Visit : https://advanceonlineclass.com

sampath lankadheera

0777 211 384
0779 925 362

TRULY AMAZING BIO CLASS IN EM

Memo Max

MEMORY MAXIMIZING PROGRAM

We offer premium learning experience

Sampath Biology

Biology

ENGLISH MEDIUM

Live Biology

UNIT 04

Plant form and Function

4.0.1: Plant Tissues

SAMPATH LANKADHEERA

B.Sc. (Hons), M.Sc.

Visit : https://advanceonlineclass.com

Growth and development process of a plant

Plant Growth

……

……

……

……

……

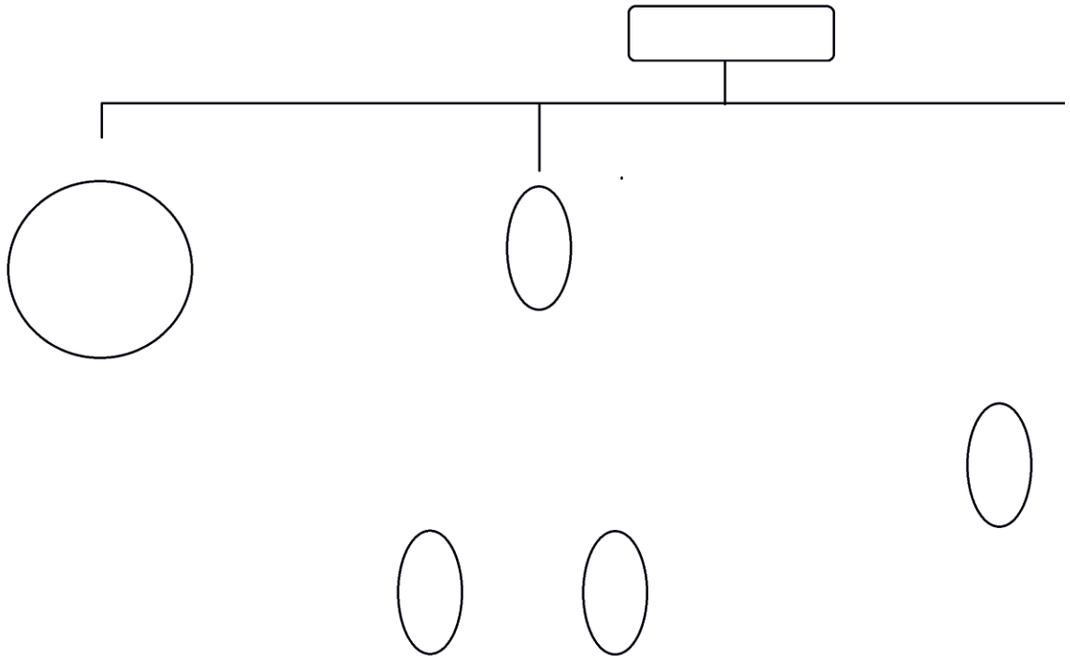
……

……

……

……

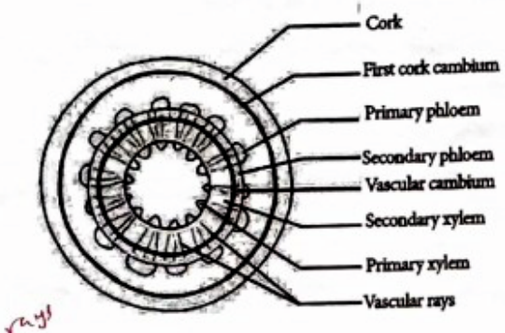
……



34. new cork cambium is formed / initiated.

35. 36. Outer layers of cork crack and peel off.

37. Lenticels / small pores are formed (in the periderm)



If vascular rays are not shown no marks for diagram

Any 35 x 4 = 140 marks

Correct diagram of secondary growth (1 mark for each label) = 8 marks

If more than 35 points are written add 2 marks) = 2 marks

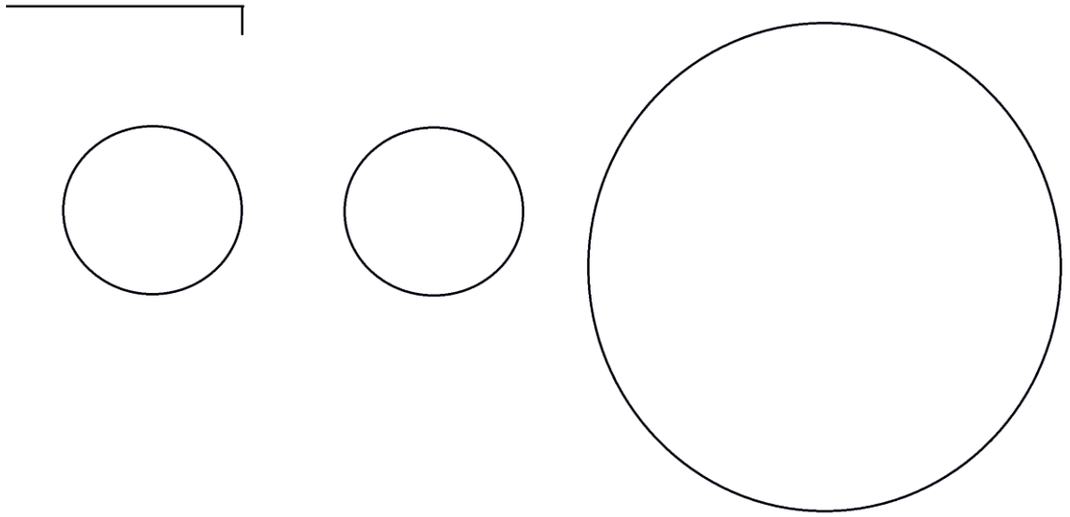
Total 150 marks

19. causing it to split, dry and falls of the stem.
20. It is replaced by two tssues produced by cork cambium,
21. a cylinder of dividing cells that arises in the outer layer of cortex in stems
22. Cork cambium produces cork cells to exterior.
23. Cork cambium and tissues it produces are collectively called periderm

Fully labeled correct diagram = 45 marks
(Any 9 x 5 marks = 45 marks)

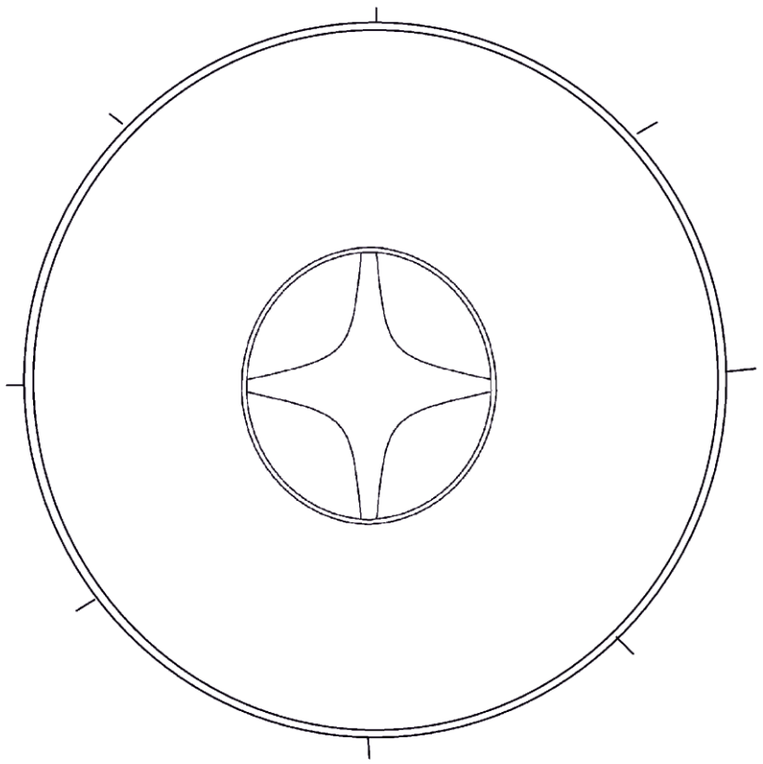
6. Briefly describe the process of secondary growth in a dicot stem.

1. Occurs due to formation of new cells to increase the diameter / girth / circumfer
2. by lateral meristem / vascular cambium and cork cambium.
3. Vascular cambium consists of a single cell layer
4. which is located outside the pith / primary xylem and
5. interior to primary phloem /cortex.
6. It is formed by meristematic cells
7. as a continuous cylinder.
8. It adds secondary xylem
9. towards primary xylem (initials)
10. and secondary phloem
11. towards primary phloem/outside vascular cambium.
12. 13. Cork cambium produces tough and thick covering
14. consisting of wax impregnated cells / cork cells
15. towards exterior / ~~periderm~~.
16. Secondary growth occurs simultaneously with primary growth.
17. Some initials / cells produced by vascular cambium are elongated and
18. oriented with their long axis parallel to the axis of stem and
19. produce tracheids, vessel elements, xylem parenchyma, xylem fibres (any 2)
20. sieve tube elements, companion cells, phloem fibres and phloem parenchyma (any 2).
21. Some initials (produce by vascular cambium) are short and
22. 23. oriented perpendicular to the axis of the stem and produce vascular rays.
24. When secondary growth continues secondary xylem layers accumulate and
25. their walls lignify.
26. 27. Epidermis is pushed outside, splits
28. 29. dries up and falls off.
30. It is replaced by (two) tissues produced by cork cambium.
31. Cork cells die
32. due to deposition of suberin in their cells.
33. (Layers of) cork cambium break and



Primary Structure of Root

- Apart of the distribution pattern of xylem and phloem tissue structures of both monocot and dicot roots are more or less similar.
- ……
  ……
  ……
  ……
  ……
  ……...



Essay

1. (a) Describe the secondary structure of a mature dicot stem as seen in a transverse section under the light microscope
(b) Explain secondary growth of dicot stem

(a) Describe the secondary structure of a mature dicot stem as seen in a transverse section under the light microscope.

1. Most peripheral outermost tissue layer is the cooked layer
2. it consists of several cell layers
3. coke is interrupted at certain places to make lenticels
4. which consist of loosely packed cells coke
5. Cork cambium is located inner to the coke
6. as a single layer
7. in order the cork cambium it is parenchymatous
8. it consists of several cell layers
9. primary phloem is arranged inner to cortex
10. secondary phloem is located inner to the primary phloem
11. vascular cambium is located
12. inner to the secondary phloem
13. Secondary xylem is located inner to the vascular cambium
14. primary xylem is located most internally
15. as few masses
16. Pith is highly reduced
17. all tissues outer to the vascular cambium is collectively called bark
18. there are several radiating parenchymatous strands in secondary vascular tissue
19. they are called secondary medullary rays

(b) Explain secondary growth of dicot stem

1. Secondary vascular tissue is produced by the action of vascular cambium.
2. In a typical woody stem, the vascular cambium consists of a continuous cylinder of undifferentiated cells of
3. often only a single cell layer in thickness,
4. located outside the pith and primary xylem
5. and to the inside of the cortex and primary phloem.
6. As these meristematic cells divides they increase circumference of the vascular cambium
7. and also add secondary xylem to the inside of the cambium
8. and secondary phloem to the outside.
9. Viewed in a cross section, the vascular cambium appears as a ring of initials.
10. Some initials are elongated
11. and are oriented with their long axis parallel to the axis of stem.
12. They produce cells such as tracheid, vessel elements, parenchyma and fibers of the xylem,
13. as well as sieve-tube elements companion cells, phloem fibers and phloem parenchyma.
14. The other initials are shorter
15. and oriented perpendicular to the axis of the stem or root.
16. They produce vascular rays-mostly parenchyma cells
17. As the secondary growth continues over many years, layers of secondary xylem (wood) accumulate.
18. During early stages of secondary growth, the epidermis pushed outwards,

5. Interfascicular cambium in most dicotyledonous stems
(1) is a primary meristem. (2) is of secondary origin. (3) consists of several layers.
(4) consists of parenchyma cells with large vacuoles.
(5) produces secondary medullary rays.

6. Which of the following is a general feature of the Class: Dicotyledonae?
(1) Perianth is not differentiated into calyx and corolla
(2) Presence of dissected leaves
(3) Presence of scattered vascular bundles in the stem
(4) Presence of reticulate venation
(5) Absence of vascular cambium (AL/2001)

7. Which of the following is directly related to primary growth of plants?
(1) Apical meristem. (2) Intercalary meristem. (3) Interfascicular cambium.
(4) Cork cambium (5) Fascicular cambium. (AL/2011 Old)

8. The periderm consists of
(1) cork cambium and cork. (2) cork cambium, cork and phelloderm.
(3) vascular cambium, secondary phloem and secondary xylem.
(4) cork, phelloderm, secondary phloem and secondary xylem.
(5) pericycIe, cork cambium and cork. (AL/2012 old)

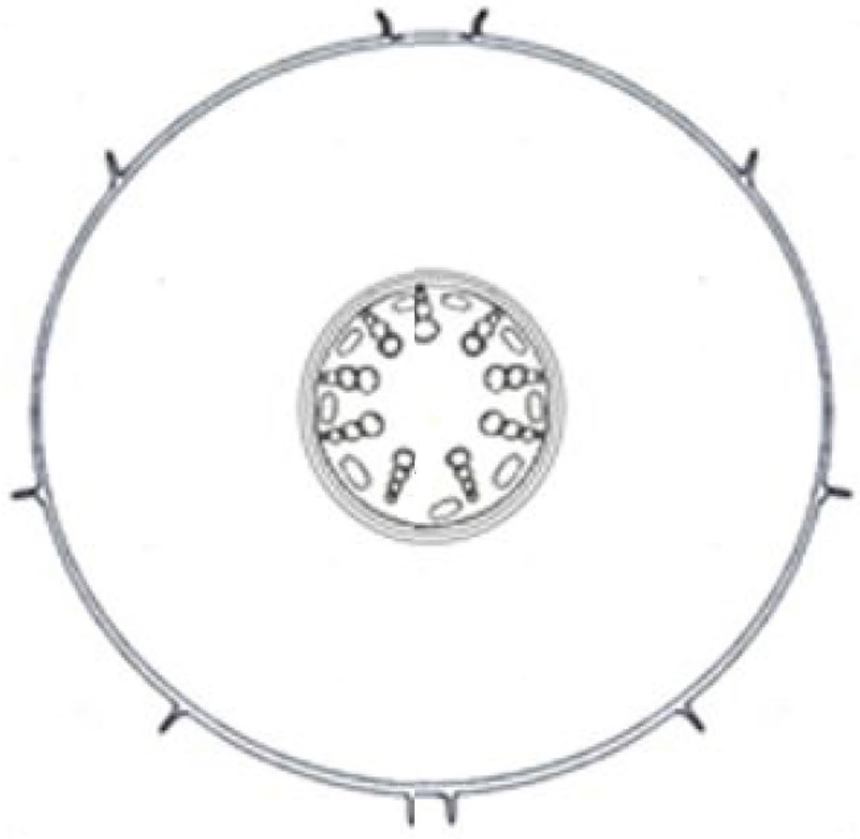
10. Which of the following statements of comparison between dicotyledonous primary stem structure and dicotyledonous primary root structure is incorrect?

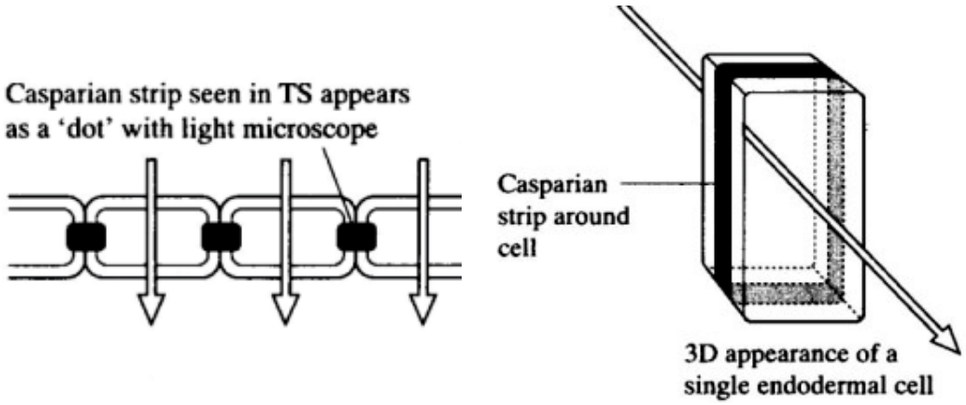
Stem	**Root**
(1) Cortex may have photosynthetic cells.	Cortex may have storage cells.
(2) Endodermis not prominent	Endodermis prominent
(3) Pith is prominent	Pith is prominent
(4) Protoxylem is inner to metaxlem	Protoxylem is outside metaxylem
(5) Cambium present	Cambium absent

(AL/2005)

13. Which of the following statements regarding plant meristems is correct?
(1) Lateral meristem and apical meristem arc involved in secondary growth.
(2) Shoot apical meristem produces new cells both inward and outward.
(3) Regrowth of broken leaves of monocots occurs due to the action of lateral meristem located at their bases.
(4) Lateral meristem contributes to the formation of periderm.
(5) Meristems are always active. 2024/13

- Between epidermis and vascular cylinder there is a ground tissue known as cortex which is made up of mostly parenchyma cells with intercellular spaces.
- Cortex mainly stores carbohydrates, and also transports water and minerals towards the endodermis.
- Innermost single cell layer of the cortex is the endodermis.
- ……
  ……
  ……
  ……





- Interior to endodermis there is a pericycle containing two or three parenchyma cell layers. These cells in dicot roots have meristematic function and involve in the formation of lateral roots and secondary growth of the root.
- ……
  ……
  ……
  ……
  ……
  ……
  ……
  ……
- In monocot roots, vascular tissue consists of a central core of parenchyma cells surrounded by a ring of alternating xylem and phloem. Pericycle in monocot roots is not meristematic

Primary Structure of Dicotyledonous plant Stem/2008 AL

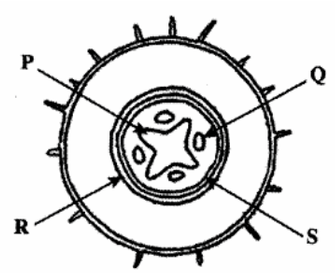
- The outermost epidermal cell layer protects inner parts from desiccation and infections. The epidermis is interrupted by pores called stomata.
- ……
  ……
- ……
  ……
- ……
  ……
- ……
  ……

(b) State two factors that are responsible for opening of stomata Other than light.

……
……
……..

(B)

(i) Identify the structure shown in the above diagram.



(ii) (a) Name the tissues labeled as P, Q, R and S in the above diagram.

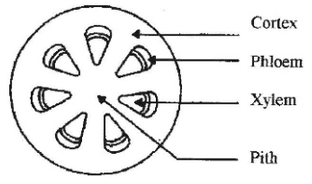
……
……
……..

MCQ

1. Which of the following is incorrect regarding xylem vessels?
   (1) They are non-living tissues at maturity. (2) They have lignified thick walls.
   (3) The lumen of each vessel is continuous with that of adjacent ones.
   (4) They conduct both water and synthesized food.
   (5) They give mechanical support to the plant.

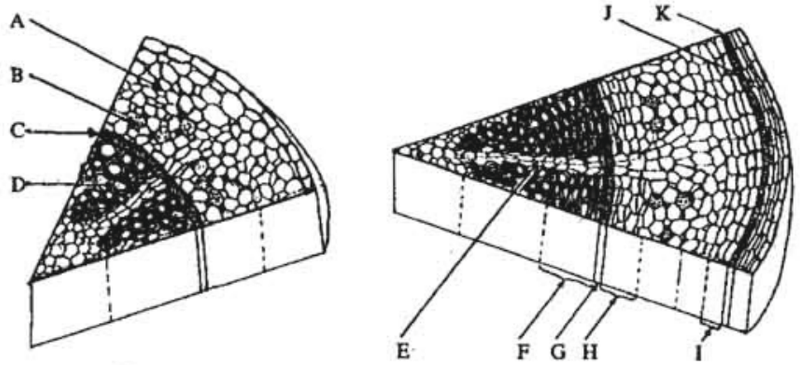
2. Which of the following root tissue regulates the passage of mineral ions into the xylem?
   (1) Epidermis (2) Endodermis (3) Cortex (4) Hypodermis (5) Pericycle

3. The diagram given below represents a cross section of part of as seen under the low power of a microscope. Which of the following statements is correct regarding the above diagram?
   (1) It has bicollateral vascular bundles
   (2) It represents a transverse section of a dicot stem.
   (3) Metaxylem of the vascular bundles is located towards the center of the diagram
   (4) Tissues shows are primary and secondary in origin
   (5) It represents a transverse section of a monocot root.



4. Rapid mitotic division of cells can be best observed in a prepared slide of which one of the following structures?
   (1) Epidermis of leaf (2) Cortex of root (3) Seminiferous tubules of human testes

X and Y given below are illustrations of parts of transverse sections of a dicotyledonous stem. X has been taken close to the apex of the stem and Y has been taken from about 5 cm below the apex.



Study the illustrations X and Y and label the Parts A to K.

A. ..... B. .....

C. ..... D. .....

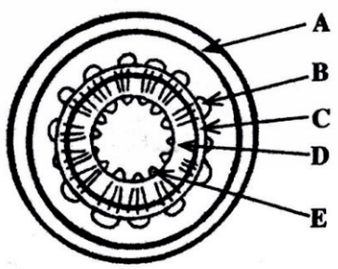
E. ..... F. .....

G. ..... H. .....

I. ..... J. .....

K .....

(iv) Identify the structure shown in the following diagram and name the parts labelled as A, B, C, D and E.



Structure : .....

.....

A : .....

B : .....

C : .....

D : .....

E : .....

2022 AL

What are considered as soft wood and hard wood?

.....

.....

2021AL

(iv) (a) What is known as secondary growth in plants?

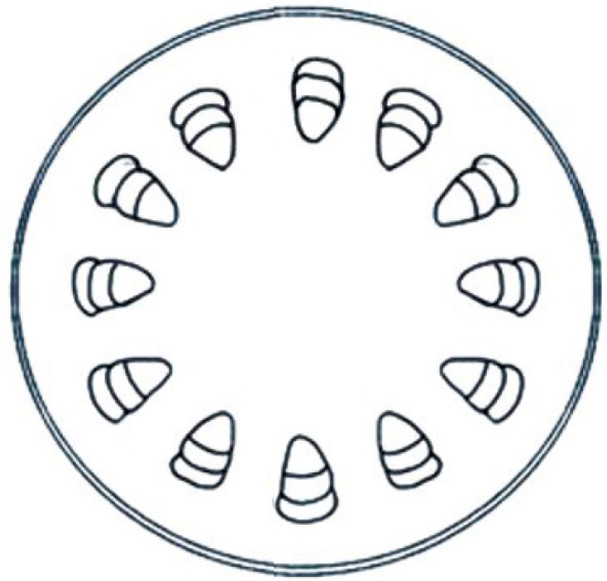
.....

.....

- .....

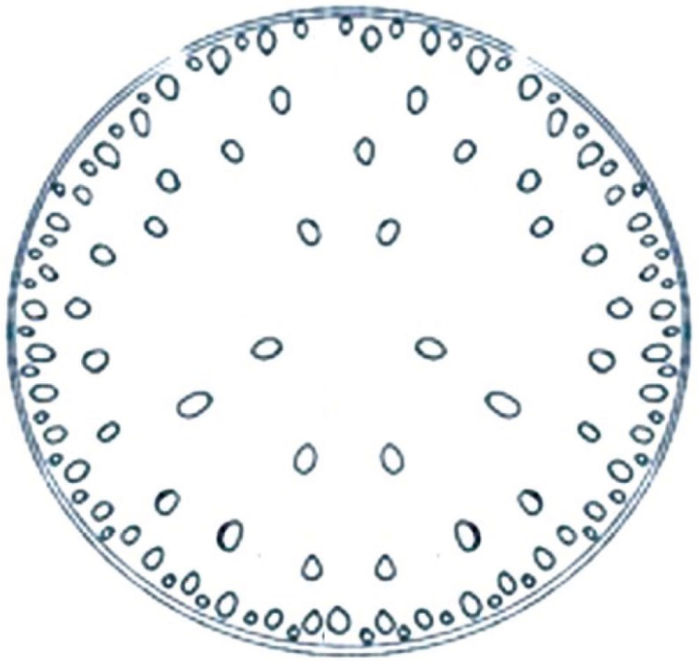
  .....
- .....

  .....
- Lateral shoots develop from axillary buds



Primary Structure of the Monocotyledonous Stem

- ……
  ……...
- ……
  ……...
- ……
  ……
  ……



4.1.2 : Examines the changes taking place in the growth and development process of a plant

Learning Outcomes:

- States basic differences between primary and secondary growth of plants
- Briefly describes the histological structures of primary dicotyledonous root and monocotyledonous root
- Briefly describes the differences between histological structure of primary dicotyledonous stem and monocotyledonous stem
- Briefly describes the process of secondary growth of dicotyledonous stem using appropriate line diagrams
- States how the secondary growth of a dicotyledonous root differ from the secondary growth of a dicotyledonous stem
- Briefly explains wood and growth rings formation as a result of secondary growth
- Names the tissues included in bark and wood
- Lists out the differences between sap wood and heart wood
- Mentions the differences between soft wood and hard wood
- Identifies the primary stems and primary roots of monocots and dicots using microscopic and macroscopic transverse sections dicotyledonous wood (Practical work)
- Appreciates the importance of secondary growth for the existence of perennial plants

Structured Essay

AL/2012 Old

1. (A) The diagram given below shows the distribution of different tissues/parts in a transverse section of a dicotyledonous stem.

(i) Name the tissues/parts labeled A-G.

A -

C -

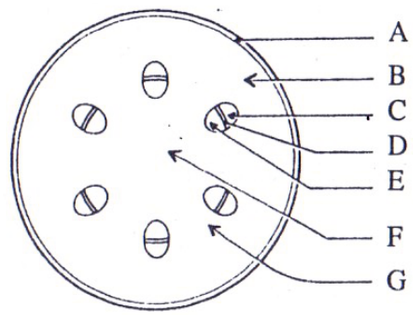
B -

D -

E -

F -

G -



(ii) What are the major functions of tissues/parts labelled Band F?

B .....

F .....

(iii) What are the types of cells found in E?

.....

- Slice of a stem of a matured woody plant
- Watch glasses with water, slides and cover slips
- Razor blades and small paint brushes
- Aniline sulphate solution
- Light Microscopes
- A slice of a stem of matured woody plant

Instructions
- Instruct students to cut thin transverse sections of the given stem and transfer them in to a watch glass filled with water.
- Instruct students to stain the stem sections with Aniline sulphate solution.
- Ask them to mount sections in a drop of water, on a slide and cover it with a cover slip.
- Let the students to observe prepared wet mounts under low power of light microscope and select a thin section where secondary xylem and secondary phloem has just begun to form.
- Direct them to observe under high power and note the distribution of different tissues.
- Guide the students to observe a slice of a stem of a matured woody plant and identify important structures such as bark, sap wood, heart wood and growth rings (macroscopic observation).
- Instruct the students to record their observations.

PRACTICAL NO.19

Observation of the structure of stomata and lenticels through light microscope
Objectives
Students should be able to
- Identify the structure of stomata,
- Identify the structure of lenticels,
- Draw and label diagrams of stomata and lenticels.

Materials and equipment
- Epidermal peel taken from a fresh leaf of betel/Rhoeo (*Tradescantia*).
- A cross section taken from a secondary stem of *Stachytarpheta*, etc.
- A permanent slide of a transverse section of a secondary stem.
- Light microscopes.

Instructions
- Allow students to get an epidermal peel of a fresh leaf of betel/Rhoeo (*Tradescantia*).
- Allow them to get a thin cross section of a secondary stem.
- Let them observe an epidermal peel of betel/Rhoeo and cross section of a secondary stem under low power of light microscope.
- Let them observe stomata and lenticels under the high power of light microscope.
- Instruct them to record their observations.

PRACTICAL NO. 17

Observation of transverse sections of primary stem and primary root of a monocot and a dicot
Objectives
- Students should be able to

1. cut thin sections of parts of plants,
2. identify the arrangement of different tissues in primary roots and primary stems under the light microscope,
3. distinguish anatomical differences between transverse sections of a monocot and a dicot,
4. Draw and label line diagrams of transverse sections of monocot and dicot observing under light microscope.

Materials and equipment
- Transverse section of a dicot root taken from a bean seedling or other similar plant.
- Transverse section of an onion root or any other similar plant.
- Transverse section of a dicot stem taken from a plant like Tridax.

- Transverse section of a monocot stem taken from a grass or other similar plant.
- Razor blades, slides, cover slips, small paint brushes, watch glasses.
- Light Microscopes

Instructions
- Guide students to cut thin transverse sections and transfer them to the water in a watch glass.
- Instruct them to mount a thin section to a drop of water on a glass slide and cover it with a cover slip.
- Ask them to observe the prepared wet mounts under the light microscope.
- Let them observe the structure and distribution of the different types of tissues and cells.
- Direct them to identify epidermis, cortex, endodermis, pericycle, xylem, phloem and pith of the prepared thin sections.
- Instruct students to make line diagrams to demarcate the important structures studied.
- Ask them to label the above mentioned tissues in their diagrams.

Secondary growth :

- ……
  ……
  …….
- This occurs in stems and roots of woody perennial plants including, all gymnosperms species and many dicot species.
- ……
  ……
  …….
- ……
  ……
  ……
  ……....
- ……
  ……
  ……
  ……
  …….
- In woody plants, primary growth and secondary growth occur simultaneously.
- As the primary growth adds new cells and lengthens stems and roots in the younger regions of a plant, secondary growth increases the diameter of stems and roots in older regions where. primary growth has ceased,
- Secondary vascular tissue is produced by the action of vascular cambium,
- ……
  ……
  ……
  ……
  ……
  ……..
- ……
  ……
  ……
  ……..

Growth rings:

- ……
  ……
  ……
  ……
  ……....
- ……
  ……
  ……
  ……
  …….
- The wood produced during rest of the growing season is called summer wood.
- These xylem tissues consist of xylem vessels with thick walls and small lumen, do not transport much water but provide more support.
- These two woods collectively known as an annual ring. A year's growth appears as distinct ring in the cross section of most tree trunks and roots. Therefore age of the tree can be estimated by counting annual rings in trees growing in temperate regions.

PRACTICAL NO.18

Microscopic and macroscopic examination of secondary structure of dicotyledonous wood using transverse sections

Objectives

- Students should be able to

1. Identify different tissues in a mature dicot stem,
2. Identify the growth rings of a dicot stem,
3. Prepare wet mounts of thin transverse sections of a dicot stem.

Materials and equipment

- Part of a secondary thickened dicot plant stem (*Stachytarpheta/Vernonia/Helianthus*)

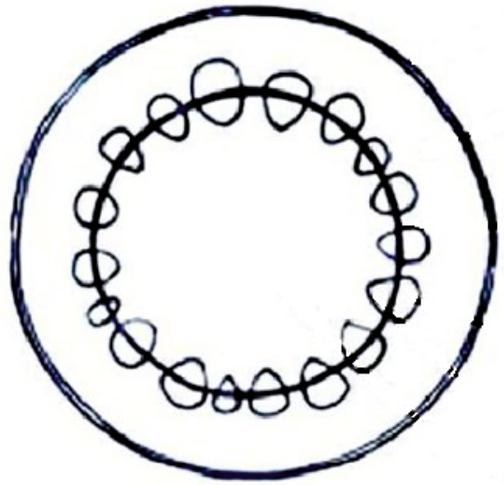
- Each cork cambium and the tissues it produces comprise a layer of periderm which is impermeable to water and gasses.
- ……
  ……
  ……
  ……
- ……
  ……
  ……
- A new cork cambium is initiated inside which with produce a new layer of periderm.
- As new cells are added, the outer regions of cork will crack and peel off in many tree trunks.
- Due to the tissue layers produced by vascular cambium and cork cambium, girth of the stem or root increases in secondary growth.
- ……
  ……
  ……
  ……

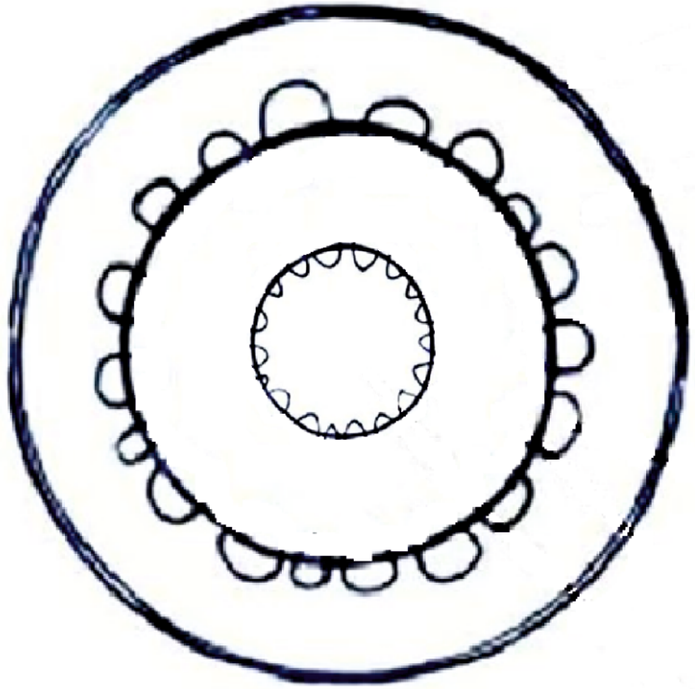
Heart Wood and Sap wood:

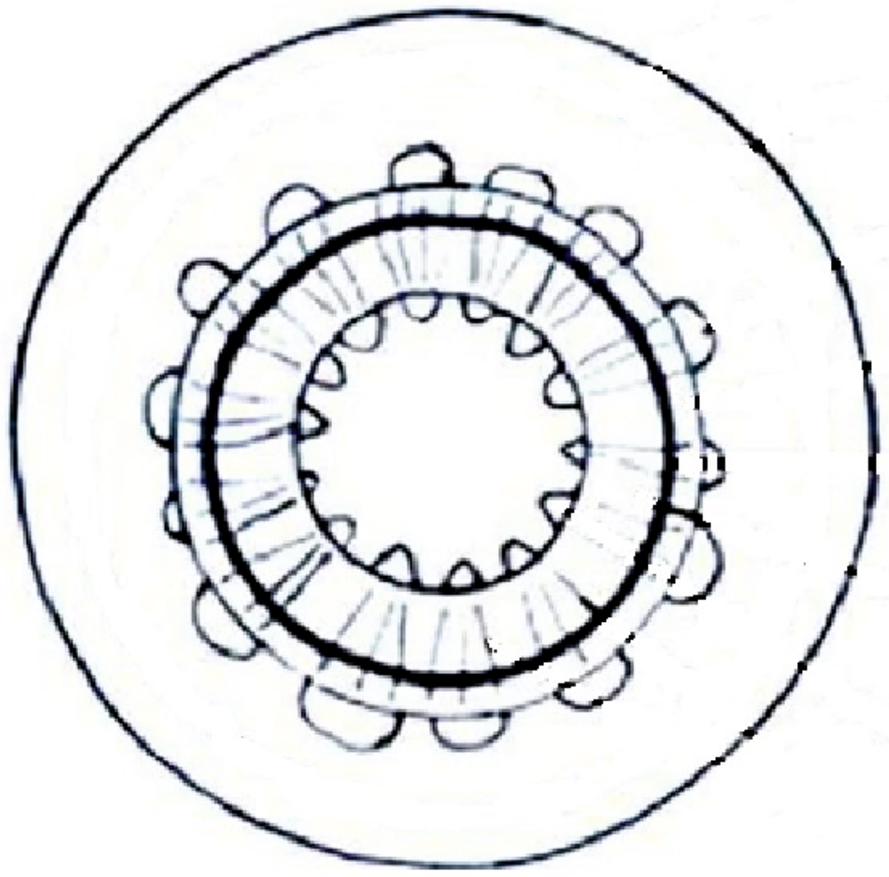
- As a woody plant ages, the older layers of secondary xylem no longer transport water and minerals.
- These layers are called heartwood because they are close to the centre of the stem or root.
- ……
  ……..
- The heartwood is generally darker than sapwood because of resins and other compounds that permeate the cell cavities and help protect the core of the tree from fungi and wood-boring insects.
- Only the young secondary phloem functions in phloem translocation and old secondary phloem is sloughed off,

Hard wood and soft wood

- Hard wood is the secondary xylem of dicot angiosperms while wood of gymnosperms are named soft wood
- Xylem vessels are absent in soft wood







- As these meristematic cells divides they increase circumference of the vascular cambium and also add secondary xylem to the inside of the cambium and secondary phloem to the outside.
- Viewed in a cross section, the vascular cambium appears as a ring of initials.
- ……
  ……
  ……..
- ……
  ……
  ……
  ……..
- ……
  ……
- ……
  ……
  ……..
- As the secondary growth continues over many years, layers of secondary xylem (wood) accumulate.
- The walls of the secondary xylem cells are heavily lignified and account for the hardness and strength of wood.
- During early stages of secondary growth, the epidermis pushed outwards, causing it to split, dry and falls off the stem or root.
- ……
  ……
  ……
  ……
- Cork cambium produces cork cells to the exterior, and to the interior. Cells added to the exterior become cork.
- Cork cambium and tissues it produces are collectively called periderm
- ……
  ……
  ……
- The cork tissues function as a barrier that helps protect the stem or root from water loss. physical damages and pathogens.