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UNIT - IV

THE STEM

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4.1 INSTRUCTIONAL OBJECTIVES

1. Given the figure of a plant, the pupil will be able to recognise the main axis of the shoot and recall its name. (U)

2. Given the figure of a shoot, the pupil will be able to recognise the node. (U)

3. Given the figure of a shoot, the pupil will be able to recognise the internode. (U)

4. Given the figure of a shoot, the pupil will be able to recognise the terminal bud. (U)

5. Given the figure of a shoot, the pupil will be able to recognise the axillary bud. (U)

6. The pupil will be able to recall the function of the terminal bud. (K)

7. The pupil will be able to recall the function of the axillary bud. (K)

8. The pupil will be able to recognise that the axillary bud and terminal bud have the same function. (K)

9. The pupil will be able to recognise that the axillary bud and terminal bud have the same structure. (K)

10. The pupil will be able to recall that the axillary bud becomes more active in development when the terminal bud is cut off. (K)

11. The pupil will be able to reason out what she would do to have a shorter and thicker growth of a plant. (U)

12. The pupil will be able to recall the names of the two main types of stem. (K)

13. The pupil will be able to describe the aerial stems. (K)

14. The pupil will be able to describe the underground stems. (K)

15. The pupil will be able to recall the names of the three types of aerial stems. (K)

16. The pupil will be able to describe the erect stems. (K)

17. The pupil will be able to describe the climbing stems. (K)

18. The pupil will be able to describe the prostrate stems. (K)

19. The pupil will be able to discriminate between the three types of aerial stems. (U)

20. The pupil will be able to recall that the underground stems are also called rhizomes. (K)

21. The pupil will be able to discriminate an underground stem from a root giving reason. (U)

22. The pupil will be able to recall the three basic functions of the stem. (K)

23. Given figures of stems, the pupil will be able to recall the special function of it - Photosynthesis, Support and Food storage. (U)

24. Given figures of stems, the pupil will be able to describe how it performs the special function - Photosynthesis, Support and Food Storage. (K)

4.2 INITIAL INSTRUCTION

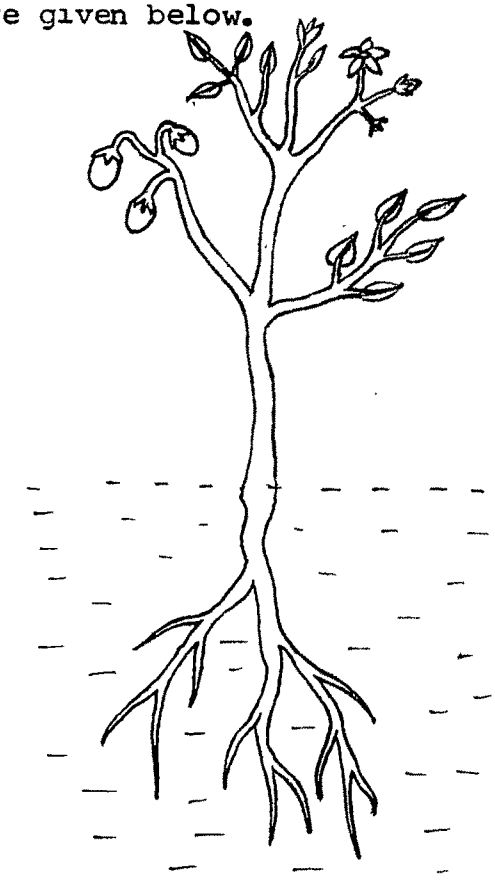
SS 1. What is the name of the main part of the plant which grows above the soil?

The shoot is the main part of the plant which grows above the soil towards sunlight.

Name the different parts of the shoot.

The different parts of the shoot are the stem, the leaves, the fruits and flowers.

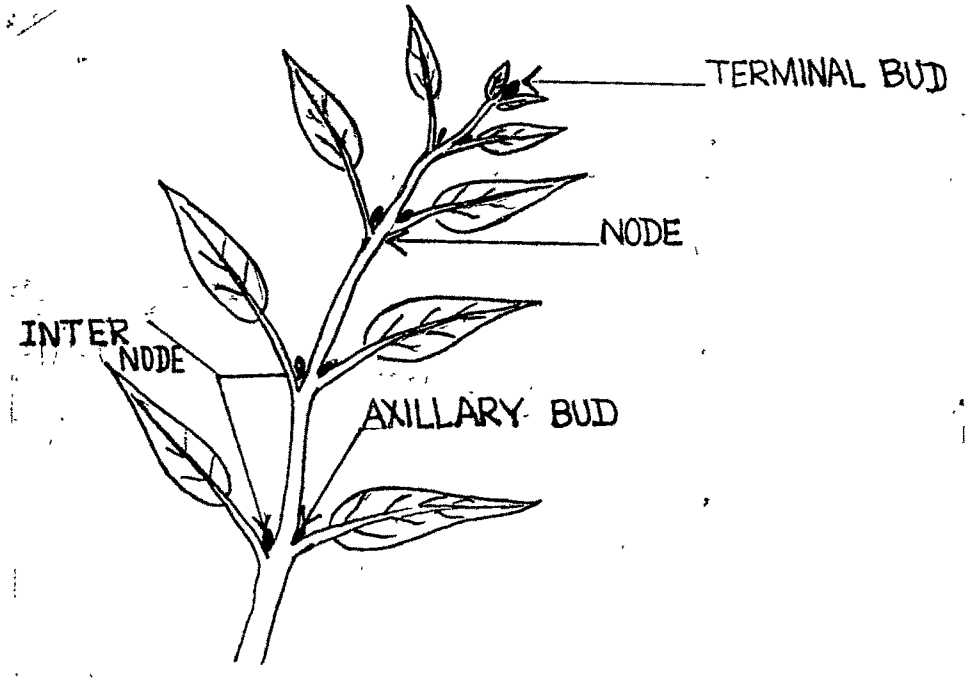
Point out with arrows these parts of the shoot in the figure given below.



The stem is the part of the plant between the roots and the leaves. It is the main axis of the shoot.

Today, we will study about the stem.

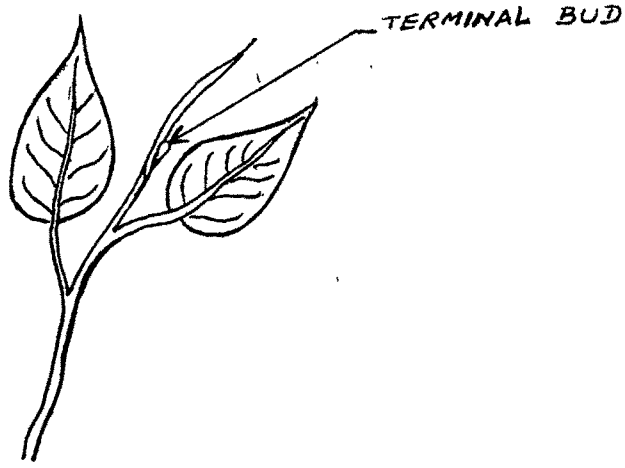
Observe the figure of the stem given below. Note the parts of the stem.



You will find leaves growing from the stem. The point from which the leaf arises from the stem is called the node. The part of the stem between two consecutive nodes (nodes which come one after the other) is called the internode. Look at the tips of the stem and its branches. There are small leaves overlapping each other. As we pluck each leaf off, we find younger and younger leaves inside till we finally get a bud. This bud is called the terminal bud. It is an undeveloped or condensed shoot. There is also a bud in the angle formed by the leaf and the stem. It is called the axillary bud. Look

at the axillary bud. It looks similar to the terminal bud. Hence their structure is the same. Both the buds help the plant to grow. The terminal bud elongates the plant and the axillary bud gives rise to branches. Thus, both the buds have the same function i.e. helping the plant to grow.

You must have observed the terminal buds of banyan, peepal and castor.



They are comparatively bigger in size and can be seen clearly. Cabbage is a very large terminal bud. When the terminal bud is cut off the axillary buds become more active in their development i.e. they give rise to branches. This is the reason why we cut off the tops of plants like rose, jasmine, henna. Thus the branches spread out and the growth becomes thick. We often see garderners trimming the plants.

2. Types of Stem

There are two types of stems.

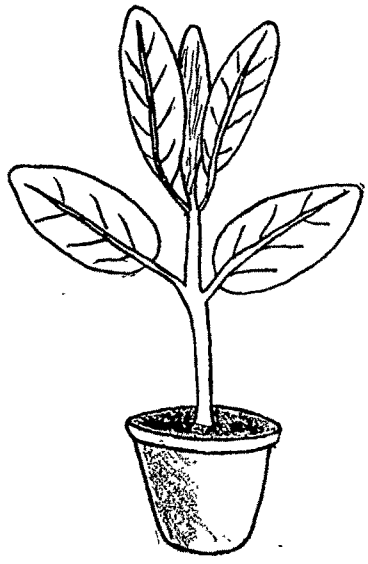
1. Aerial stems, 2. Underground stems.

Stems growing above the soil are called **aerial** stems. Some stems develop in the soil. They are called the underground stems.

There are three types of Aerial stems. They are (a) Erect Stems, (b) Climbing Stems, (c) Prostrate Stems

Erect Stems :

Look at the figure of this stem. It can stand erect and grow. It does not need support. It is called as erect stem. Examples of such types of stems are Rose, Tamarind, Coconut, Neem, Aster.



Climbing Stems:

Look at the figures of the stems given below:

'A'

'B'

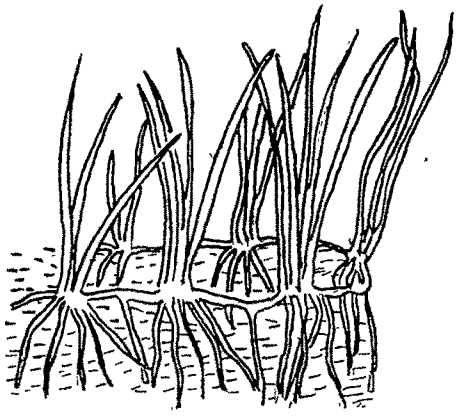
These stems are too weak to stand and grow upright by themselves so they climb on whatever support they find. Such stems are called climbing stems.

Look at the stem 'A', the plant climbs by coiling around the support. Examples of the plants with this type of stem are bean and Corcinia indica (Giloda).

Look at the stem 'B' the plant produces thread like structures which help in climbing. Examples of the plants with this type of stem are peas and gourds (Lauki).

Prostrate Stems:

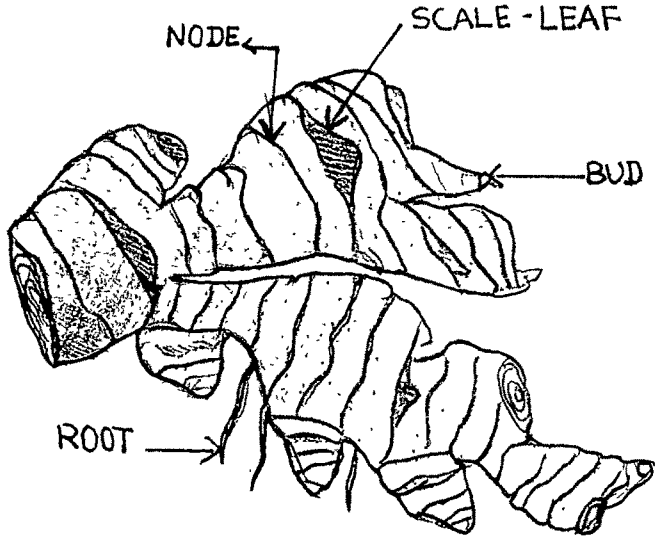
Look at the stem in the figure given below.



This stem is weak and trails on the ground. The roots arise from the nodes and get fixed in the soil. This type of stem is called prostrate stem.

Underground Stems :

Observe the figure of this stem. It is an underground stem. Why is it called an underground stem?



It is called an underground stem because it grows in the ground. These stems are called rhizomes. Observe the stem in the above figure. What do you notice?

_____

_____

_____

_____

_____

On this stem, there are roots, nodes and buds. Parts of leaves can be seen on the nodes. Thus, though they are under the soil, they are not roots but stems.

§§ 3. You must have observed that the stem is an important part of the plant. The plant depends on the stem for carrying out certain functions.

What are those functions that the stem carries out?

The basic functions of the stem are:

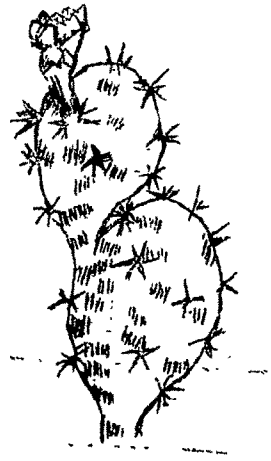
1. It supports the branches bearing leves, flowers and fruits.
2. It spreads the leaves in such a way that they get enough of sunlight and air.
3. The stem transports the water and minerals absorbed by the roots, to the leaves.
4. The stem transports the food prepared by the leaves, to the other parts of the plant.

Special functions of the Stem

Some stems perform special functions besides the normal functions. For this, the stem undergoes a modification in its structure.

Photosynthesis

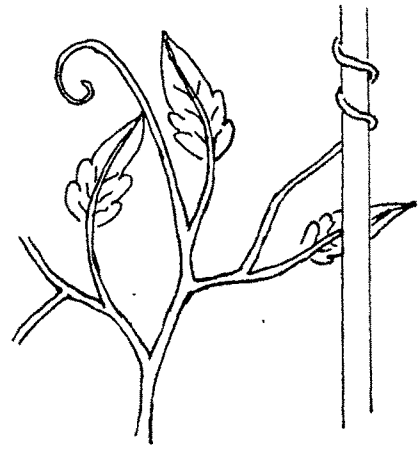
Look at the figure of opuntia.



The stem has no leaves on it. The stem is thick, flat and green. It is green as it contains chlorophyll and so it can prepare food with the help of sunlight. Thus it carries out the function of photosynthesis.

Support

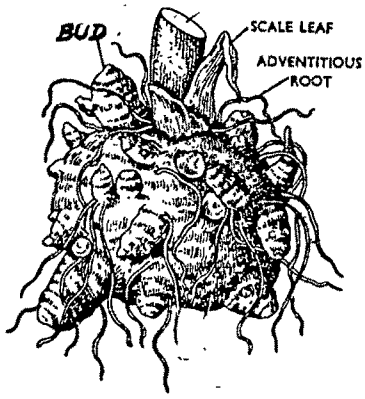
Look at the figures of the stems.

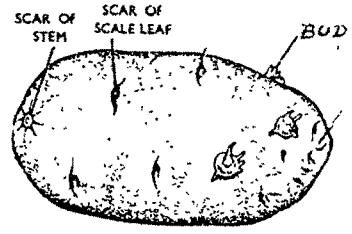


These stems are the climbing stems. They give support to the plants with weak stem. Some plants have thread like structures which coil around the support. The stems of some plants coil around the support. This supports the weak stem.

Food Storage :

Some underground stems store food. Look at the figures of the stems which store food, e.g. Suran and Potato.





This food is used for the plant growth in the following year. The stems are thick, big and have different shapes.

Summary

The stem is the part of the plant between the roots and the leaves. It is the main axis of the shoot. Leaves grow from the stem. The point from which the leaf arises from the stem is called the node. The part of the stem between two consecutive nodes is called the internode. At the tip of the stem there is a bud called terminal bud, a similar type of bud is present in the angle formed by the leaf and the stem. It is called axillary bud. Both the terminal and axillary buds have the same function. They help in the growth of the plant. The terminal bud helps the plant to grow longer and the axillary bud helps it to grow sidewards. Both these buds are similar in structure too.

There are two types of stems. Stems which grow above the soil called aerial stems and stems which grow in the soil are called underground stems.

There are three types of aerial stems. a) Erect Stems, b) Prostrate stems, c) Climbing stems.

Erect Stems : The plants with erect stems stand erect and grow. They do not need support.

Prostrate stems: These plants have weak stem and hence cannot grow erect. They trail on the ground and grow.

Climbing stems: These plants have weak stem and hence cannot grow upright. They climb on whatever support they find.

Underground stems are called rhizomes. On these stems are found roots, nodes, and buds. Parts of leaves can be seen on the nodes. Hence, though they are underground they can be differentiated as stems and not roots.

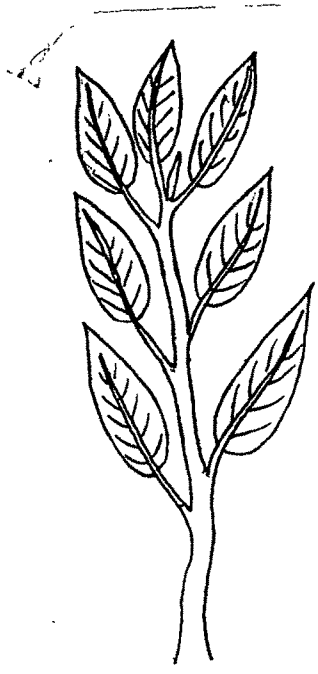
Functions of the stem :

1. It supports branches bearing leaves, flowers and fruits.
2. It spreads the leaves in such a way that they get enough of sunlight and air.
3. The stem transports the water and minerals absorbed by the roots to the leaves.
4. The stem transports the food prepared by the leaves to the other parts of the plant.

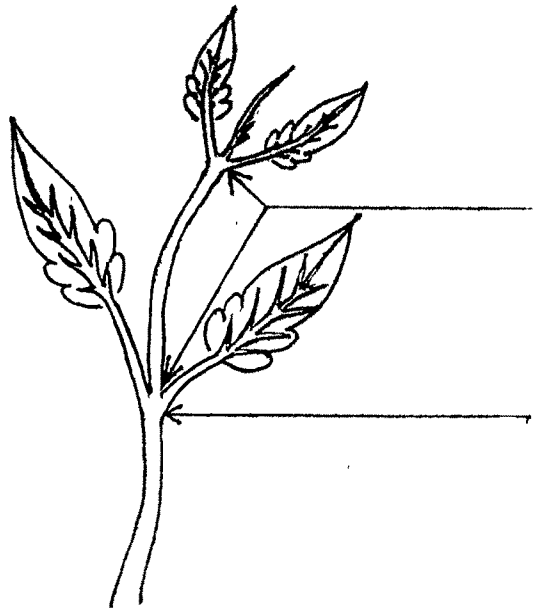
The stems of some plants carry out some special functions. These special functions are photosynthesis, support and food storage.

4.3 FORMATIVE TEST

1. In the figure drawn below, point out the main axis of the shoot and name it.



2. A figure of the shoot has been drawn below. Label the parts that have been pointed by arrow marks.



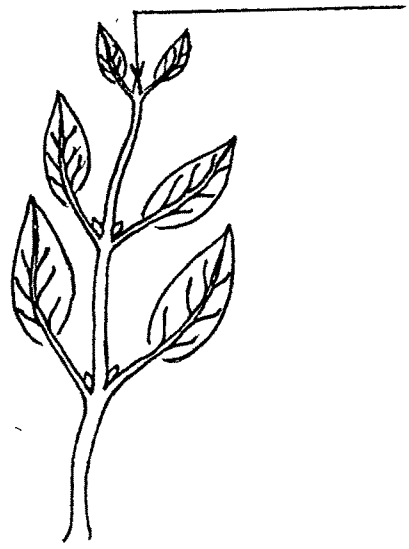
3. Match the following :

Directions : Column A contains the names of the parts of the plant. Column B contains the description of the parts. Find out the appropriate descriptions from the column B to match the names given in Column A. Write the names from Column A in the brackets provided with the appropriate descriptions in column B.

A	B
i) Node	- Part of the plant which grows above the soil. ( )
ii) Internode	- Part of the plant between the root and the leaves. ( )
	- Part of the stem from where the leaf arises. ( )
	- Part of the plant between two nodes. ( )

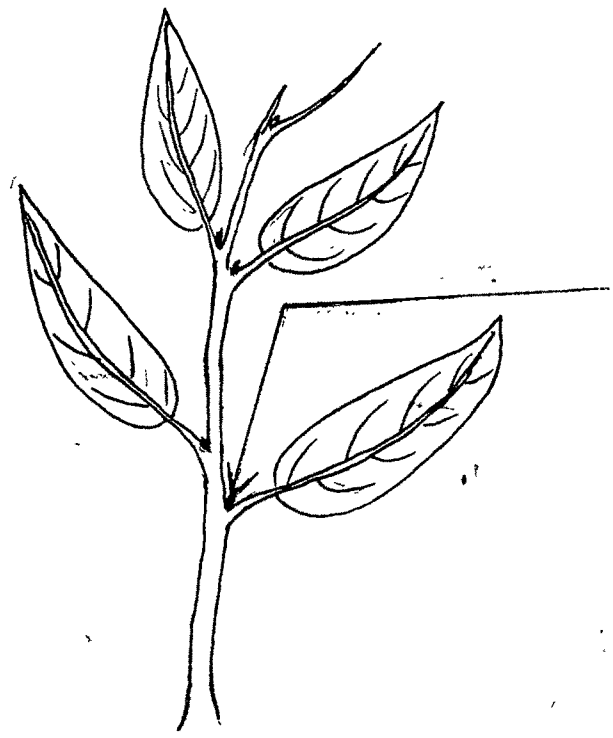
4. a) A figure of the shoot has been drawn below. Label the part that has been pointed by an arrow mark.

b) What is the function of it?



5. a) A figure of the shoot has been drawn below. Label the part that has been pointed by an arrow mark.

b) What is the function of it?



6. Fill in the blanks choosing the most appropriate answer.

The terminal bud and axillary bud have _____ function and _____structure.

a. Same structure & different function.
b. Different structure & different function.
c. Different structure & same function.
d. Same structure & same function.

7. State what happens to the axillary bud when the terminal bud is cut off?

8. State what you would do to the plant, if you want a shorter and thicker growth of it.

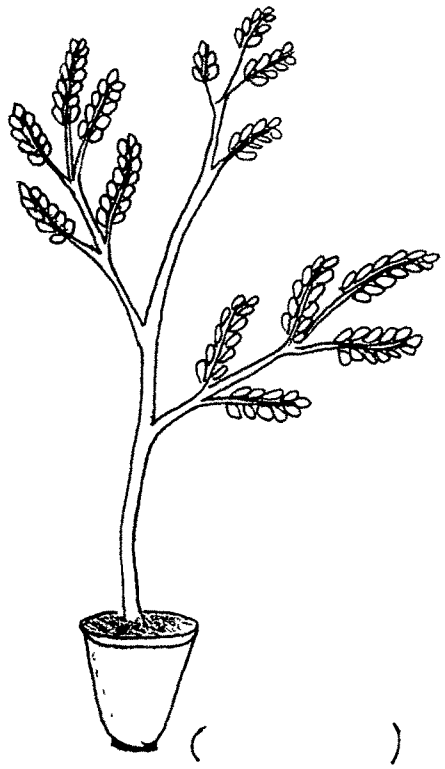
9. a. Name the two main types of stem.

b. Describe each of them.

10. a. Name the three types of aerial stems.

b. Describe each of them.

11. The different types of aerial stems are given below. Name which type each belongs to.



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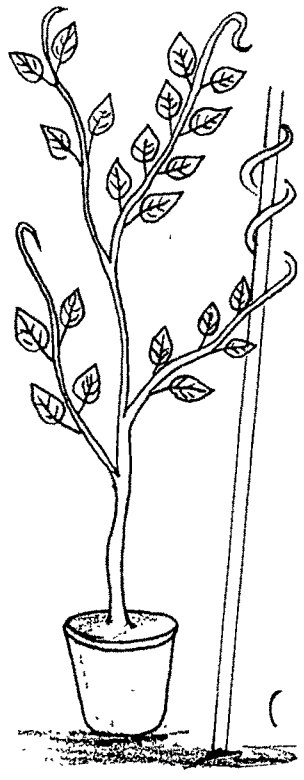

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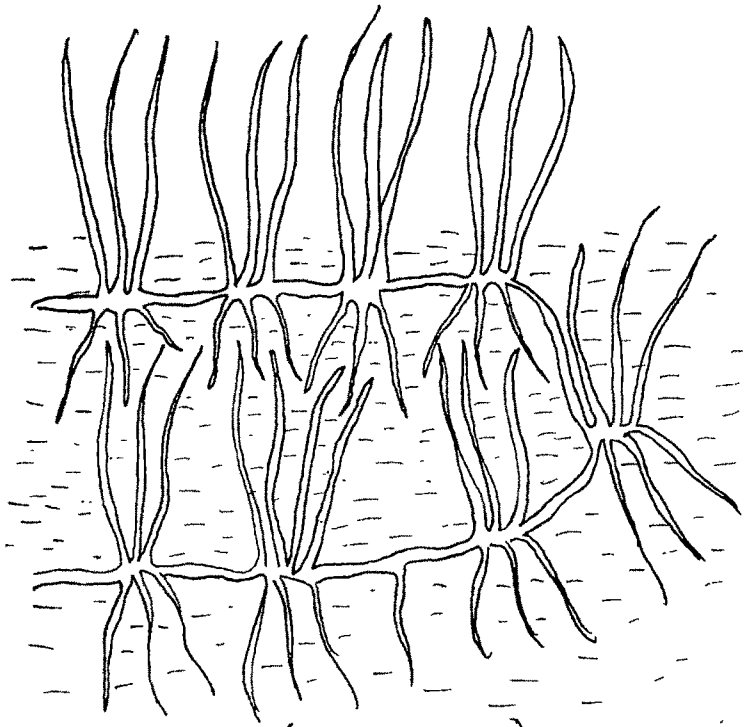

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12. Fill in the blanks :

The underground stems are also called as _____.

13. Why is Elephantyam (Suran) called an underground stem and not a root.

14. State the three basic functions of the stem.

15. a. Given figures of stems, Name the special function of each of the stems.

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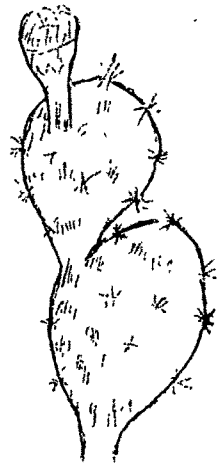

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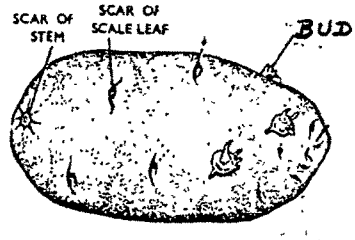

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b. Describe how each performs their special function.

4.4 REMEDIAL INSTRUCTION

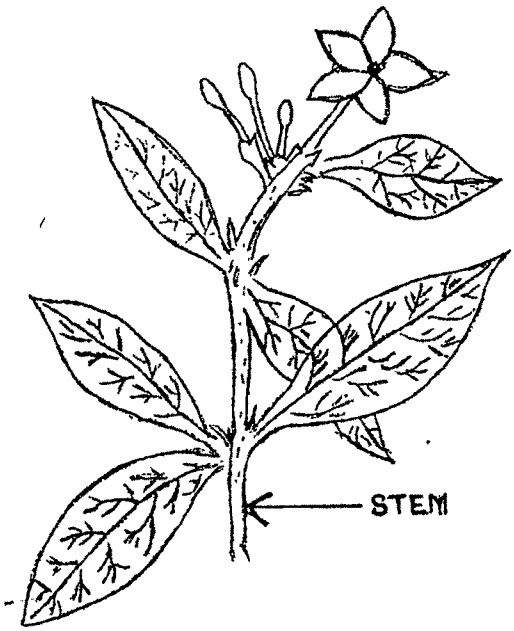
4.4.1 Instructional Objective.1

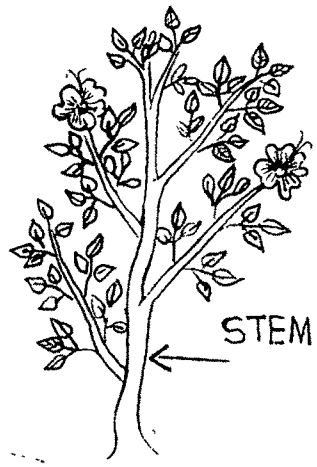
Location of Stem

(i) P.L.M. (Deviated form)

Section A

The main axis of the shoot is the stem. The stem is the part of the plant between the roots and the leaves. Look at the stem in the figures of the shoot.

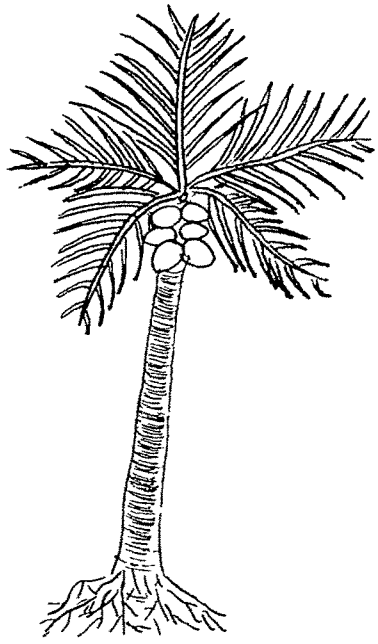


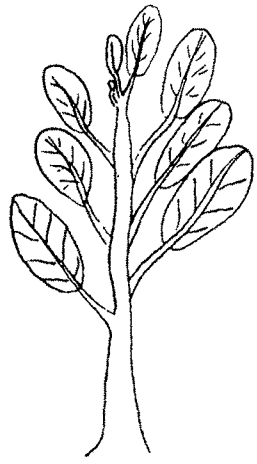


Turn to Section B

Section B

a. Figures of shoot are given below. Label the main axis of the shoot.





Fill in the blank

b. The main axis of the shoot is called the _____.

(ii) Oral Verbal Elaboration

Teacher (investigator) points out the stem of a plant and states "Look at this part of the shoot. It is the main axis of the shoot. It is called as the stem."

Teacher then shows other plants and points out their stems.

4.4.2 Instructional Objective.2

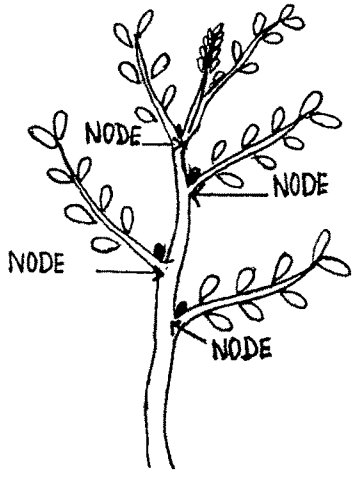
Location of Node

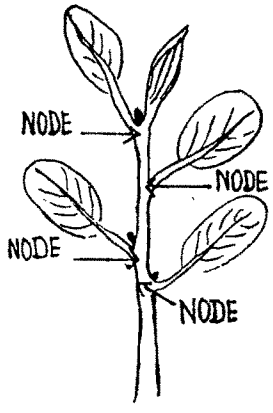
(i) P.L.M. (Deviated form)

Section A

The leaves are seen growing from the stem. The point from which the leaf arises from the stem is called the node.

Look at the figures of the stems and observe the node.





Turn to Section B

Section B

a. In the figures of stems, point out with an arrow mark the node.

b. Fill in the blank:

The leaves are seen growing from the _____ part of the stem.

(ii) Oral Verbal Elaboration

Teacher (investigator) points out the node of a shoot and states "Look at this part of the stem. It is called the node."

Teacher shows shoots of other plants and points out the nodes in those shoots.

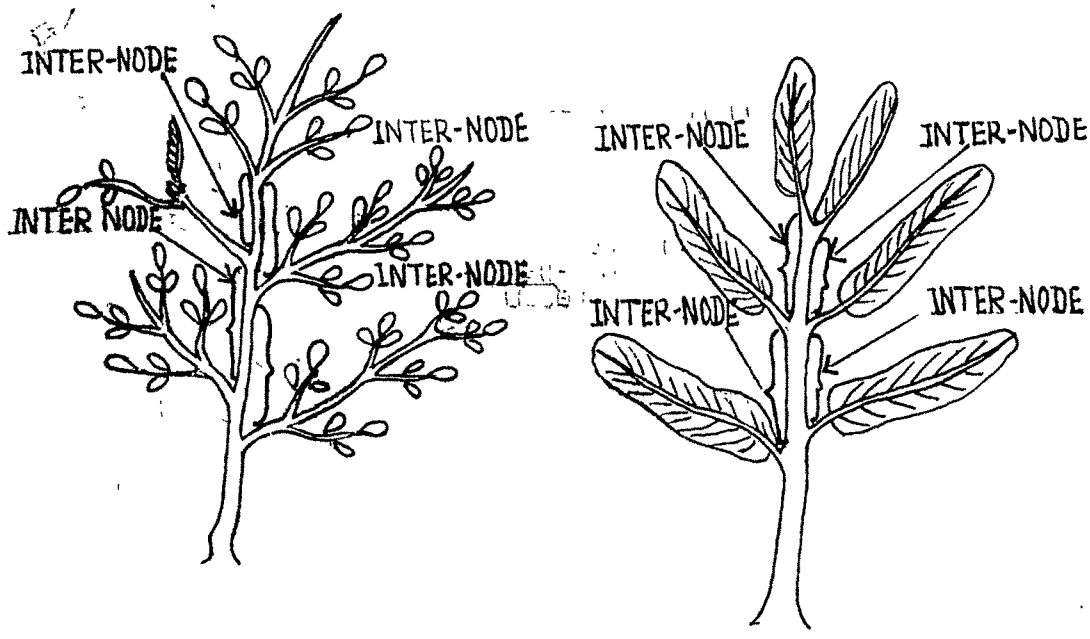
4.4.3 Instructional Objective.3

Location of the Internode

(i) P.L.M. (Deviated form)

Section A

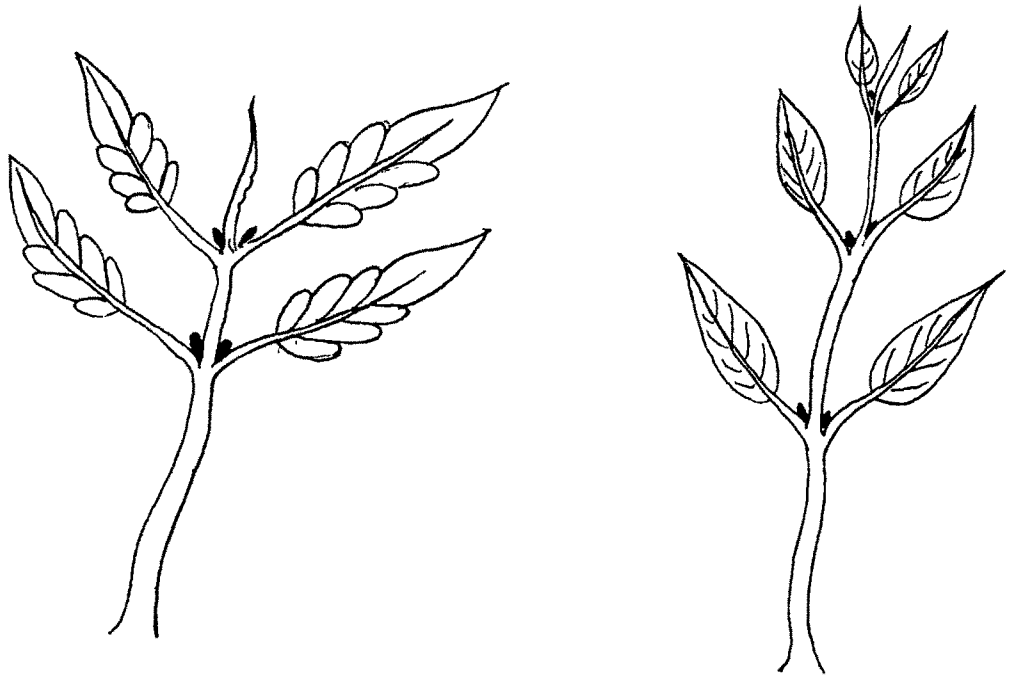
The part of the stem between two consecutive nodes is called the internode.



Turn to Section B

Section B

In the figure of stems, point out with an arrow mark the internode.



(ii) Oral Verbal Elaboration

Teacher (investigator) points out the internode of a shoot and states "Look at this part of the stem. It is called the internode."

Teacher then shows shoots of other plants and points out the internodes in them.

4.4.4 Instructional Objective.4

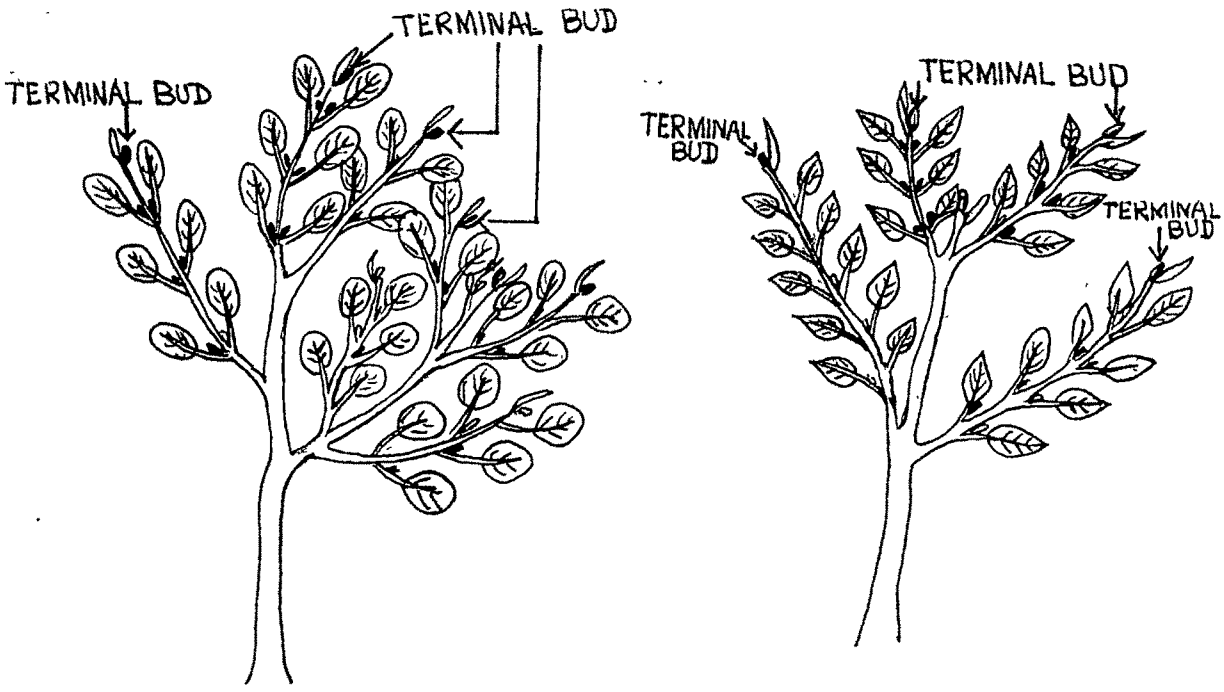
Location of the terminal bud

(i) P.L.M. (Deviated form)

Section A

The terminal buds are present at the tips of the stem and its branches.

Look at the terminal buds in the figures of the stems.



Turn to Section B

Section B

a. Point out the terminal buds present on this figure of the stem.

b. In the plant, where are the terminal buds present?

_____

_____

_____

(ii) Oral Verbal Elaboration

Teacher (investigator) points out the terminal bud and states "Look at the tip of this shoot, there is a bud present. It is called the terminal bud."

Teacher shows shoots of other plants and points out the terminal buds in those shoots.

4.4.5 Instructional Objective.5

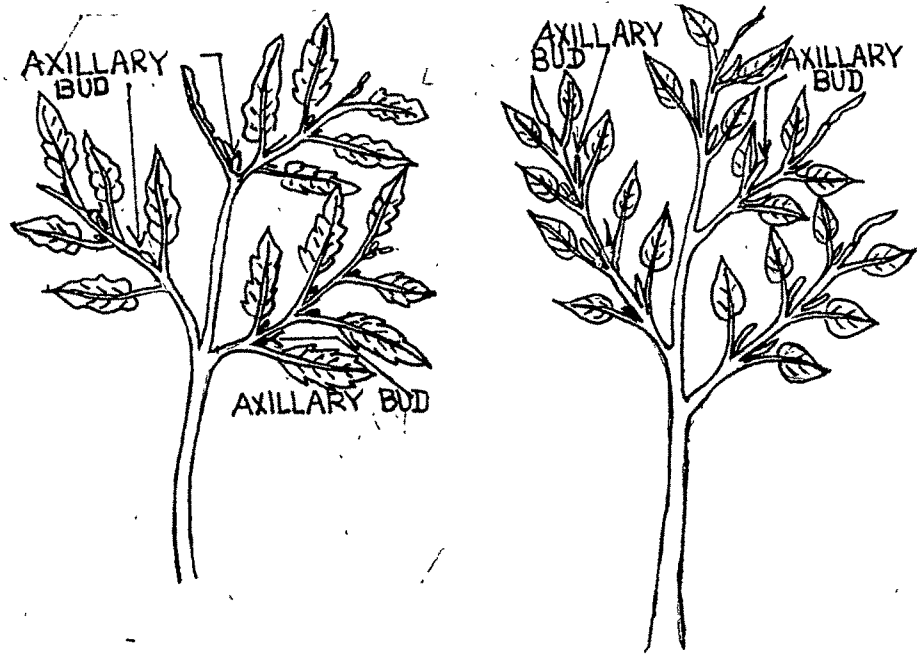
Location of the Axillary bud

(i) P.L.M. (Deviated form)

Section A

The axillary bud is present in the angle formed by the leaf and the stem.

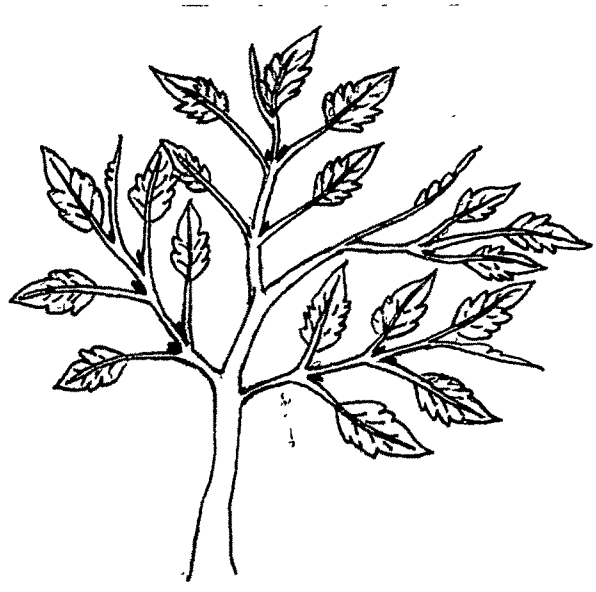
Look at the axillary buds in the figure of the stems.



Turn to Section B

Section B

a) Point out the axillary buds present on this stem.



b) In the plant, where are the axillary buds present?

(ii) Oral Verbal Elaboration

Teacher (investigator) points out the axillary bud of a shoot and states "Look at this region between the leaf and the stem. There is a bud present. It is called the axillary bud."

Teacher shows shoots of other plants and points out the axillary buds in those shoots.

4.4.6 Instructional Objective.6

Function of the terminal bud

(i) P.L.M. (Deviated form)

Section A

When the terminal bud grows, the stem grows longer. Hence the function of the terminal bud is to help the plant grow upwards.

Turn to Section B

Section B

Fill in the blank by choosing the most appropriate answer :

The function of _____ is to help the plant grow upwards.

(a) Terminal bud (b) Axillary bud (c) Node.

Turn to Section C

Section C

Tick mark (_/) the correct answer

The function of the terminal bud is to

a) help the plant grow sideways ( )
b) help the plant grow downwards ( )
c) help the plant grow upwards ( )

(ii) Oral Verbal Elaboration

Teacher (investigator) states "The terminal bud helps the plant to grow upwards (vertically) i.e. it elongates the plant."

4.4.7 Instructional Objective.7

Function of the axillary bud

(i) P.L.M. (Deviated form)

Section A

When the axillary bud grows, it gives rise to a branch. Hence, the function of the axillary bud is to help the plant grow sideways.

Turn to Section B

Section B

Fill in the blank by choosing the most appropriate answer:

The function of _____ is to help the plant grow sideways.

(a) Node, (b) Axillary bud, (c) Terminal bud.

Turn to Section C

Section C

Tick mark (_/) the correct answer

The function of the axillary bud is to

a) help the plant grow upwards ( )
b) help the plant grow downwards ( )
c) help the plant grow sideways ( )

(ii) Oral Verbal Elaboration.

Teacher (investigator) states "The axillary bud helps the plant to grow sideways (horizontally) i.e. it gives rise to branches."

4.4.8 Instructional Objective.8

Similarity in the functions of the axillary and terminal buds.

(i) P.L.M. (Deviated form)

Section A

The terminal bud helps the plant to grow upwards and the axillary bud helps the plant to grow sideways. Thus both these buds help the plant to grow. Hence they have a common function of helping the plant to grow.

Turn to Section B

Section B

Fill in the blanks by choosing the appropriate answer:

The _____ and _____ have the same function.

a) Terminal bud & Internode.
b) Axillary bud & Leaf.
c) Terminal bud & Axillary bud.

Turn to Section C

Section C

Tick mark (_/) the correct answer.

The terminal bud & axillary bud have

(a) Similar function ( )
(b) Different types of functions( )

(ii) Oral Verbal Elaboration

Teacher (investigator) states "The terminal bud helps the plant to grow upwards and the axillary bud helps the plant to grow sideways. Since both these buds help the plant to grow, they have the same function."

4.4.9 Instructional Objective.9

Similarity in the structure of the axillary and terminal buds

(i) P.L.M. (Deviated form)

Section A

Look at the structure of the terminal bud

Look at the structure of the axillary bud

Compare the structure of both these buds.

You will find that they have the same structure.

Turn to Section B

Section B

Tick mark (_/) the correct answer

The terminal bud and axillary bud have _____

(a) Similar structure ( )
(b) Different structure ( )

(ii) Oral Verbal Elaboration

Teacher (investigator) shows a plant & points out to the terminal bud and axillary bud and states "Look at the terminal bud and look at the axillary bud in this plant. They have the same structure."

Teacher shows the axillary and terminal buds in other plants.

4.4.10/11 Instructional Objective.10 & 11.

Increase in the activity of the axillary bud when the terminal bud is cut off.

(i) P.L.M. (Deviated form)

Section A

Do you notice the gardeners trimming the plants in the hedges. Why do they trim them?

In order to have a strong fence, they have to have a thick growth of the plant. This can take place by cutting the terminal buds. When the terminal buds are cut off, the axillary buds become more active in development i.e. it gives rise to more branches and hence the plant will be shorter and thicker in growth. This is the reason why plants are trimmed.

Turn to Section B

Section B

Why are some plants trimmed at the top? Give some examples of such plants.

(ii) Oral Verbal Elaboration

Teacher (investigator) explains as follows "You may have observed that some gardens have a fence formed by thick growth of plants. The gardener cuts off the terminal buds as he trims the plants. This is because axillary buds become more active in development i.e. they give rise to more branches, when the terminal buds are cut off. Thus to have a shorter and thicker growth of a plant, we need to cut off the terminal buds."

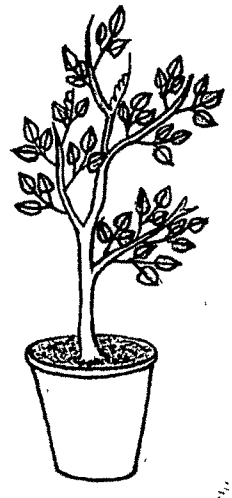
4.4.12/13/14 Instructional Objective.12, 13 & 14.

Types of Stems

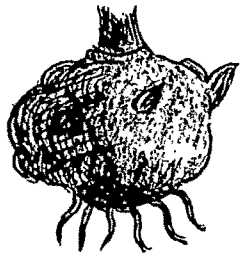
(i) P.L.M. (Deviated form)

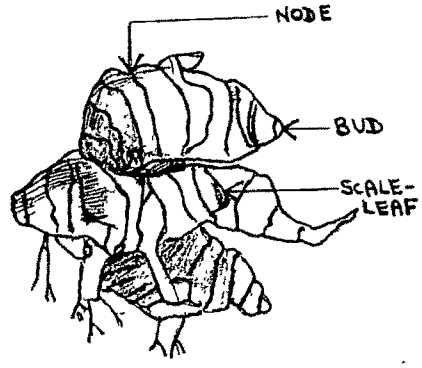
Section A

There are two types of stems. Aerial stems and Underground stems. Stems which grow above the soil are called Aerial stems. Examples of such types of stems are those of Tulsi, Rose & Tamarind.



Stems which grow in the soil are called underground stems.





Turn to Section B

Section B

a. Name the two types of stems.

_____

_____

. Describe each of them.

_____

_____

_____

_____

Give two examples of each.

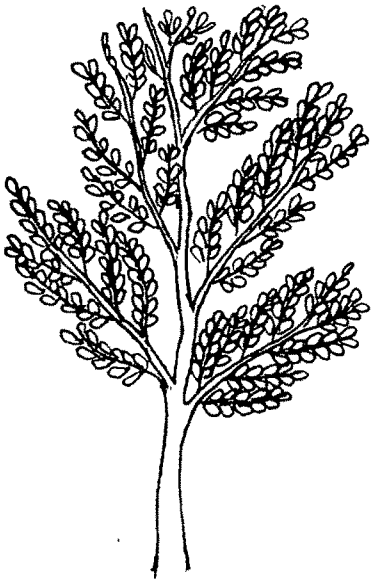
_____

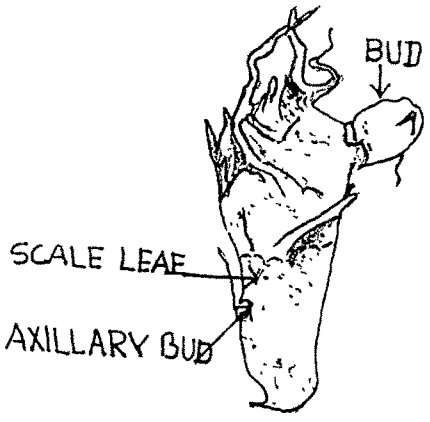
_____

_____

_____

b. Name the type of stem each of them belongs to.





( ) ( )

( )

(ii) Oral Verbal Elaboration

Teacher (investigator) states "There are two types of stems. They are the stems that grow above the soil called the aerial stems and the stems that grow in the soil called the underground stems."

4.4.15 Instructional Objective.15

Types of Aerial Stems

(i) P.L.M. (Deviated form)

Section A

There are three types of Aerial stems. They are (1) Erect stem, (2) Climbing stem, (3) Prostrate stem.

Fill in the blanks :

a. There are _____types of Aerial stems. They are _____,climbing and prostrate stems.
b. The three types of Aerial stems are erect, _____ _____and climbing stems.
c. The three types of Aerial stems are erect, _____ _____ and prostrate stems.
d. The three types of Aerial stems are erect, _____ and _____stems.
e. The three types of Aerial stems are _____, _____and _____stems.

Turn to Section B

Section B

How many types of Aerial stems are there?

_____

b. Name them

_____

_____

(ii) Oral Verbal Elaboration

Teacher (investigator) states "There are three types of aerial stems. They are the Erect stems, Climbing stems and Prostrate stems."

4.4.16 Instructional Objective.16.

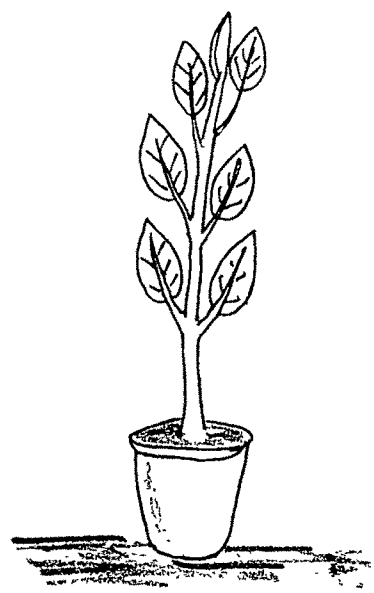
Erect Stem

(i) P.L.M. (Deviated form)

Section A

You must have observed the stem of Rose, Tamarind, Coconut, Neem and Date. You will see that their stems stand erect and grow. They do not need support. These stems are called erect stems.

A figure of an erect stem has been given below.



Turn to Section B

Section B

a. Name the type of stem it belongs to.

b. Describe it.

c. Give three examples of such type of stem.

(ii) Oral Verbal Elaboration

Teacher (investigator) shows an erect stem and describes it as follows "Look at this stem. It is called the erect stem. It can stand erect and grow. It does not need support."

Teacher then shows some more erect stems.

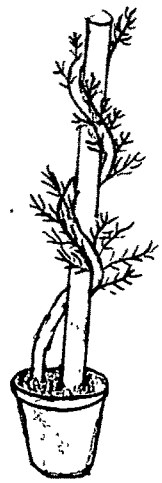
4.4.17 Instructional Objective.17

Climbing Stem

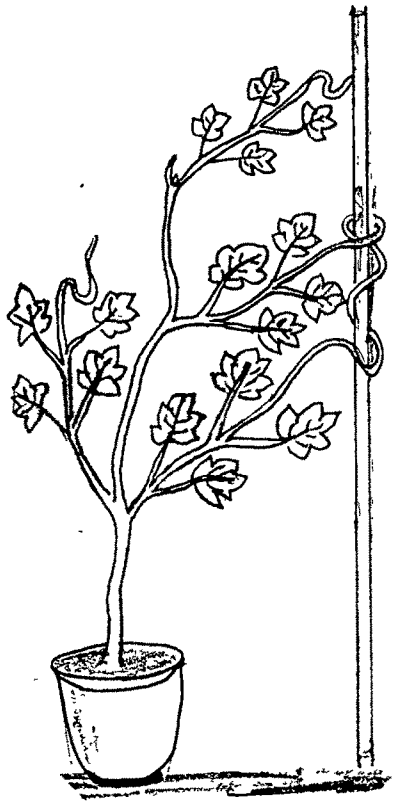
(i) P.L.M. (Deviated form)

Section A

The stems of some plants are weak and cannot stand erect and grow. They need support to grow upright. Hence, their structure is modified. The stem of some such plants climb and twine round the support.



In some other plants, the stem gives out thread-like structures which coil round the support.

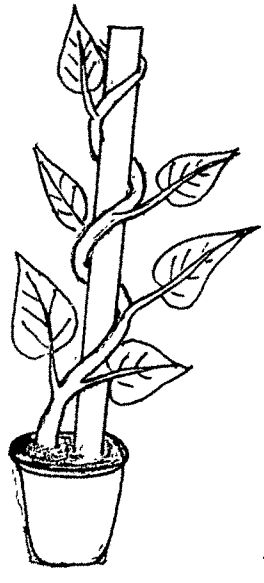


As these stems climb on some support to grow upwards, they are called climbing stems.

Turn to Section B

Section B

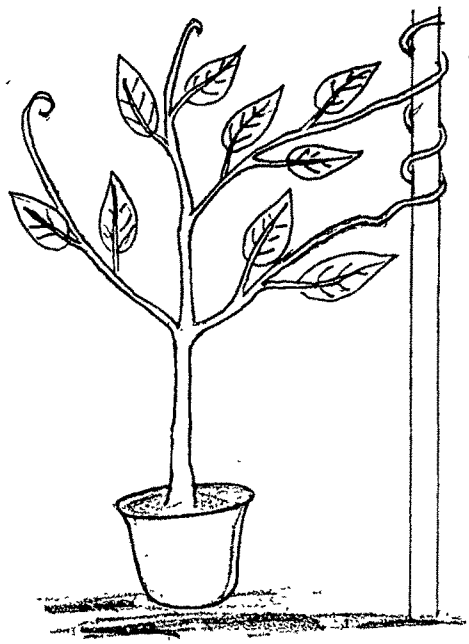
a. Name the type of stem it belongs to.



b. Describe the way in which it grows upright.

c. Give an example of such type of stem.

2. a. Name the type of stem it belongs to.



b. Describe the way in which it grows upright.

_____

_____

_____

_____

_____

_____

_____

c. Give an example of such type of stem.

_____

(ii) Oral Verbal Elaboration

Teacher (investigator) shows a climbing stem and describes as follows "Look at this stem. It is called the climbing stem. This stem is too weak to stand and grow upright by itself. So it climbs on whatever support it finds."

Teacher then shows some more climbing stems and explains as follows "All the stems are called climbing stems."

Teacher now points out the two types of climbing stems and states "There are two types of climbing stems."

Teacher (investigator) points to one of the type of climbing stems and then describes it as follows "Look at this stem, the plant climbs by coiling around the support."

Teacher (investigator) shows some more stems of this type and states "All of these plants climb by coiling round the support."

Teacher (investigator) then points to the other type of climbing stem and describes as follows "Look at this stem, the plant produces thread-like structures which help in climbing.

Teacher (investigator) shows some more stems of this type and states "All of these plants climb with the help of thread-like structures which coil round the support."

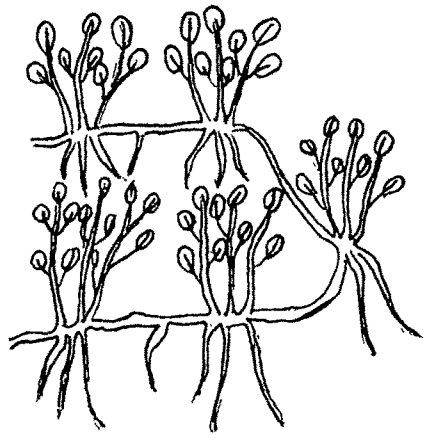
4.4.18 Instructional Objective.18

Prostrate Stem

(i) P.L.M. (Deviated form)

Section A

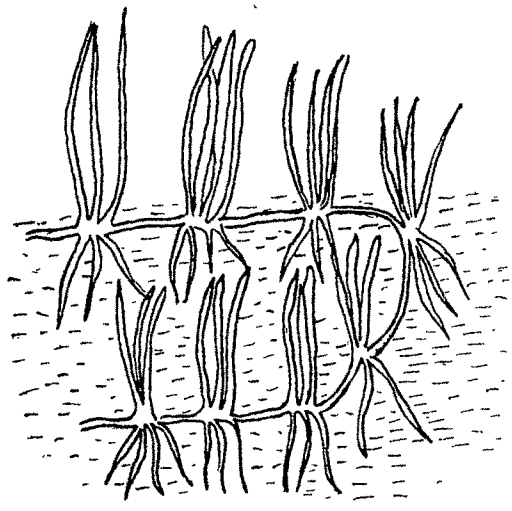
The stems of some plants like pudina (mint), grass are weak and cannot stand erect and grow. Hence, they trail along the surface of the soil and grow. Roots arise from the nodes and get fixed in the soil. Such type of stems are called prostrate stems.



Turn to Section B

Section B

a. Name the type of stem it belongs to.



b. Describe it.

_____

_____

_____

_____

_____

_____

_____

c. Give an example of such type of stem.

_____

(ii) Oral Verbal Elaboration

Teacher (investigator) shows a prostrate stem and describes as follows "Look at this stem. It is called the prostrate stem. This stem is weak and trails on the ground. The roots arise from the nodes and get fixed in the soil."

Teacher then shows more prostrate stems.

4.4.20 Instructional Objective.20

Rhizome

(i) P.L.M. (Deviated form)

Section A

The stems which grow in the soil are called rhizomes.

Fill in the blank:

Underground stems are also called as _____

Turn to Section B

Section B

What are rhizomes?

_____

_____

Fill in the blank

_____stems are also called as rhizomes.

(ii) Oral Verbal Elaboration

Teacher (investigator) states "The underground stems are called rhizomes."

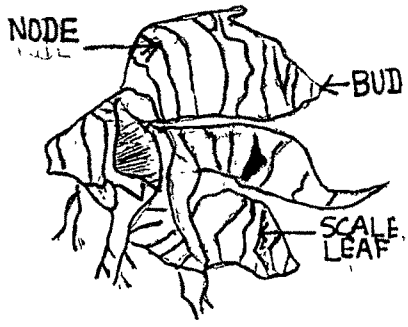
4.4.21 Instructional Objective.21

Description of a rhizome

(i) P.L.M. (Deviated form)

Section A

Observe the figure of the rhizome.

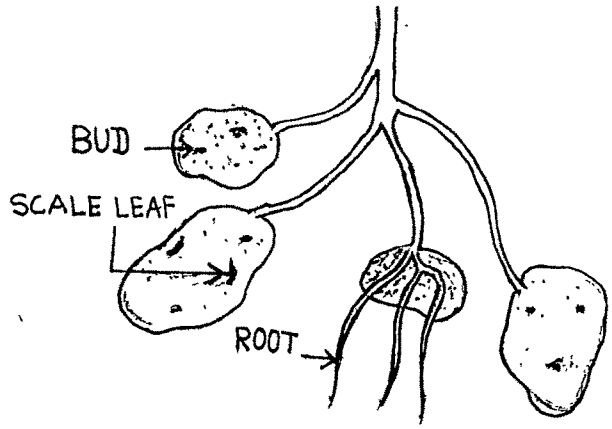


You will observe that the rhizome has roots, nodes and buds on it. Parts of leaves are also seen on the nodes.

Turn to Section B

Section B

Look at the figure of the potato. Give reason why it is called an underground stem and not a root.



(ii) Oral Verbal Elaboration

Teacher (investigator) shows an underground stem and then describes it as follows "Look at this underground stem. It has nodes and buds present on it. Parts of leaves can be seen on the nodes. Roots arise from the stem. Thus, it has the characteristics of a stem and hence can be identified as a stem."

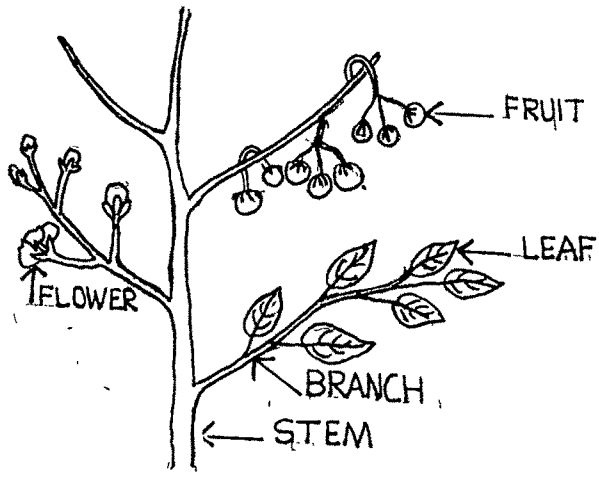
4.4.22 Instructional Objective.22

Functions of the stem

(i) P.L.M. (Deviated form)

Section A

(1) Observe the figure below.



The stem supports the branches bearing leaves, fruits and flowers.

Fill in the blanks

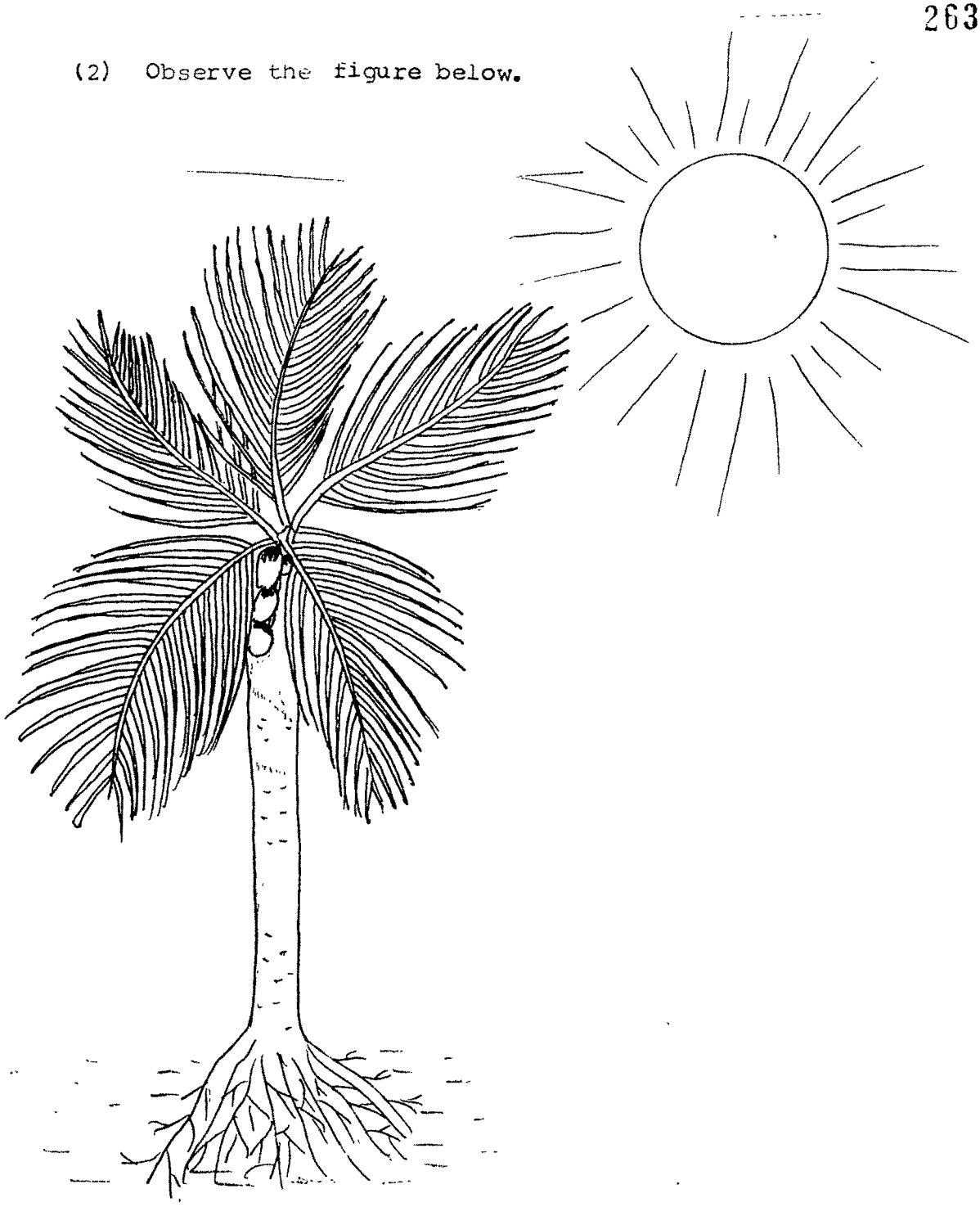
a. The stem _____ the branches, bearing leaves, fruits and flowers.

b. The stem supports the branches bearing _____ _____ and _____.

c. The _____ supports the branches bearing leaves, fruit and flowers.

Turn to Section B

(2) Observe the figure below.



The stem spreads the leaves in such a way that they get enough sunlight and air.

Fill in the blanks

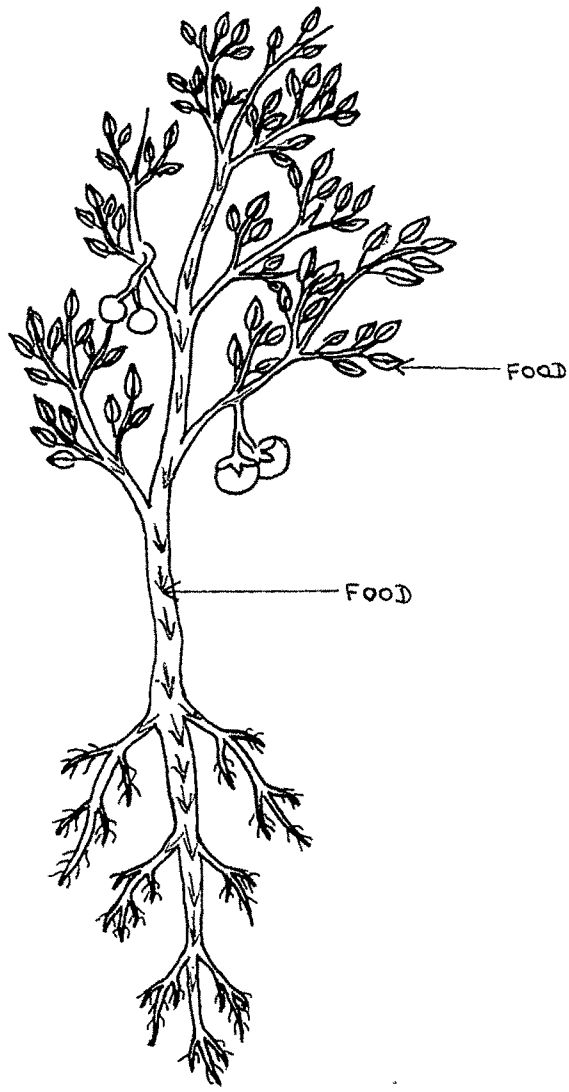
a. The stem spreads _____ _____ in such a way that they get enough sunlight and air.

b. The stem spreads leaves in such a way that tney get enough _____ and _____.

c. The stem _____leaves in such a way that they get enough sunlight and air.

Turn to Section B

(3) Observe the figure below.



The food prepared in the leaves reaches the other parts of the plant through the stem.

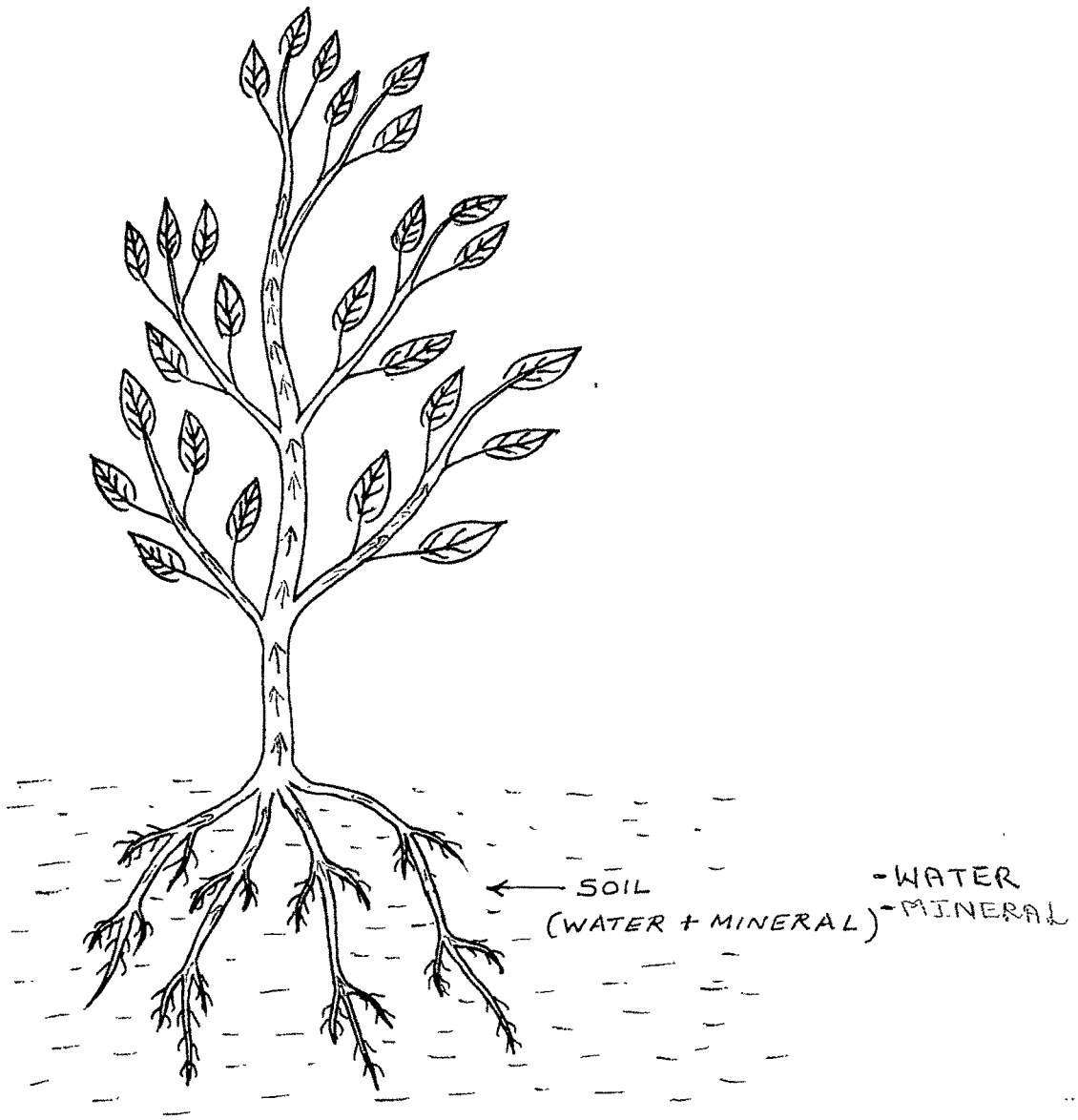
Fill in the blanks

a. The _____prepared in the leaves reaches the other parts of the plant through the stem.

b. The food prepared in the leaves reaches the other parts of the plant through the _____.

Turn to Section B

(4) Observe the figure below.



The water and minerals absorbed by the root reach the leaves through the stem.

Fill in the blanks

a. _____ and _____ absorbed by the root reach the leaves through the stem.

b. The water and minerals absorbed by the roots reach the leaves through the _____

Turn to Section B

Section B

State the basic functions of the stem.

(ii) Oral Verbal Elaboration

The teacher (investigator) describes the functions of the stem as follows "The stem performs three basic functions: 1. It supports the branches bearing leaves, flowers and fruits. 2. It spreads the leaves in such a way that they get enough sunlight and air. 3. The stem transports the water and minerals absorbed by the roots to the leaves. 4. The stem transports the food prepared by the leaves, to the other parts of the plant."

4.4.23/24 Instructional Objective.23 & 24

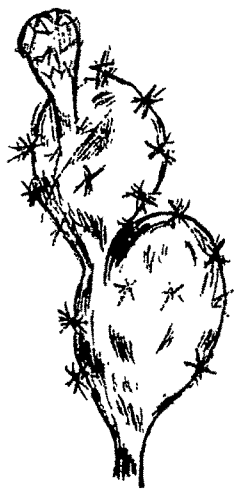
Special functions of the stem

(i) P.L.M. (Deviated form)

(1) Section A

The stems of some plants perform some special functions besides the normal functions. For this purpose, the stems undergo modification in their structure.

Look at the figure of the stem of opuntia.

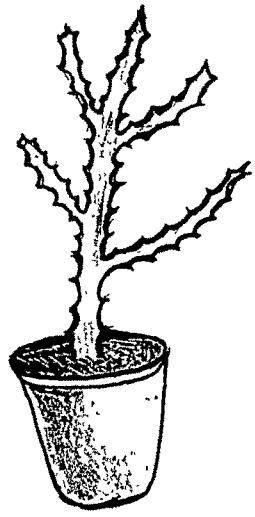


The stem is thick, flat and green and has no leaves on it. The stem is green as it contains chlorophyll and so it can prepare food with the help of sunlight. Thus it carries out the function of photosynthesis.

Turn to Section B

Section B

Observe the stem given below. What function does it carry out?



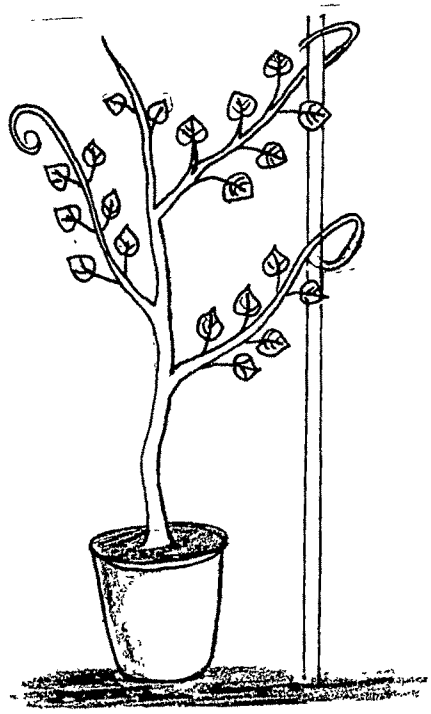
What are the modifications it has undergone to carry out this function?

(2) Section A

The stems of some plants are weak to grow upright by themselves hence they take support by modifying their structure.

The stems of some plants coil around the support they find thus enabling the plant to grow upright.

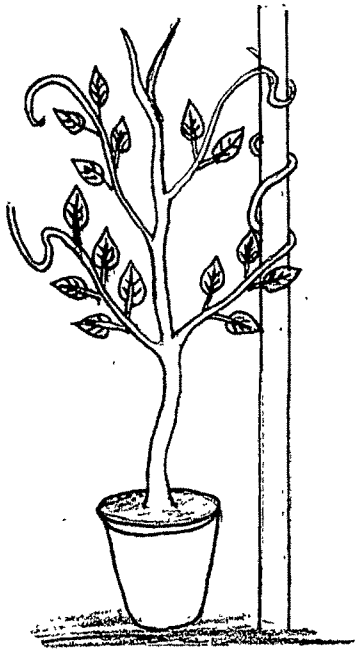
In some plants, the stems give out thread-like structures which coil around the support and thus enable the plant to grow upright.



Turn to Section B

Section B

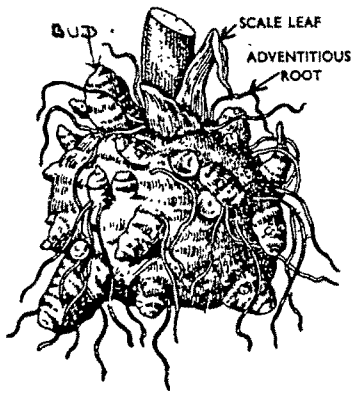
Two figures of stems have been shown to you. What is the special function of each.

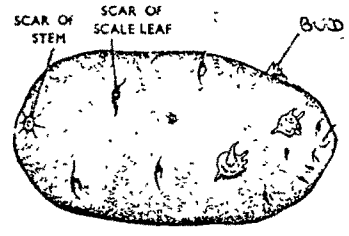


Describe how they are modified for carrying this function.

(3) Section A

The stems of some plants carry out the function of storing the food which has to be used later on. Hence, they undergo a structural modification. They become thick, big and have different shapes.

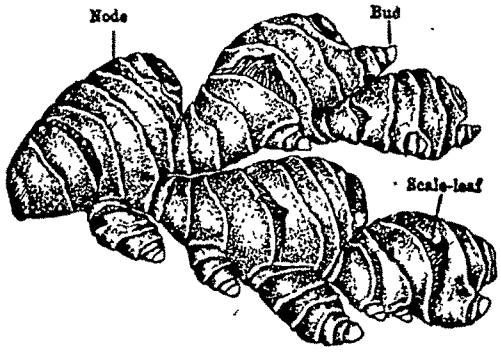


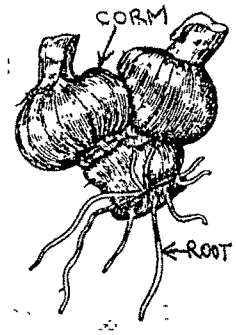


Turn to Section B

Section B

Look at the figures of stems given below.





Why do these stems look different from the normal stems.

What is the special function they carry out. Describe how they are modified to carry out this function.

(ii) Oral Verbal Elaboration

Teacher (investigator) states "Some stems perform some special functions. For this, they undergo modifications in their structure."

(1) Teacher shows the stem of opuntia and explains how it performs photosynthesis as follows "Look at the stem (Opuntia). The stem has no leaves on it. The stem is thick, flat and green. It is green as it contains chlorophyll and hence it can prepare its food with the help of sunlight. This stem carries out the special function of photosynthesis."

(2) Teacher shows the climbing stems and then describes how they have modified to perform the function of supporting the plant, as follows "Look at these stems. They are climbing stems. They give support to the plant with weak stems. Hence they have undergone some changes. Stems of some plants produce thread-like structures which coil around the support. While stems of some other plants coil round the support. These stems carry out the special function of giving support to the plant."

(3) Teacher shows some underground stems and then describes how they have modified to perform the function of food storage, as follows "Look at these stems. They are thick, big and have different shapes. They store the food for the plant growth in the following year hence, the change in their structure. These stems carry out the special function of food storage."

4.5 ENRICHMENT ACTIVITIES

1. Prepare an album of pressed specimens of

   a. Stem showing node.
   b. Stem showing internode.
   c. Stem showing terminal bud.
   d. Stem showing axillary bud.
   e. Erect stem.
   f. Two types of climbing stems.
   g. Prostrate stem.

2. Stick pictures in the same album of

   a. Underground stems.
   b. Stems which perform photosynthesis.
   c. Stems which give support to the plant.
   d. Stems which store food for the plant.

   N.B.: Label what each of them display.

3. Carry out the following experiments at home.

   a. Experiment :

      Take two plants A & B. Measure their height and count the number of branches. Pluck off the terminal bud of Plant A. Place the plants in the sunlight. Observe them after a week.

      i) In which plant is there an increase in height?

      _____

      _____

      ii) Why is there an increase in height in only this plant and not the other?

      _____

      _____

      _____

iii) In which plant is there an increase in the number of branches?

iv) Why is there an increase in the number of branches in this plant compared to the other?

v) What should we do for getting a bushy growth in a plant?

b. Experiment :

Take a balsam plant. Cut all roots except the main root while the plant is immersed in a basin of water. Insert the plant in a wide-mouthed bottle containing water coloured with red ink. Observe after a few hours or overnight.

i) What do you observe?

ii) Why is it so?

Reading Material

I. Definition and Kinds of Stems

A. The stem of a plant is the part of the plant between the roots and the leaves.

B. Stems may be found above the ground, below the ground, or both above and below the ground.

C. A stem tnat grows above the ground is called an aerial stem.

1) Aerial stems vary in length, ranging from less than 1 inch to more than 100 feet tall.

2) There are four main groups of aerial stems: Shortened stems, Creeping stems, Climbing stems and erect stems.

D. Shortened stems are very small stems.

1) Sometimes they are so short that they seem to be missing from the plant.

2) The Onion, Garlic and Carrot all have shortened stems.

3) Their very short, flat, circular stems can be seen growing just above the roots.

4) Plants with shortened stems need open places to grow, where they can get lots of light.

E. Creeping stems are long and slender and stay close to the ground.

1) These stems do not have woody tissues and are weak, so they grow along the surface of the ground.

2) The stems are also called runners or stolons.

3) The strawberry plant and mint (Pudina) having creeping stems.

4) Plants with creeping stems also need open places to grow, where they can get lots of light.

F. Climbing stems are thin and very long.

1) They do not have woody tissues and are weak, so they grow into the air by wrapping themselves around and around a tall object.

2) The passion flower and Gourds have climbing stems.

G. Erect stems stand above the ground by themselves.

1) They may be either a few inches tall or many hundred feet high.

2) They may be herbaceous or woody.

3) Trees, shrubs, and most garden flowers have erect stems.

H. Stems that grow below the ground are called underground stems

1) Because they are located underground, most persons do not usually think of them as stems.

2) There are four main groups of underground stems: rhizomes, tubers, bulbs and corms.

I. Rhizomes are long, underground stems that grow horizontally close to the surface of the ground.

1) Some rhizomes are thick and fleshy, filled with food; examples are the rhizomes of the Ginger, turmeric and arrowroot.

2) Other rhizomes are thin, such as those of grasses.

J. Tubers are the enlarged tips of rhizomes, with food stored in them.

1) The potato is an example of a tuber.

2) The "eyes" of the potato are really buds from which new growth begins.

K. A bulb is made up of a stem shortened to the size of a disc, surrounded by thick, fleshy, scale-like leaves.

1) The leaves have food stored in them.

2) The garlic and onion are examples of bulbs.

L. A corm is different from a bulb only in that most of it is stem.

1) This stem is surrounded by thin, scale-like leaves.

2) The suran is an example of corms.

II. External Structure of a Woody (Dicotyledon) Stem.

A. The bare, winter twig of a tree is an excellent example of a woody stem.

B. The twig has buds on it.

1) Each bud is a place on the stem where a new stem, leaves and flowers can grow.

2) In cold climates the delicate buds are protected by overlapping bud scales.

C. Most twigs have a terminal bud at their tip.

D. Along the sides of the twig are lateral buds, from which branches may grow.

E. The node is a point on the leaf scar (region where leaf stalks were attached in previous season) where leaves or branches were produced by the stem.

III. The Functions of Stems

A. Stems conduct water and dissolved minerals upward from the roots to the leaves.

B. Stems also conduct food from the leaves downward to the roots.

C. The stem produces and displays the leaves so that they receive the sunlight they need.

D. Most stems support the plant and hold it erect.

E. Green herbaceous stems can make food for the plant.

F. Some stems, like the potato, store food for the plant.

G. Some aerial stems, such as the strawberry and black raspberry can grow new plants.

H. Most underground stems can grow new stems.

4.6 FINAL TEST

1. a. In packet 1. a., you are supplied with a shoot of the plant, and a piece of adhesive tape. Observe the shoot carefully and stick the tape around the main axis of the shoot. Place this shoot in the same packet.

b. Fill in the blanks :

The main axis of the shoot is called the _____

2. a. In packet 2.a. you are supplied with a shoot of the plant on which is stuck an adhesive tape. Name this part of the shoot.

b. In packet 2.b., you are supplied with a shoot of the plant on which is stuck an adhesive tape. Name this part of the shoot.

3. Fill in the blanks :

a. The point from which the leaf arises from the stem is called _____

b. The part of the stem between two consecutive nodes (nodes coming just one after the other) is called _____

4. Look at the shoot labelled 4.

a. Name the part pointed out.

_____

b. What is the function of it?

_____

_____

_____

5. Look at the shoot labelled. 5.

a. Name the part pointed out.

_____

b. What is the function of it?

_____

_____

_____

6. State whether True or False

The terminal bud and axillary bud have the same function and same structure. ( )

7. What happens to the axillary bud when the terminal bud is cut off?

_____

_____

_____

8. State what would you do to the plant if you want a shorter and thicker growth of the plant.

9. a. Fill in the blanks

The two main types of stems are _____ & _____

b. Describe each of them.

10. a. Fill in the blanks

The three types of aerial stems are _____, _____ and _____.

b. Describe each type of aerial stem.

11. Packet 11 and Packets 11.a., 11.b., and 11.c., are supplied to you. In packet 11, stems have been placed. Classify these stems into the three types of aerial stems. Place each type of aerial stem in each of the separate packets. Label the packet by the type of aerial stem it contains.

12. Fill in the blanks :

The underground stems are also called as _____

13. Why is turmeric an underground stem and not a root?

14. State the three basic functions of the stem.

15. Look at the stems labelled 15.a., 15.b., 15.c., Mention the special function of each of them and describe how each perform their special function.