

6 THE MYSTERY OF GROWTH



Haven't you noticed the words of the girl? What could be the reason the mother did not grow? Didn't the mother get nutrients in the required quantity? All living things grow and this growth manifests in different ways. If so, what is the basis of growth?

You know that cell is the structural and functional unit of organisms. Does the body grow due to the growth of cells? Or does it happen when the number of cells increase? Note down your guess

in the science diary.

You know that energy and other cell forming constituents are necessary for the formation and growth of cells. How do the changes that occur in the cells lead to growth?

Caskets of life to grow and multiply

Don't you remember that we called the cell the casket of life? What is the role of cells in the growth of the body?

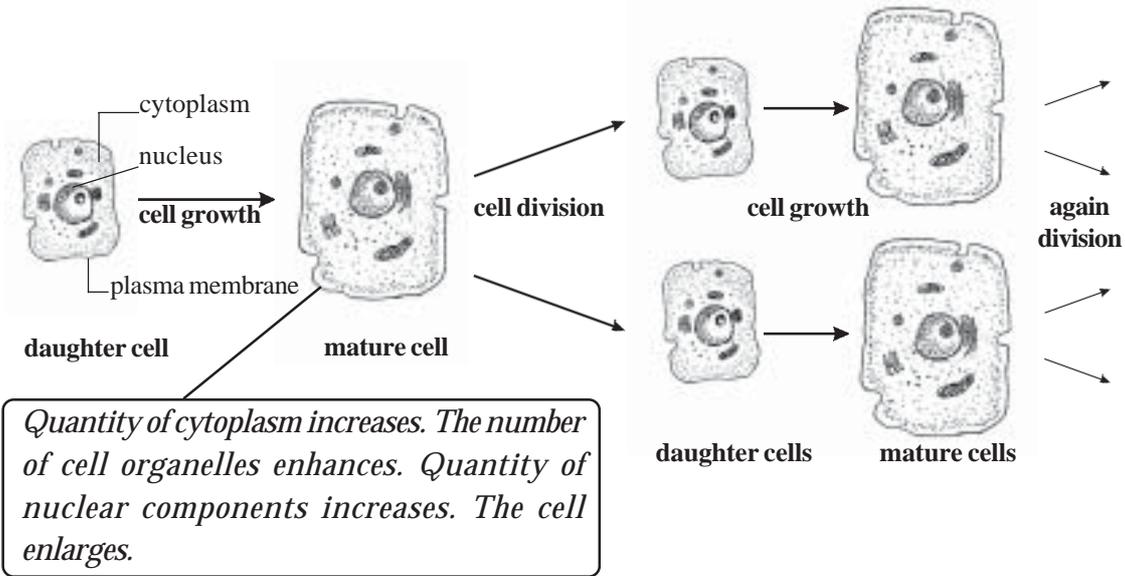


Fig. 6.1 Cell growth and cell division

Examine Figure 6.1 and formulate inferences about how the body grows. When a cell attains a particular size it divides. The new cells which are formed by the division grow and divide again. Now you have realised the role of cells in the growth of the body. Compare the guess you have formed about growth with the inferences formulated and assess the validity of your guess.

The changes inside the casket

What would be the changes occurring inside the cells when they divide? You know that the nucleus controls all the activities of the cell. If so, how does the nucleus get prepared for cell division? Prepare a note by analysing Figure 6.2 and description based on indicators.

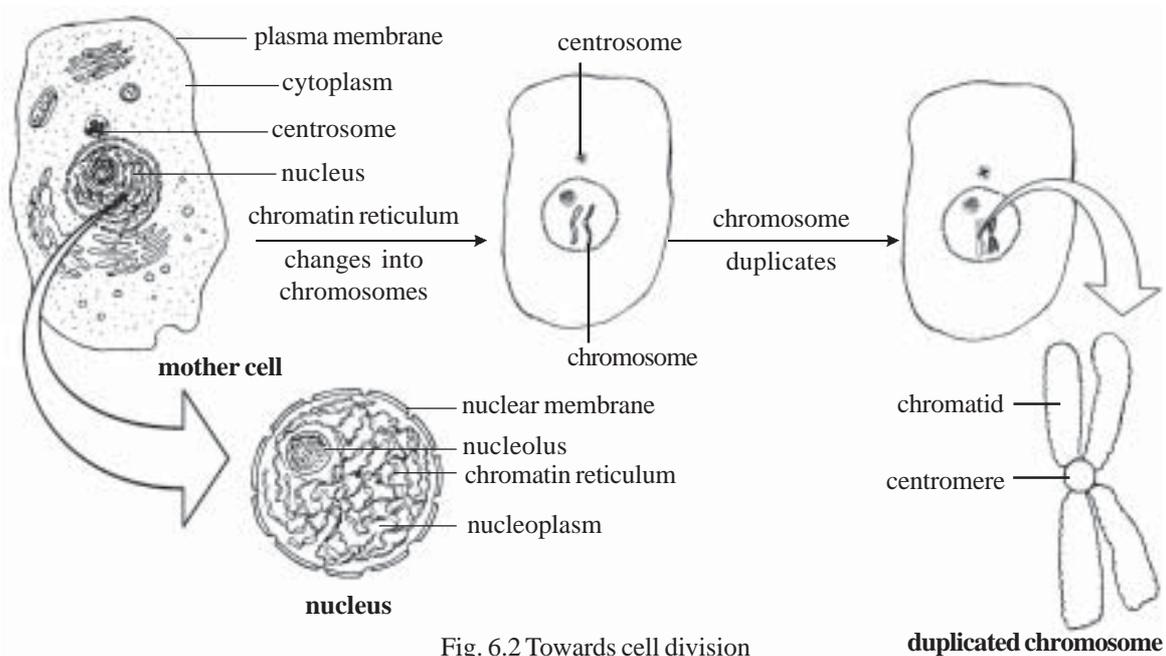


Fig. 6.2 Towards cell division

Nucleus - The Casket Inside the Casket

Nucleus is the controlling centre of the cell. Nucleus is covered by a double layered membrane. The fluid inside the nuclear membrane is called nucleoplasm. Spherical structures called nucleolus and a network of chromatin reticulum are seen in the nucleoplasm. When the chromatin reticulum becomes chromosomes we can say that the cell is ready to divide. Each chromosome contains one DNA (Deoxyribo Nucleic Acid) molecule. The genes which carry hereditary characters are part of the DNA. Just before cell division the chromosome duplicates by producing exact copies. At this stage the chromosome has two chromatids. The number of chromosomes is constant for each species of organism. The chromosome number of man is 46. Differences in age or place do not bring about any change in the chromosome number of a species.

Indicators

- ★ What happens to the chromatin reticulum just before cell division?
- ★ How does the structure of chromosome differ from that of chromatin reticulum?
- ★ How is the chromosome related to gene?

Let us examine what changes are occurring in the nucleus during cell division. Observe Figure 6.3, analyse it based on indicators and prepare notes.

Indicators

- ★ How many chromosomes are there in the mother cell? What changes do they undergo?
- ★ What are the parts disappearing from the nucleus during division?
- ★ What is the function of spindle fibres?
- ★ How many chromosomes are there in the daughter nucleus?

Isn't it clear from the figure that though the division of the nucleus is completed, two cells have not yet been formed. If the daughter cells are to be

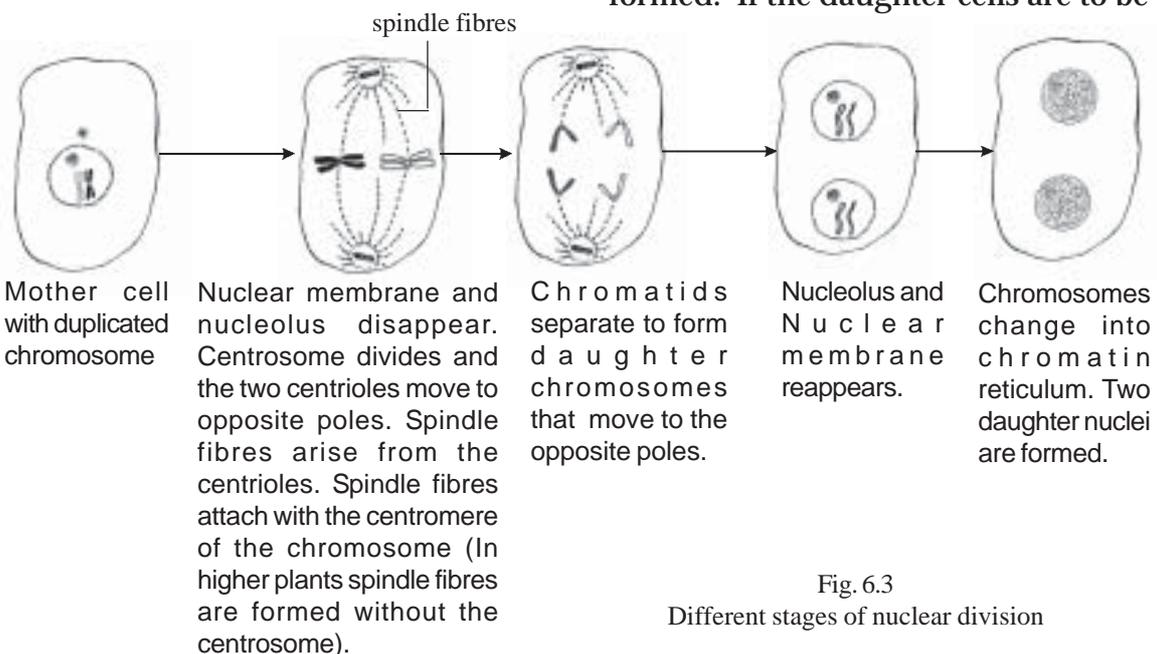


Fig. 6.3
Different stages of nuclear division

separated freely the cytoplasm should also be divided. Is the division of the cytoplasm same as that of the nucleus? Analyse the given Figure 6.4 and formulate inferences.

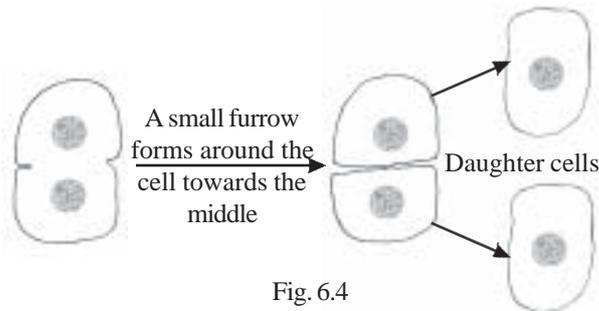


Fig. 6.4
Division of cytoplasm in animal cells

Is the process of cytoplasmic division similar in plant and animal cells? Observe Figure 6.5 and formulate inferences.

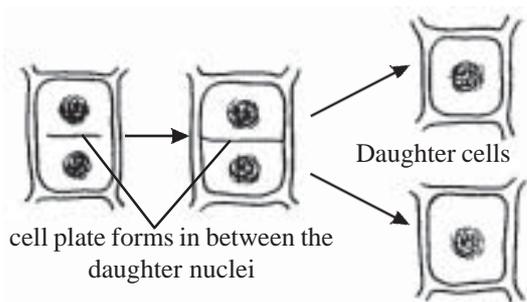


Fig. 6.5
Division of cytoplasm in plant cells

In this type of cell division, two identical daughter cells are formed from a mother cell. They grow and divide again. This kind of cell division which leads to the growth of the body is called mitosis. Observe mitosis in the onion root-tip with the help of your teacher.

In spite of the innumerable cycles of cell divisions in the body, the chromosome number remains constant. This is the significance of mitosis. Without any change in chromosome number, the body grows through mitosis upto a certain age.

As far as man is concerned, growth has social and cultural importance also. Stages like infancy, childhood and adolescence therefore become relevant in the life of a man. As he passes through these stages, each individual gets a chance to develop his personality by interacting with the society.

Adolescence - a period of specialities

You are now passing through an important stage of growth that is adolescence. Observe the chart given below and find out which of these special features you have.

I have some of these features. Have I attained adolescence?



Features of Adolescence

- The voice changes (in boys).
- Hair grows.
- Breasts develop (in girls).
- Develop interest towards opposite sex.
- Feel anxiety and worry even about unimportant matters.
- Imitate and worship film stars and sports stars.
- Tendency to respond to anything.
- Reluctance to listen to advice.
- More interest in making friends.
- Over enthusiasm.

The main reason for these specialities of adolescence is the physical changes occurring at this time. Each of you should be able to accept these changes with equanimity. Your parents and teachers will help you to face the challenges of adolescence normally. They have also gone through this stage in their life. Do not hesitate to tell your family about even the silly matters that disturb you. They will be with you to solve your problems. You will never be alone.

Youth comes after adolescence. Adolescence is from about 10 to 19 years. As far as the growth of the body is concerned, youth is not a relevant stage. The growth of a person stops in the early twenties. When growth ceases, the body moves towards old age. But old age gets manifested only years after in a person.

Have you ever thought of what happens in old age? Analyse the description given below and formulate inferences about old age.

Old Age - The Inevitability of Life

Growth is completed in man when adolescence is over. The activity of the cells slows down. Rate of cell division decreases. Reduced supply of oxygen to the cells and low rate of mitochondrial activity reduces energy production. Rate of cell death increases. Muscles shrink. The efficiency of eyes, ears and other organs decreases.

Old age is an inevitability of life. In future, you also will become old. If so, what should be the attitude towards the aged?

Discuss this in the class.

Just like old age, death is also an inevitability of life. What do you understand by death?

Analyse the description given below and develop the concept about it .
Make notes in your science diary.

Synonyms of Death

Brain Death

Brain death is a condition in which the activities of the brain cells cease permanently. The main symptom of this is the loss of electric impulses in the brain. This can be detected with the help of EEG (Electro Encephalo Graph). Even after brain death, the working of the heart and respiration might continue at a slow pace.

Clinical Death

The doctors say that a person has died when the heart beat and respiration stops. Some organs removed from the body immediately after death can be used for organ transplantation. Heart, kidneys, eyes etc., are organs that can be transplanted.

We have discussed the growth of man and the inevitable death. You know that growth is the characteristic feature of all living things. Plants seen around us are also growing. Is the growth of human beings and that of plants alike? What differences do you come across?

How do plants grow?

Like human beings plants also grow by cell division. But unlike human beings

the growth in plants is localised in certain parts. These plant parts where growth occurs are called meristems.

Meristematic cells divide and new cells are formed. The new cells undergo differentiation and engage in different functions. These cells do not have the capacity for division. Observe the given Figures 6.6 a, b, find out the differences between a meristematic cell and a mature cell and complete Table 6.1.

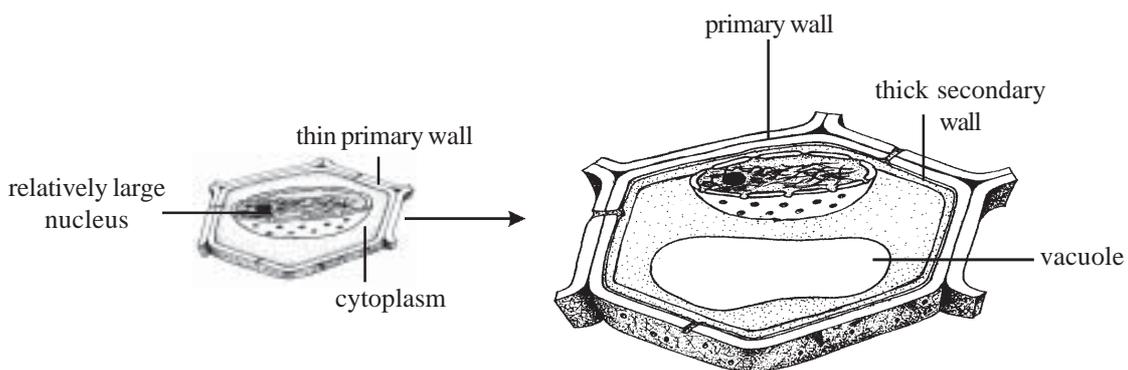


Fig . 6.6 (a)
Meristematic cell

Fig . 6.6 (b)
Mature cell

Meristematic cell	Mature cell

Table - 6.1

Do you know where the meristems are found?

Observe Figures 6.7, 6.8 and 6.9 and the flowchart given below and prepare note based on indicators.

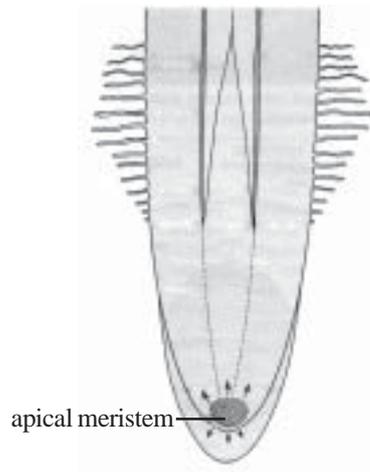


Fig. 6.7
Meristem of root

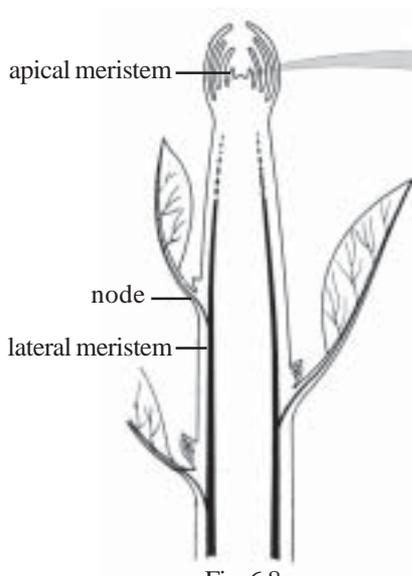


Fig. 6.8
Meristems of the stem

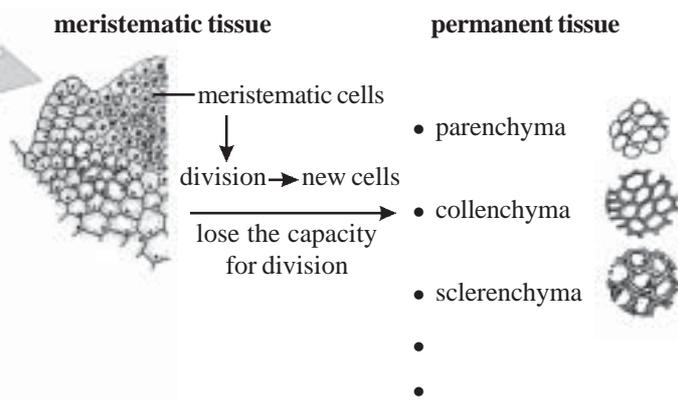
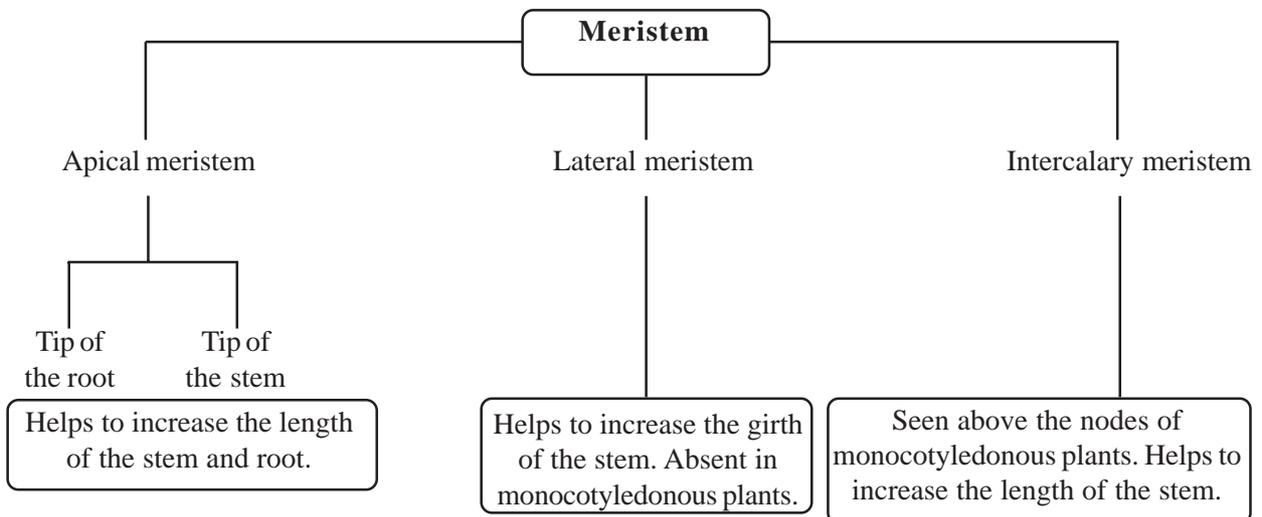
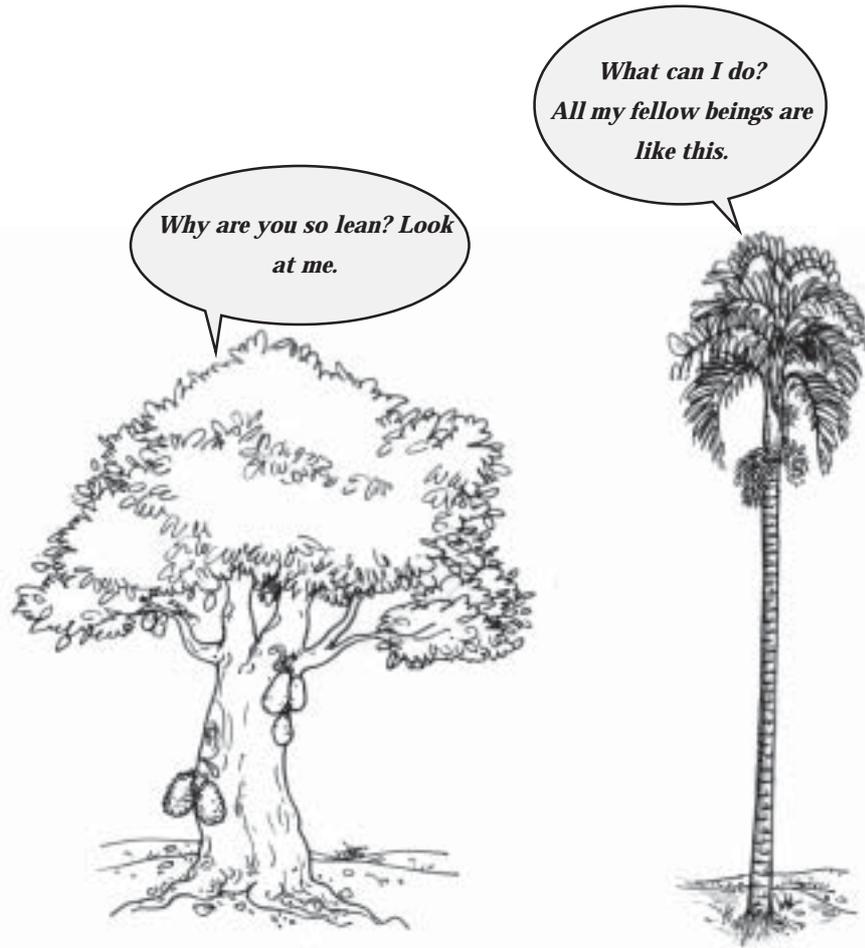


Fig. 6.9
Different types of permanent tissues



Indicators

- Compare the position and function of different types of meristems.
- ★ Why don't monocotyledonous plants increase in girth like that of dicotyledonous plants?

Growth in Microorganisms

Do microorganisms grow like plants and animals? Observe Figures 6.10 a, b given below and prepare a note on the growth of microorganisms.

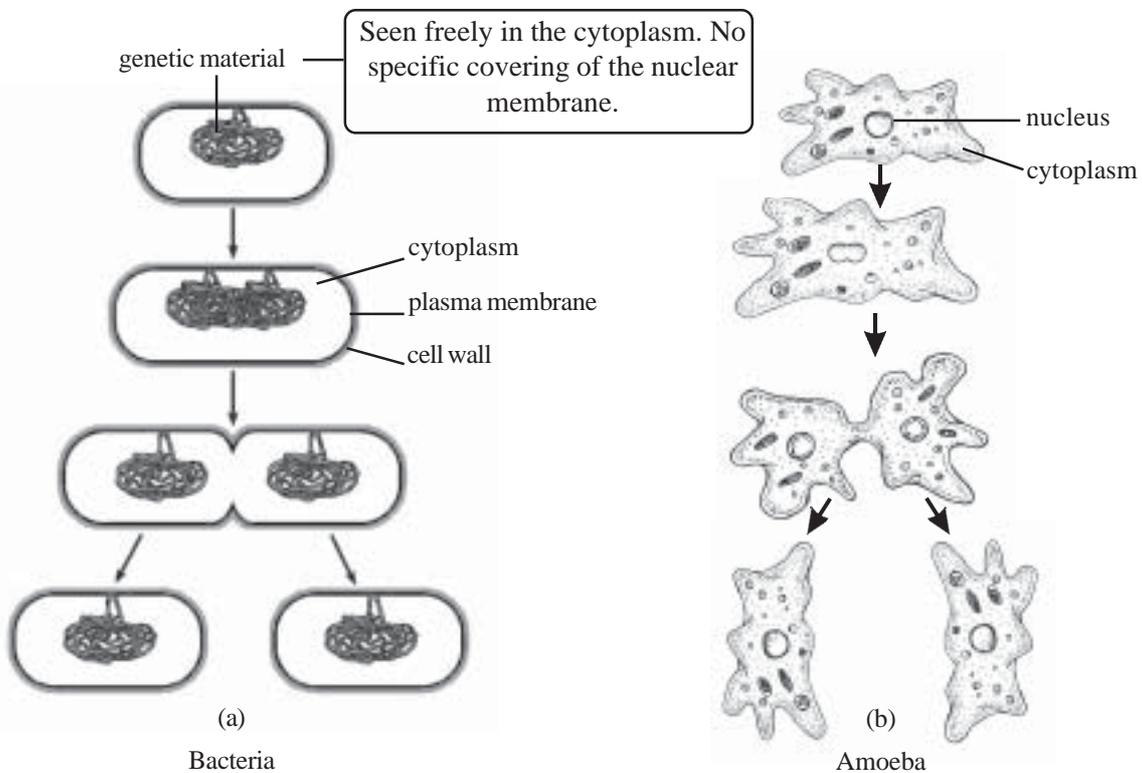


Fig. 6.10

Growth and division in microorganisms

Now it is clear that even though the cells of microorganisms grow, they divide only for reproduction.

The phenomenon of transmission of solar energy from plants to animals and their growth utilizing this energy

and their death after a particular stage is perhaps, a unique feature of this green earth. Man is the only living being who can understand and appreciate this phenomenon, sustain it qualitatively and consciously interfere in it.

