ANGIOSPERM

General Information

Angiosperms are the flowering plants. In angiosperms, the sporophyte has reached its greatest specialization, while the gametophyte has become greatly reduced. They are the dominant element of our land flora, and in number of species exceed all other green plants. Most angiosperm families are tropical in their distribution. Angiosperms are subdivided into two subclasses thus; dicotyledonidae and monocotyledonidae. These subclasses differ from each other in a number of characters.

Practical Exercise 1: Morphological and internal structures of dicotyledonous root and stem

Materials:

- Water leaf plant (Talinum triangulare)
- Razor blade
- Wash glass
- Glass slide
- Microscope
- Cover slip
- Iodine solution

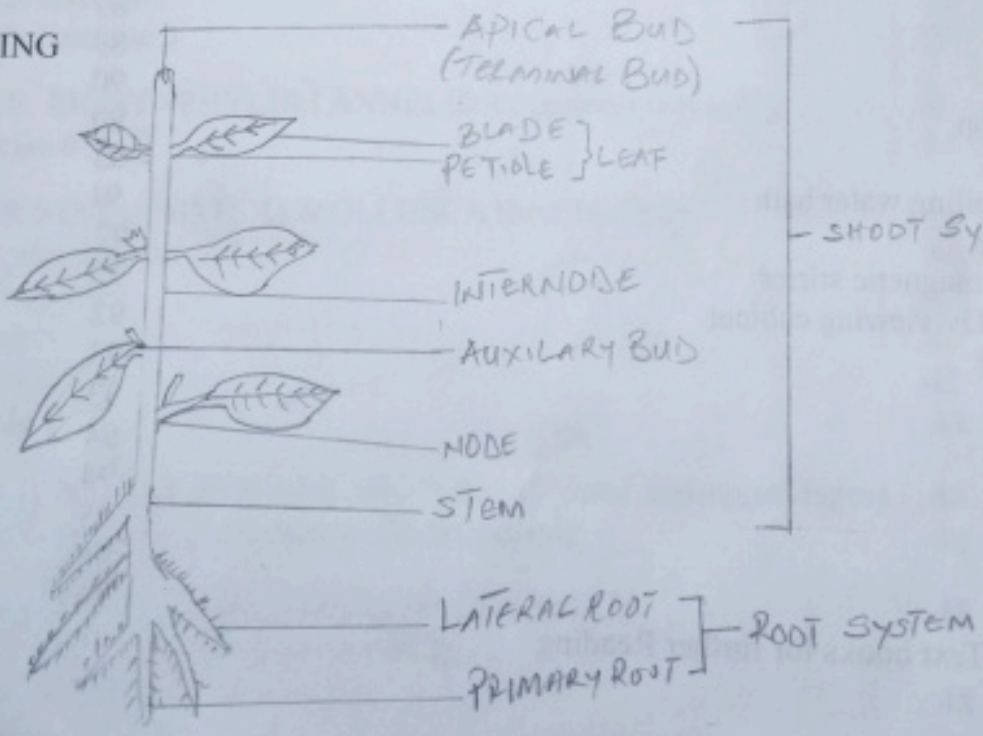
Procedure:

Examine, draw and label the plant provided.

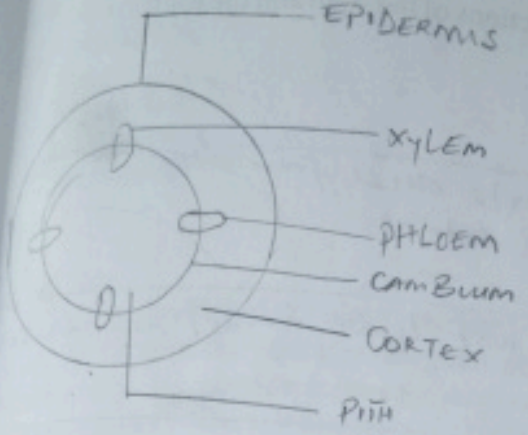
Make as many possible cross-section of the water leaf root and stem.

1. Place the sectioning of the root and stem into different wash glasses containing water.
2. Drop a drop of water on a clean glass slide.
3. Remove a piece of the section of the root.
4. Mount the section on a glass slide.
5. Add a drop of iodine on the mounted section.
6. Observe draw and label under low and high power objectives.
7. Repeat the procedure for the stem. Draw and label your observation.

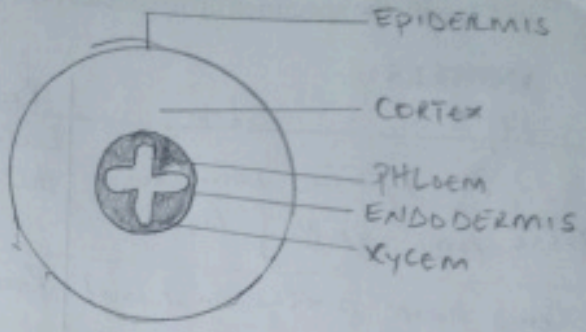
DRAWING



STRUCTURE OF A WATER LEAF PLANT

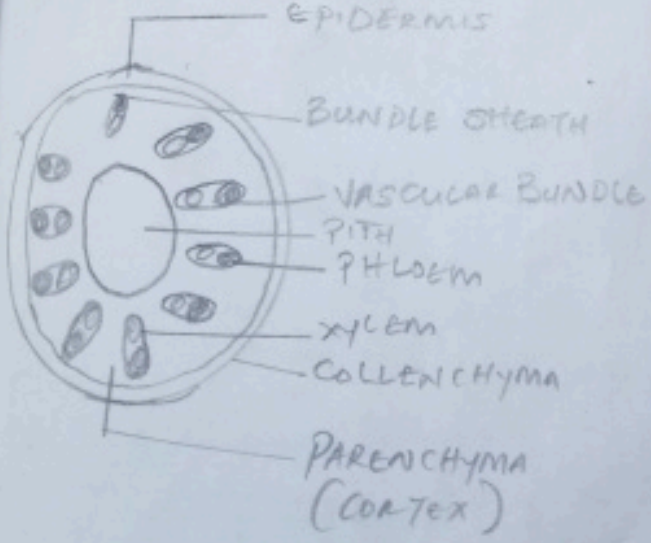


CROSS SECTION OF A WATERLEAF STEM

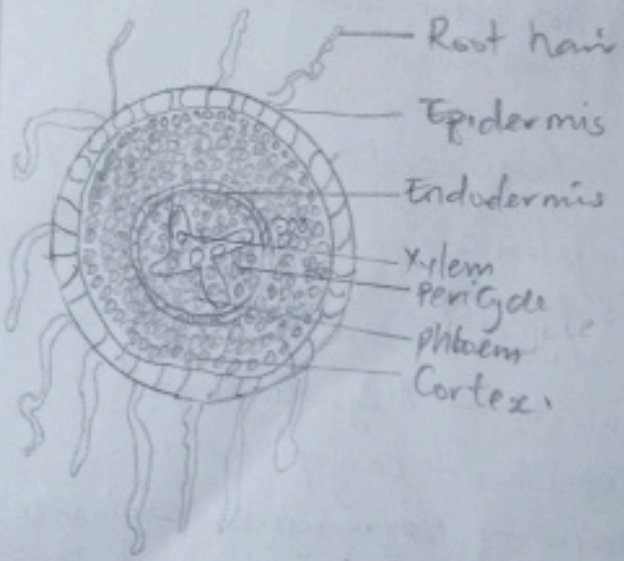


CROSS SECTION OF A WATERLEAF ROOT.

HIGH POWER OBJECTIVES.



CROSS SECTION OF A WATERLEAF STEM.



Cross section of waterleaf Root.

Questions:

i. What are the differences between the transverse sections of the stem and the root.
ii. What are the similarities between the transverse sections of the stem and the root.
iii. Classify the specimen up to species level.

ANSWERS

(i) Stem	Root
i) Side branches arise from axillary buds.	Lateral roots arise from deep within the roots tissue
ii) Stems have nodes and bud	Roots do not have nodes and buds.
iii) In herbaceus stem, the Vascular tissues are Connected in bundle	In roots the Vascular tissue form a Central Core.

ii) Similarities

(a) both the stem and root Contain Vascular tissue (Xylem and Phloem)
b) Both are able to initiate lateral growth, that is to form branches.

iii) Classification of water leaf

Kingdom – Plantae
Sub-kingdom – Tracheobionta
Super-division – Spermatophyta
Division – Magnoliophyta
Sub-Class – Campophyllidae
Order – Boraginales
Family – Talinaceae
Genus – Talinum Adans
Species – Talinum Fruticosum.

Practical Exercise 2: Morphological and Internal structures of monocotyledonous stem and root.

Materials:

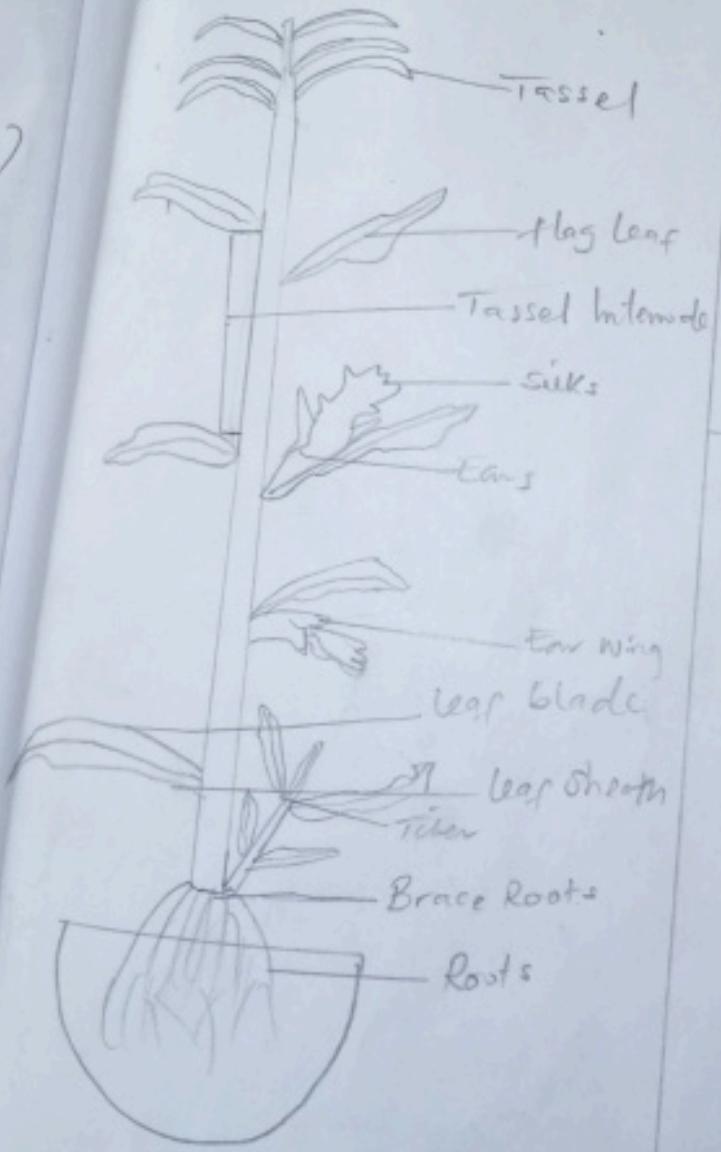
- Young maize plant
- Razor blade
- Wash glass
- Water
- Glass slide
- Microscope
- Cover slip

Procedure:

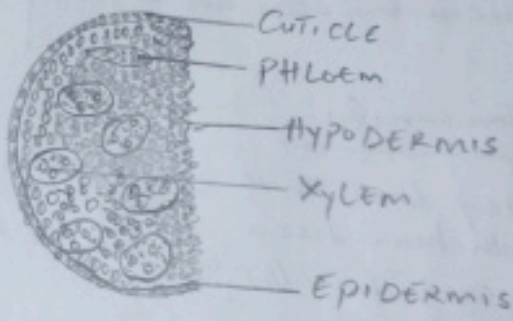
Examine, draw and label the plant provided.

1. Wash the roots of the young maize plant obtained.
2. Make transverse-section across the stem and across the root.
3. Examine them under the low power objective
4. Make drawings of your sections and label them

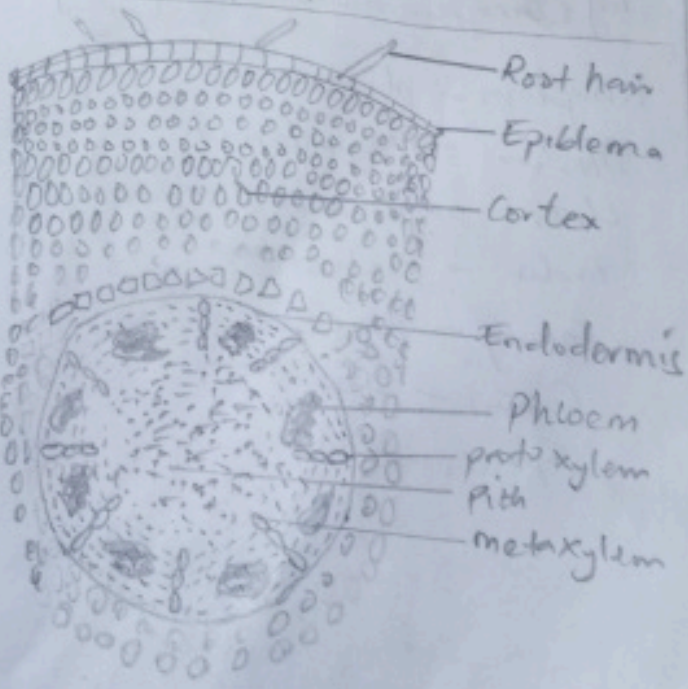
DRAWING



YOUNG MAIZE PLANT.



T.S OF THE STEM OF YOUNG MAIZE PLANT.



T.S OF THE ROOT OF A YOUNG MAIZE PLANT.

Questions:

i. Compare the internal structures of the monocotyledonous stem and that of the root. State the structural differences between the stem and root.

ii. Compare and contrast the morphological characteristics of the water leaf and maize plant.

iii. Classify the specimen up to species level.

ANSWERS

i) Differences

Stem	Root
① Stomata are usually present in epidermis	stomata are absent in epidermis
② Cortex is small	Cortex is large
③ Vascular bundles are Co-joint	Vascular bundles are radial

ii) Similarities

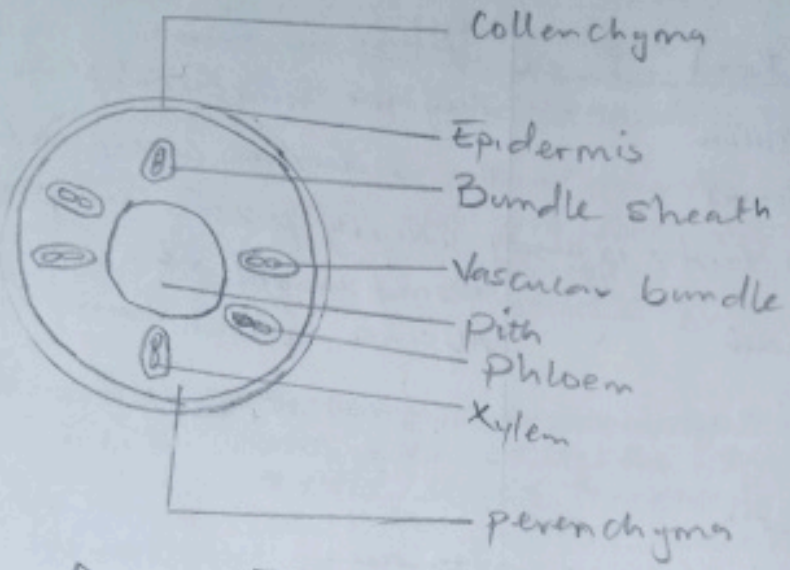
① They both have epidermis
② Both have tissue
③ Vascular bundles are present in both.

iii) Classification of young maize

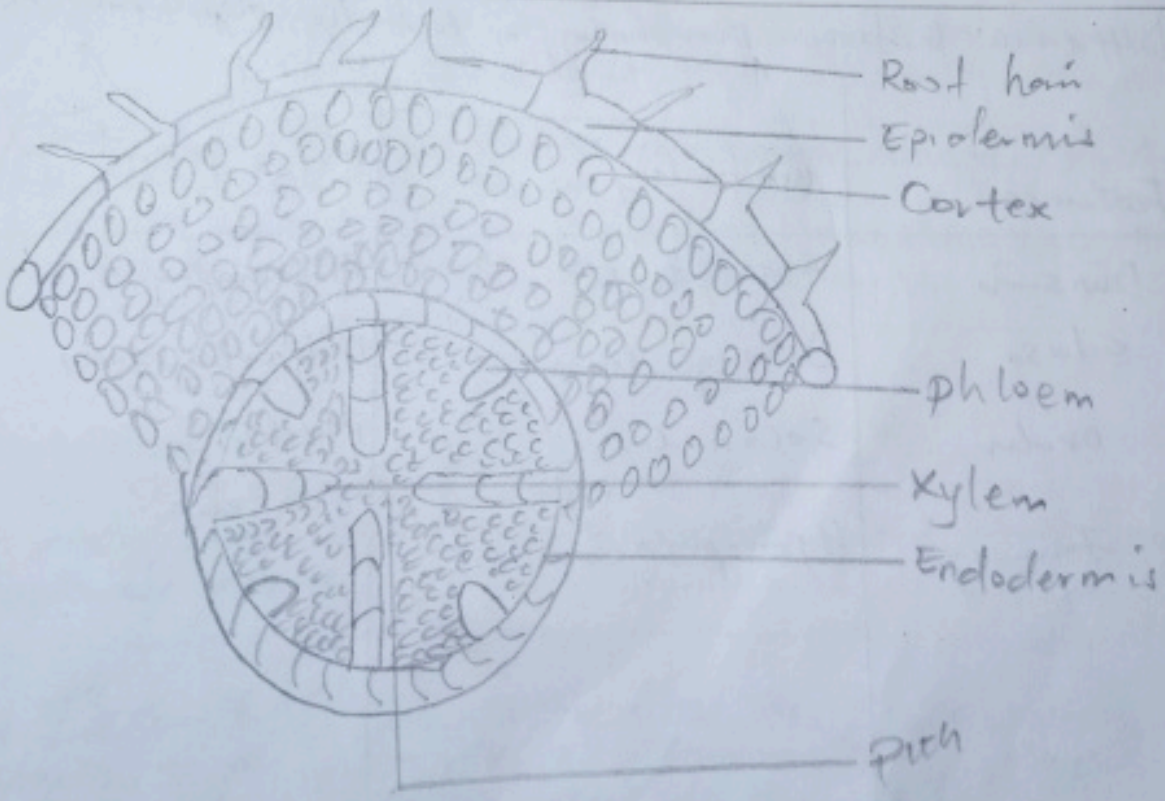
Kingdom - plantae
Division - Magnoliophyta
class - Liliopsida
order - Poales
family - Poaceae
Genus - Zea
Species - Mays

A: Morphological and internal structures of dicotyledonous root and stem
Differences between the transverse sections of the stem and the root: Present in a tabular form the differences and similarities between the transverse sections of the stem and the root of the specimens provided.

ANSWERS



DICOT STEM



DICOT ROOT

B: Morphological and internal structures of monocotyledonous stem and root

Differences and similarities between the internal structures of the monocotyledonous stem and the root: Present in a tabular form the differences between the morphology of water leaf plant and that of a maize plant.

Difference between internal structure of Monocotyledonous Stem and root

Root	Stem
① They are unicellular	They are multicellular
② Epiblema or piliferous	The epidermis is usually with cuticle
③ Chlorenchyma in cortex is ~~absent~~ absent	usually present in young stem but absent in old stem.
④ present of root hair	Absence of root hair.

Similarities

① Both contain vascular tissues

Difference between morphology of water leaf plant and that of maize

Features	water leaf	maize plant
Division	Anthophyta	Magnoliophyta
Class	Dicotyledonae	Magnoliopsida
Order	Solanales	Poales
Family	Hydrophyllaceae	Poaceae.

Question 1:
What is meant by modification of root? What type of modification of root is found in:
(a) Maize plant – Fibre root
(b) Sweet potato – Adventitious root
(c) Mangrove trees – Pneumatophores.

Question 2:
Justify the following statements on the basis of external features:
(i) Underground parts of a plant are not always roots
Underground parts of plant are not always root because sometimes the stem also becomes underground and gets modified into various forms to perform different functions of storage, vegetative propagation, perennation etc.

(ii) Flower is a modified shoot.
During the flowering season, the apical meristem gives rise to the floral meristem. The axis of the stem gets condensed, while the internodes remain near each other. Instead of leaves, various floral appendages arise from the node. Therefore, it can be said that the flower is a modified shoot.

Question 3:
How is pinnately compound leaf different from palmately compound leaf?
In pinnately compound leaves, a row of leaflets forms on either side of an extension of the petiole called the rachis. While in palmately compound leaves, the leaflets radiate from a single point at a distal end of the petiole.

Question 4:
Explain with suitable examples the different types of phyllotaxy?
i) Alternate: In alternate phyllotaxy, a single leaf arises from the node of a branch. This type of phyllotaxy is observed in the Sun flower, mustard and peepal.
ii) Opposite: This type the plant has two leaves arising from the node in opposite direction eg. guava.
iii) Whorled: Plants with whorled phyllotaxy have three or more leaves arising from the node eg. Alstonia.

Question 5:
Define the following terms:
(a) Aestivation... The term Aestivation refers to the mode in which sepal or petals are arranged in a floral bud with respect to other floral members.

(b) Placentation... Placentation is defined as the arrangement of the placenta in the ovary of a flower. The placenta connects the ovules with the wall of the ovary.

(c) Actinomorphic... Actinomorphic flower is a flower that is radially symmetrical and can be divided into two equal parts along any diameter.

(d) Zygomorphic... Zygomorphic flower is a flower that is bilaterally symmetrical and can be dissected into two equal parts only in one plane.

(e) Superior ovary... A Superior Ovary is an Ovary attached to the receptacle above the attachment of other floral parts. A Superior ovary is found in type of Fleshy fruits such as true berries, drupes, etc.

(f) Perigynous flower... A flower having a Concave or flat receptacle with the gynoecium and other floral parts at the same level as in the case of relating to the parts of a flower arranged in this way.

(g) Epipetalous Stamen... is a Stamen that is borne over a Petal instead of being inserted directly over the thalamus. For Example, Solanum.

Question 6:
Differentiate between the following terms:

(a) Racemose and cymose inflorescence

The flowers are borne laterally and the main floral axis continues to grow in the racemose inflorescence, where as in the Cymose inflorescence, flowers are borne terminaly on the floral axis and the main axis shows limited growth.

(b) Fibrous roots and adventitious roots:

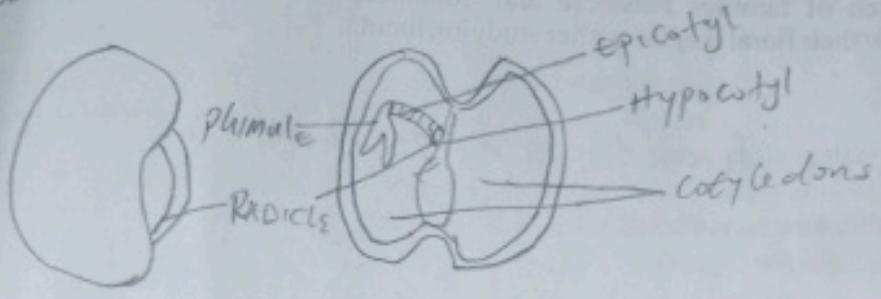
Fibrous roots arises from the base of the stems while Adventitious roots arises from the part of the plant other than the radicul.

(c) Apocarpous and syncarpous ovary:

The flowers with apocarpous ovary have more than one carpel, these carpels are free while the flowers with Syncarpous ovary have more than one carpel. However, these carpels are fused.

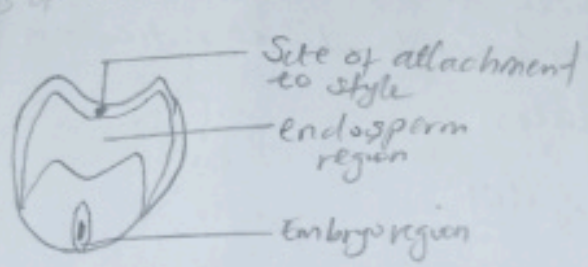
Question 7:
Draw and label a diagram of the following:
(i) Bean seed
(ii) V.S. of maize seed

i) Bean Seed

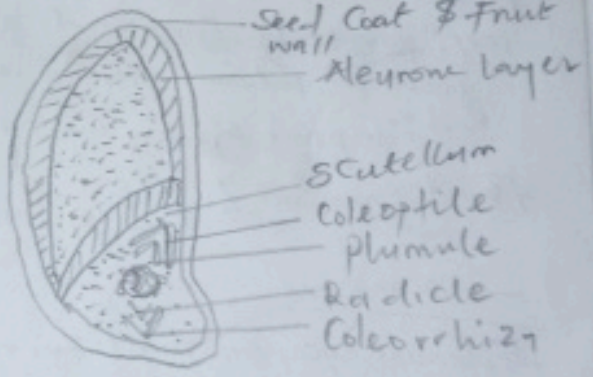


STRUCTURE OF BEAN SEED

ii) V.S OF MAIZE SEED



MAIZE GRAIN



STRUCTURE OF A MAIZE SEED

Question 8:
Describe modifications of stem with suitable examples
Stems of various plants have undergone modifications to perform different functions.

Underground stems or storage stems: (Examples:).
Underground stems or storage stems: are modified plants that derive from stem tissue but exist under the soil surface. they function as storage tissue for food and nutrients, propagation of new clones and perennation (survival from one growing season to the next) eg bulbs, corms, rhizomes, stolons and tubers.

Supportive stems (Example:)
Stem tendrils of watermelon, grapevine, cucumber are modified for support.

Protective stems (Example: Thorns)
Axillary bud of stem of Citrus, Bougainvillaea get modified into pointed thorns. they protect the plants from Animals.

Photosynthetic stems (Example:) Modified stem of Opuntia
Others stem modifications
Contain chlorophyll and performs photosynthesis.

Question 9:
Take one flower each of families Fabaceae and Solanaceae and write its semi-technical description. Also draw their floral diagrams after studying them.

DRAWING
Semi-technical description of flowers of following families are:

Fabaceae

Family Fabaceae
Vegetative characteristics
Herbs
Leaf: pinnately compound, alternately arranged with leaf tendrils with the pulvinus present at the leaf base. Venation is reticulate.
Root: Tap root system with root nodules.
Floral formula: ♀ ♂ $K_{(5)} C_{1+2+(2)} A_{(9)+1} \underline{G1}$

Solanaceae

Solanum lycopersicum (Tomato)
Family – Solanaceae
Vegetative characteristics
Stem: Herbaceous stem, aerial, erect branched solid
Leaf: Alternate, simple, exstipulate
Seed: Many endosperms.

FLORAL DIAGRAM

(1) Family Fabaceae/Papilionaceae (pea plant)
Fabaceae/Papilionaceae is a sub-family of the Leguminoseae family.

C) Axile placentation

(D) Basal placentation

(E) Free central placentation

Question 11:
What is a flower? Describe the parts of a typical angiosperm flower?

Answer A flower: is the specialized part of an angiospermous plant that occurs singly or in clusters, possesses whorls of often colorful petal or sepals, and bear the reproductive structure (such as stamen or pistil) involved in the development of seeds and fruit.

Parts of flowers

(A) The calyx The calyx is the outermost whorl of a flower. They mainly contain sepals they are green, and leaf like structures that cover and protect the flower during the initial stage or bud stage.

(B) The corolla The corolla of a flower is a layer that is found inside the calyx. It contains beautifully and attractively colored petals. These petal help in allowing and attracting insects for pollination.

(C) The androecium or the stamen It is the next part or whorl present after corolla. The androecium typically consist of stamens which are the male reproductive unit of a flower and is composed of two parts anther and filament.

(D) Gynaecium .....

.....

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Question 12:
How do the various leaf modifications help plants?

Answer

The main function of the leaves is to carry out the process of photosynthesis. However, in a few plants, leaves are modified to perform different functions.

(a) Tendrils: The leaves of a pea plant are modified into tendrils that help the plantin climbing.

(b) Spines: The leaves in cactus are modified into sharp spines that act as an organ of defense.

(c) Phyllode: The leaves of some Australian acacia are short-lived and soon replaced by flattened, green structures called phyllodes that arise from the petiole of the leaves. The petioles in these plants synthesize food.

(d) Pitcher: The leaves of the pitcher plant are modified into pitcher-like structures, which contain digestive juices and help in trapping and digesting insects.

Question 13:
Define the term inflorescence. Explain the basis for the different types of inflorescence in flowering plants.

Answer An Inflorescence is arrangement and distribution of flowers over an axis of the plant called pendunde (iv) peadicel

BASIS i) Growth of the pendunde
ii) Branching of the penduncle
iii) Number of the branches
(v) Length of the pedicel
(vi) Condensation
(vii) Sex of flowers.

Question 14:
Write the floral formula of an actinomorphic bisexual, hypogynous flower with five united sepals, five free petals. Five free stamens and two united carpals with superior ovary and axile placentation.

Answer $\oplus \, \varphi \, K_{(5)} \, C_{(5)} \, A_{(5)} \, \underline{G}_{(2)}$

Question 15:
Describe the arrangement of floral members in relation to their insertion on thalamus?

Answer

Based on the position of the Calyx, Corolla and androecium in relation to ovary on the thalamus, the flowers are divided into 3 types, namely hypogynous, perigynous and epigynous. In hypogynous flowers, the ovary is superior as it is present on thalamus. The other floral parts are present below thalamus. Example include China rose. In perigynous flowers, the ovary is half inferior. It is situated in the center. the floral parts are present on the rim of the thalamus. Example includes rose. In Epigynous flowers, the ovary is inferior. The thalamus is present around the ovary Example include: Cucumber.