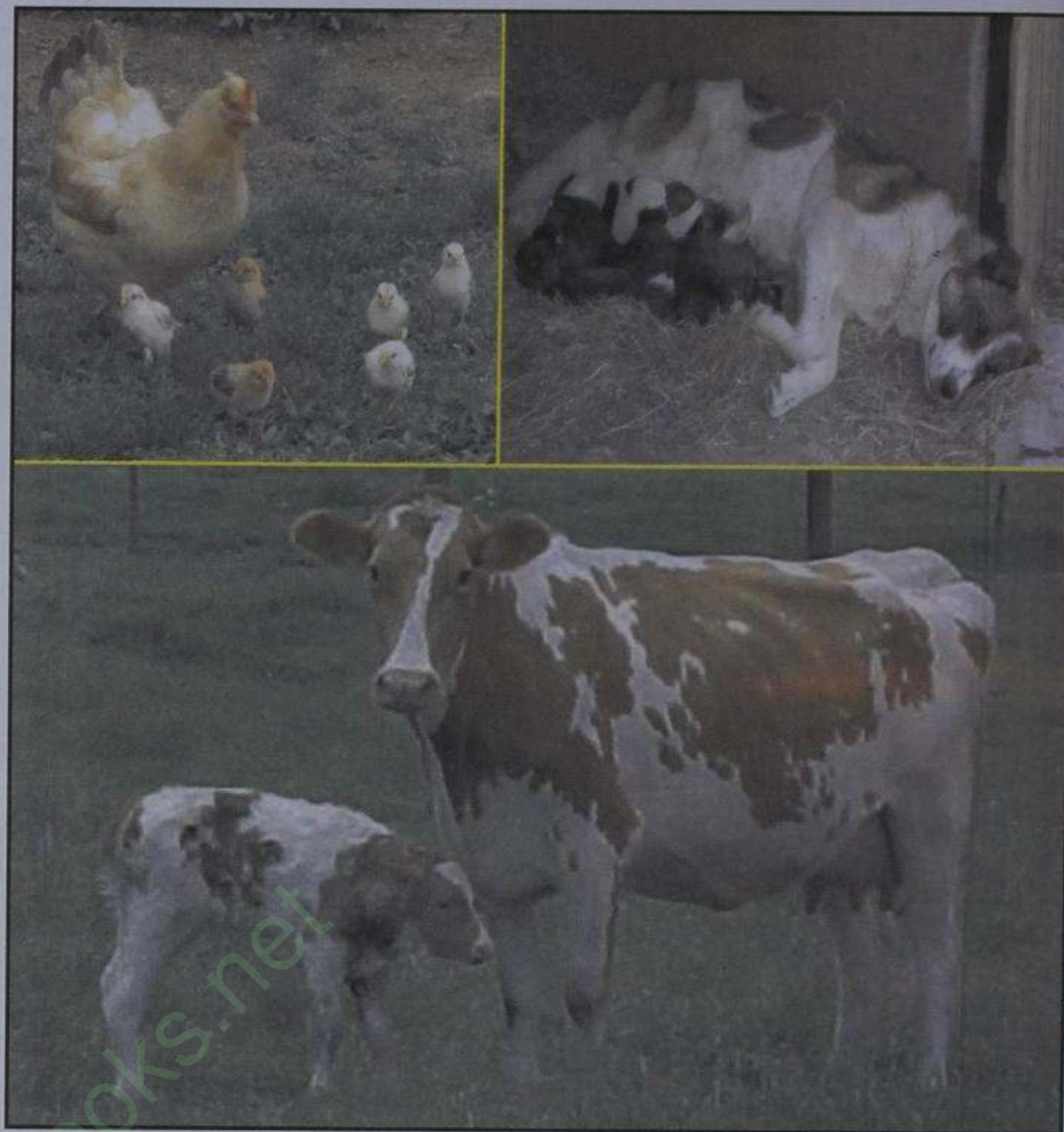


Fig. 1.20 Living beings reproduce their young ones

Table 1.1 : Differences between animals and plants

ANIMALS	PLANTS
1. Animals move from one place to another in search of food and shelter.	1. Plants do not move and are fixed at one place because they can make their own food.
2. Animals cannot prepare food with the help of carbon dioxide and water.	2. Plants prepare their own food with the help of carbon dioxide and water in presence of sunlight.
3. Animals do not have green pigment called chlorophyll in their body.	3. Green plants have green pigment chlorophyll in their body (leaves) which traps sunlight.
4. Animals stop growing after certain period of time.	4. Plants keep growing throughout their life.
5. Animal's body is compact and grows somewhat uniformly all around.	5. Plants have branching form, show growth at the tip of shoot and root.
6. Animals show quick or sudden response to stimuli.	6. Plants show very slow response to stimuli.

Table 1.2 : Differences between living and non-living things

CHARACTER	LIVING THINGS	NON-LIVING THINGS
1. Cellular structure :	Made of tiny units called cells.	Not made of cells.
2. Movement :	Show movement by their internal forces.	Can move only mechanically by the external forces.
3. Growth :	Grow by the addition of new cells internally. Also, repair cut parts themselves by means of growth.	Show only external growth by the deposition of similar substances. Such growth is reversible and does not contribute to repair.
4. Fixed life span and death :	After birth, they grow, produce their offsprings and die.	Have no life cycle and no death. They can only be broken or destroyed by the external forces.
5. Nutrition :	Take usable food first within the body, which is then used either in building up of body substances or to release energy.	Fuel supplied from outside such as battery which provide energy.
6. Respiration :	Breakdown food and release energy for the life activities.	Only burn the fuel provided from outside to release heat instantaneously (as in motor car).
7. Excretion :	Throw out harmful waste substances.	Do not excrete.
8. Responsiveness :	Respond to stimuli for their own benefit.	Show no response to stimuli.
9. Reproduction :	Reproduce their own kind.	Cannot reproduce. They only break into parts mechanically.

REVIEW QUESTIONS

- Why do we take food ?
- How are plants different from animals ?
- Define the following terms : (i) Stimulus (ii) Locomotion (iii) Excretion (iv) Reproduction
- When you touch a leaf of a sensitive plant (*Lajwanti*), it droops. Is this drooping of the leaf a kind of movement or the locomotion ?
- Match the items given under **column I** with those given under **column II** :

Column I

- Cell
- Leaf of *Lajwanti*
- Nutrition
- Autotrophs
- Stimulus

Column II

- Green plant
- Energy
- Movement
- Responsiveness
- Basic unit of life

- Fill in the blanks :

- Green plants can manufacture their own food because they have in their leaves.
- Animals show quick to stimuli.
- Animals move from one place to another in search of and
- Green plants can trap energy to prepare their food.
- Plants keep throughout their life.