

LIFE PROCESSES in PLANTS

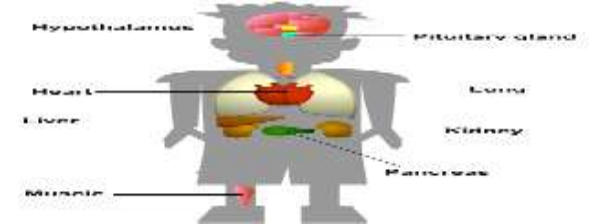
HOMEOSTASIS

STRUCTURES within a DICOTyledonous PLANT

TRANSPORT within PLANTS

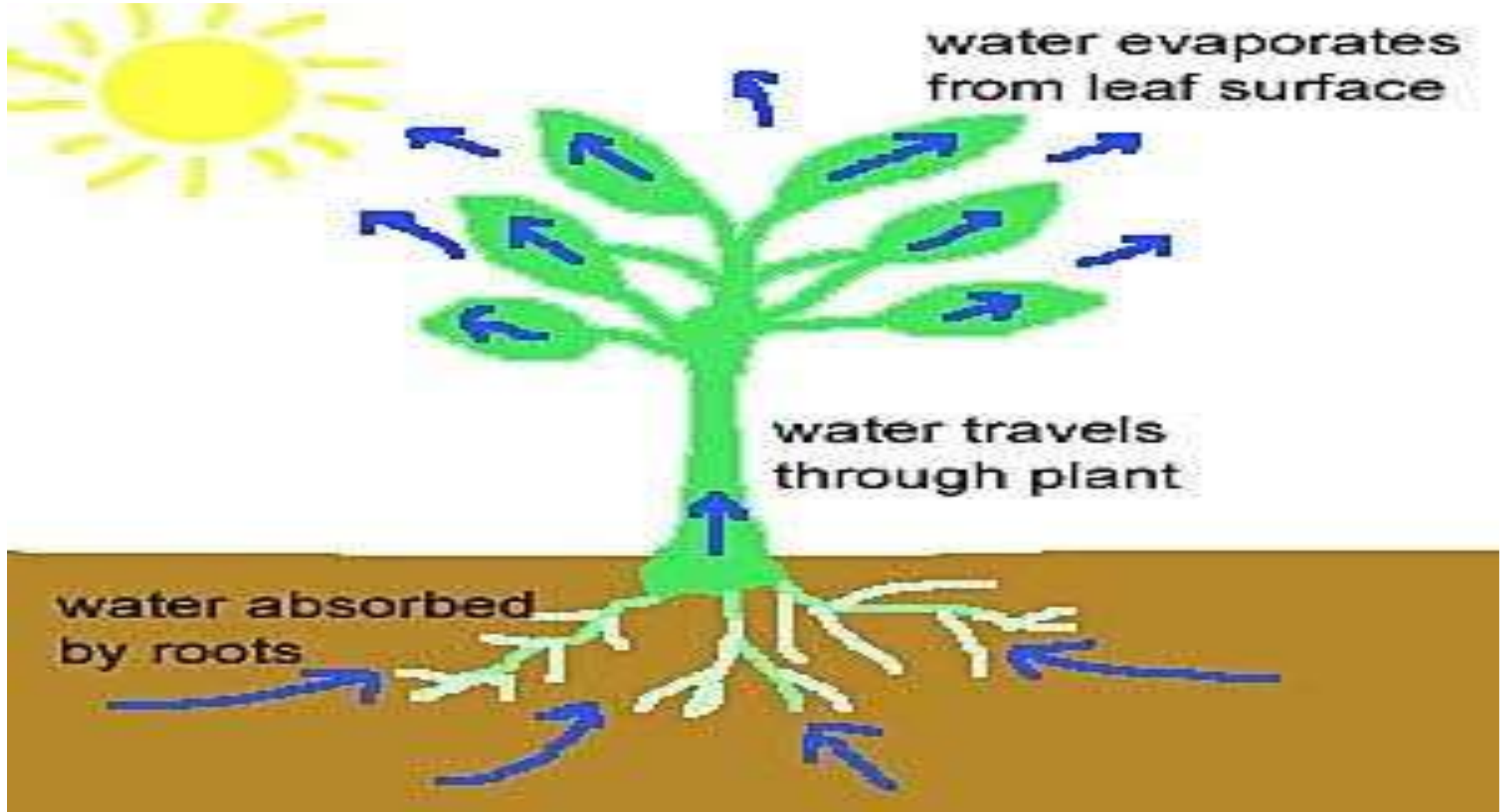


HomeoSTASIS



- In any living organism, there are so many different organs doing so many different things all the time.
- **HomeoStasis** refers to how the *brain* co-ordinates all these operations so that they work together (as a whole) in that body – not each as a separate process.
- That's why *HomeoStasis* means: *Keeping the inside of that organism constantly the same.*
- This process happens inside humans. It happens in all animals. It also happens in all plants.
- Seeds of simpler plants (like the mealie/maize) are made of only **one** part, so are called **MonoCotyledons**.
- Seeds of more advanced plants (like the bean) can be split into **two** parts, so are called **DiCotyledons**. **These** are the ones we will be studying this year.

A REMINDER of the LEAF



- The leaf is packed with ChloroPhyll, and this is used to make food for the plant.

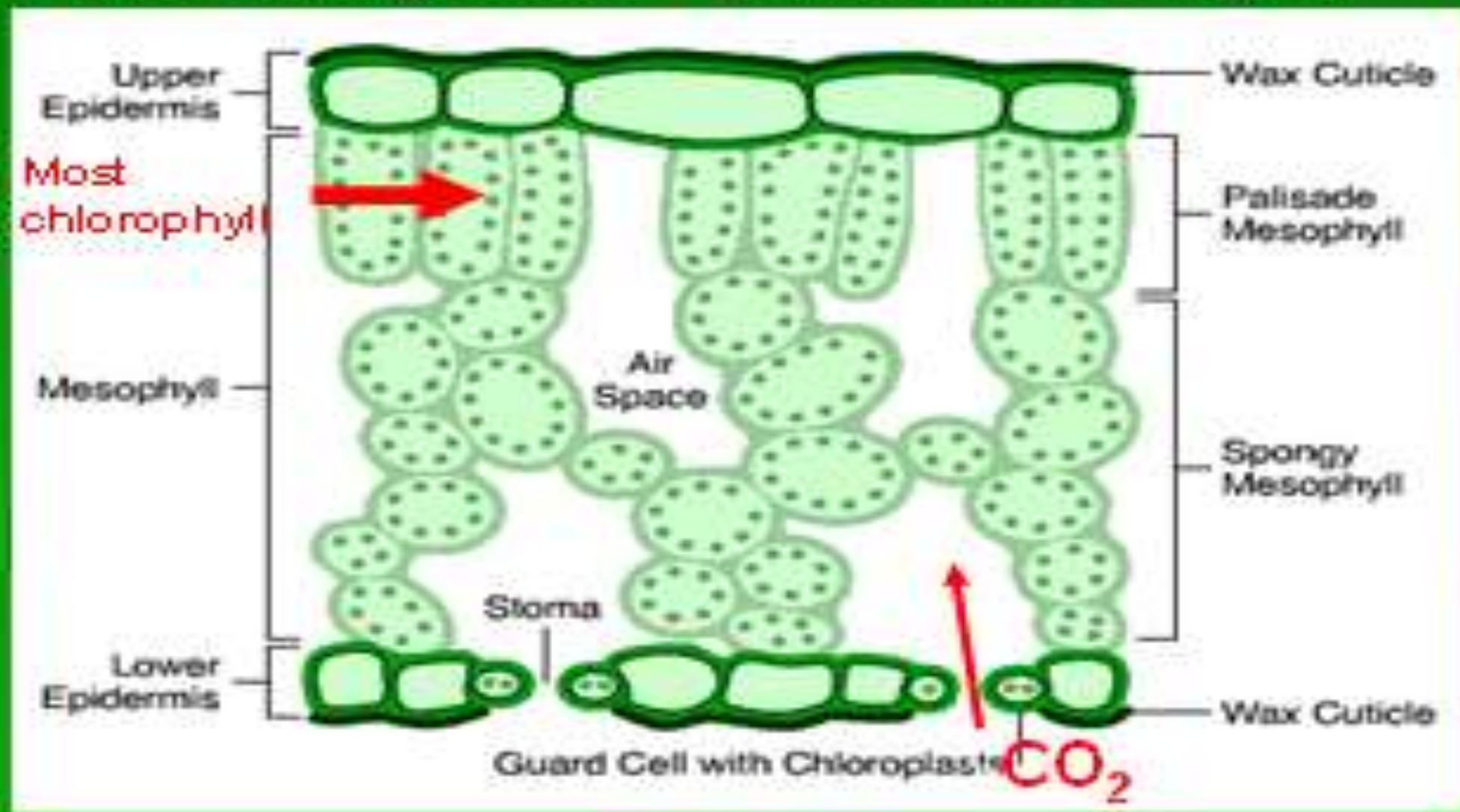


In this food, energy from the sun can be stored.

- To make this food, the ChloroPhyll needs chemicals from the air (CO_2), the chemicals that make up water (H_2O), and the energy from the sun (*).
- Water comes into the plant from the soil. The roots suck it up, and send it through the stem to the leaf.
- The stomata in the leaf allow Carbon DiOxide to come in, and they also allow Oxygen and Water-Vapour to be released into the air.



Leaf diagram – palisade layer

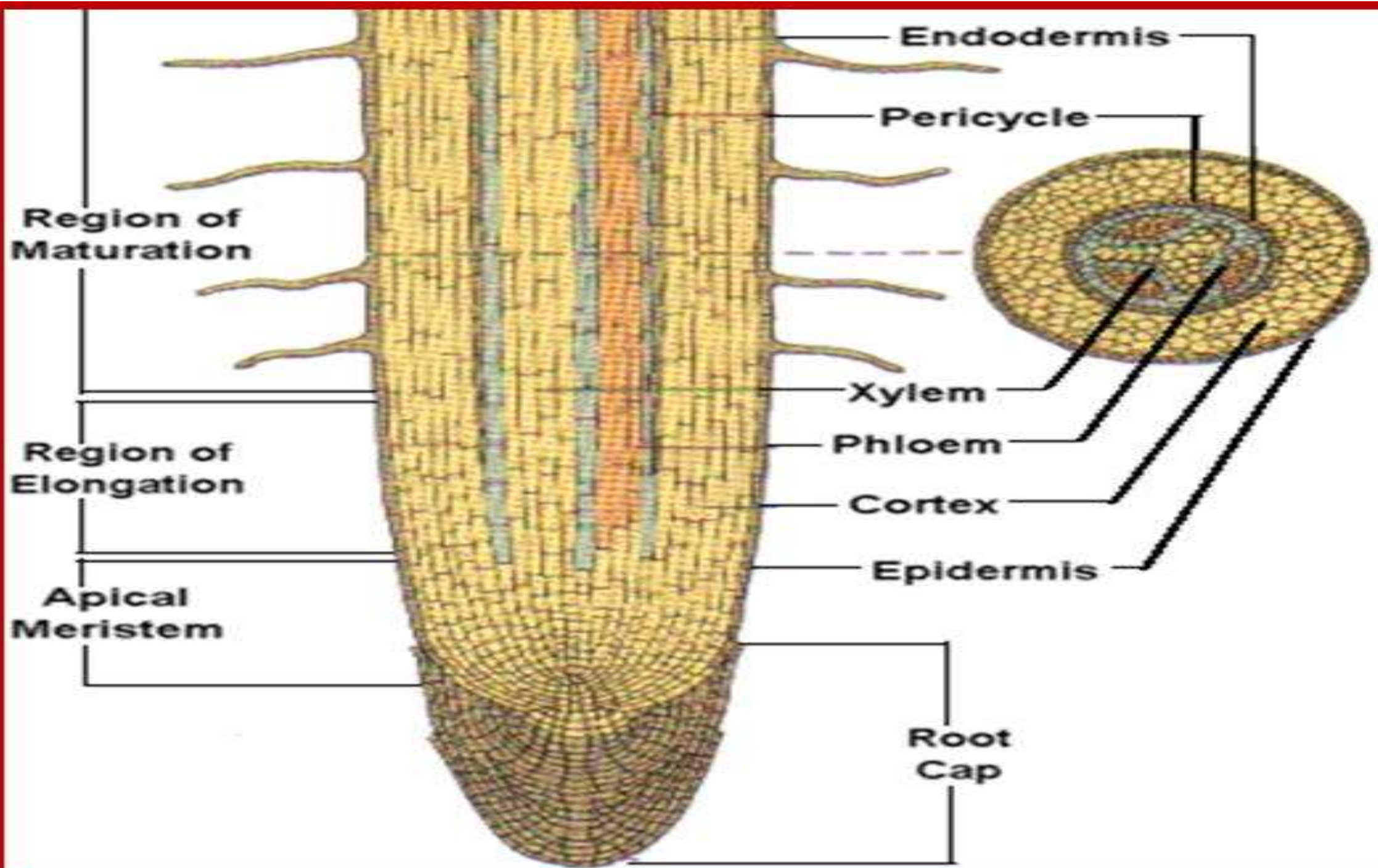




The ROOT



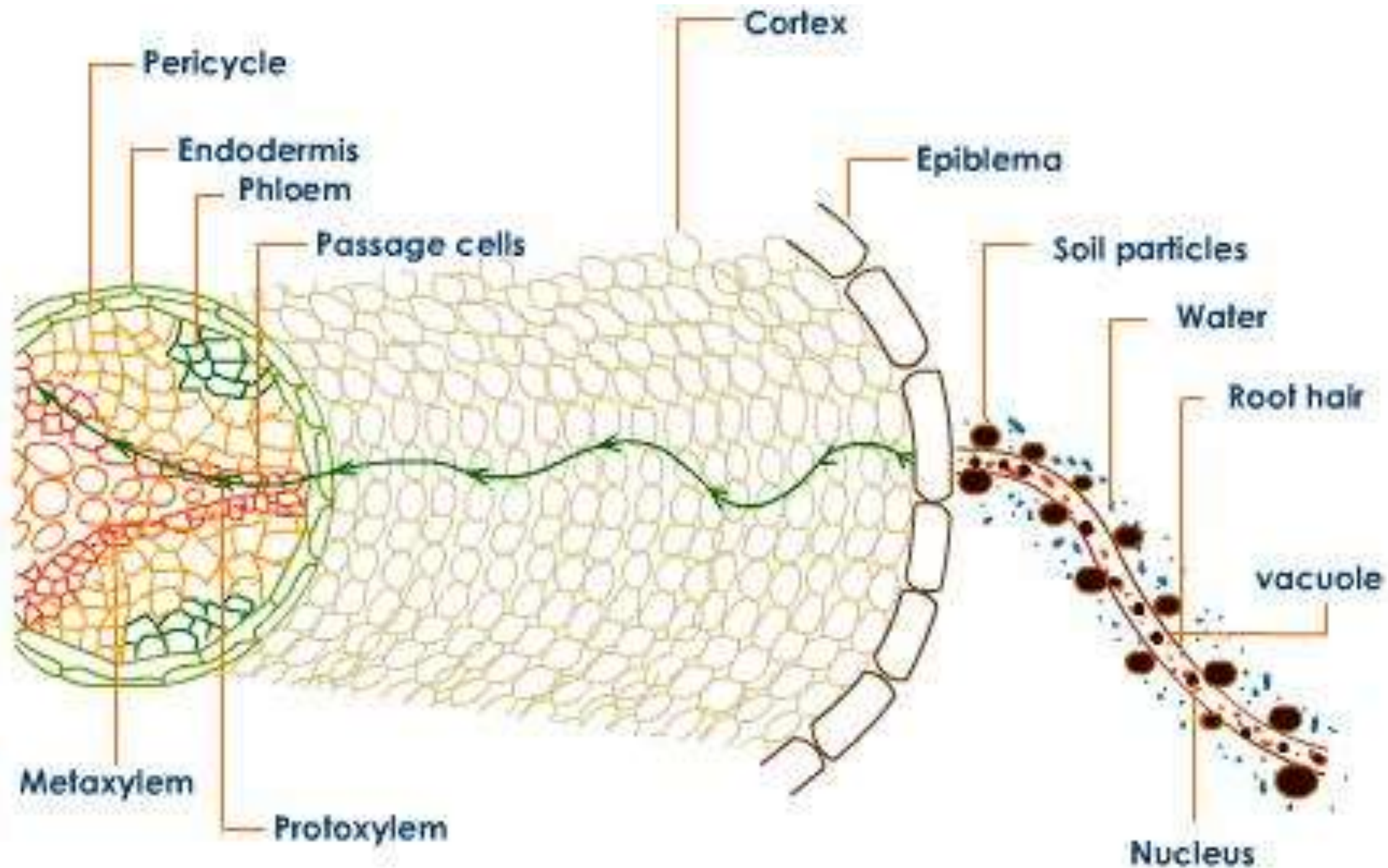
- The root's job is to keep the plant stuck firmly in the ground, and also to suck up water for the plant. It is made of **FIVE** sections:
 1. **Root Cap** – This acts like a *crash-helmet* to protect the tip of the root as it grows down into the soil.
 2. **Growing Point** – This is the *MeriStem* (just behind the *crash-helmet*), where **new** stem-cells keep being formed by mitosis.
 3. **Elongation** – Remember, these have just been the newly divided cells. They are now growing longer.
 4. **Root Hairs** – These cells were formed a while back, and have had time to develop so as to work as root hairs.
 5. **Mature** – This is the older section of the root, from which new side-roots have been able to grow.



STRUCTURE INSIDE the ROOT



- In the middle of the root are lots of *Xylem Straws* to take water up, and (in the opposite direction) lots of *Phloem Tubes* (to bring food down). The xylem straws form a *star* shape, with the Phloem Tubes tucked between their *star rays*. (**See the diagram.**) MeriStem Cambium separates the bundles of xylem from the bundles of phloem.
- Around this central ***stele*** is a single layer of *EndoDermis* cells. Only its *Passage Cells* allow water through, into the **Xylem star rays**. A water-proof *Casparian strip* protects the food in the **Phloem bundles** from water.
- Working as **Packaging**, so as to **Protect** this whole working section, is a thick layer of **ParenChyma** cells. This layer is called the **Cortex**. Water moves easily through it.
- Around this is the *EpiDermal layer* of cells (some with root hairs) which allow water to come in to the root through thin walls.



2. Life Processes in Plants and Animals

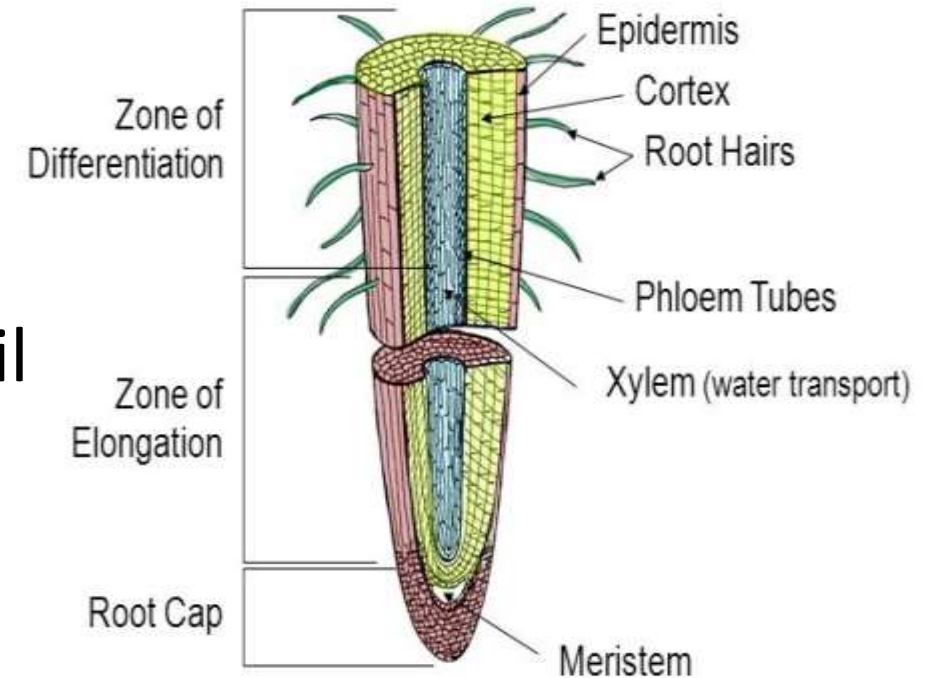


A. Dicot Root

Question 1

1. Anchors the plant to the soil
Absorbs water and mineral salts from the soil
2. REFER TO STUDY GUIDE
3. A. protects the underlying tissues.
B. produces cells by mitosis
C. cells elongate causing root to grow root deeper into soil
D. gives rise to root hairs
E. gives rise to lateral roots

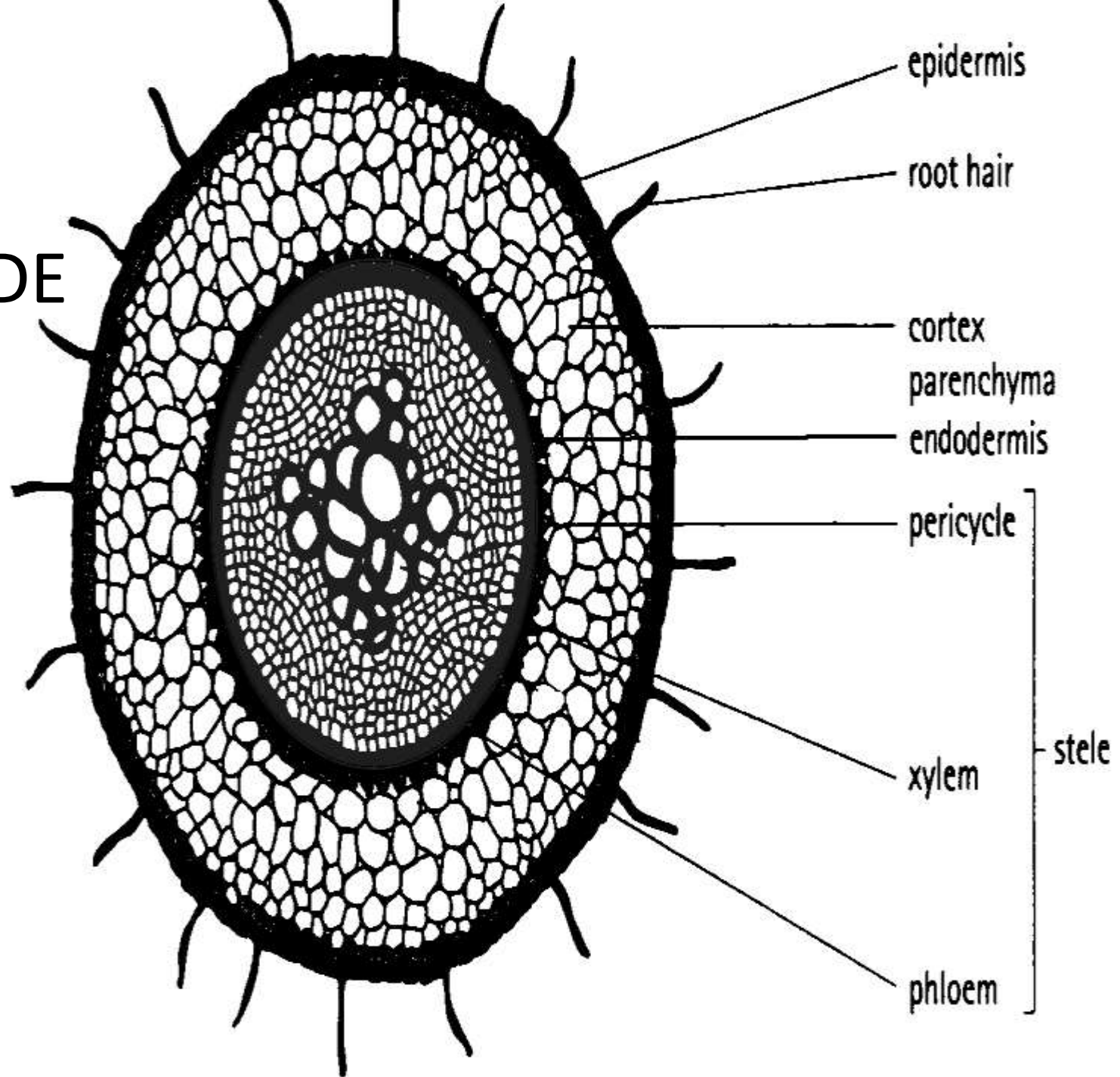
Root Structure



Question 2

1. REFER TO STUDY GUIDE

2. a. xylem
- b. phloem
- c. pericycle
- d. endodermis
- e. root hair



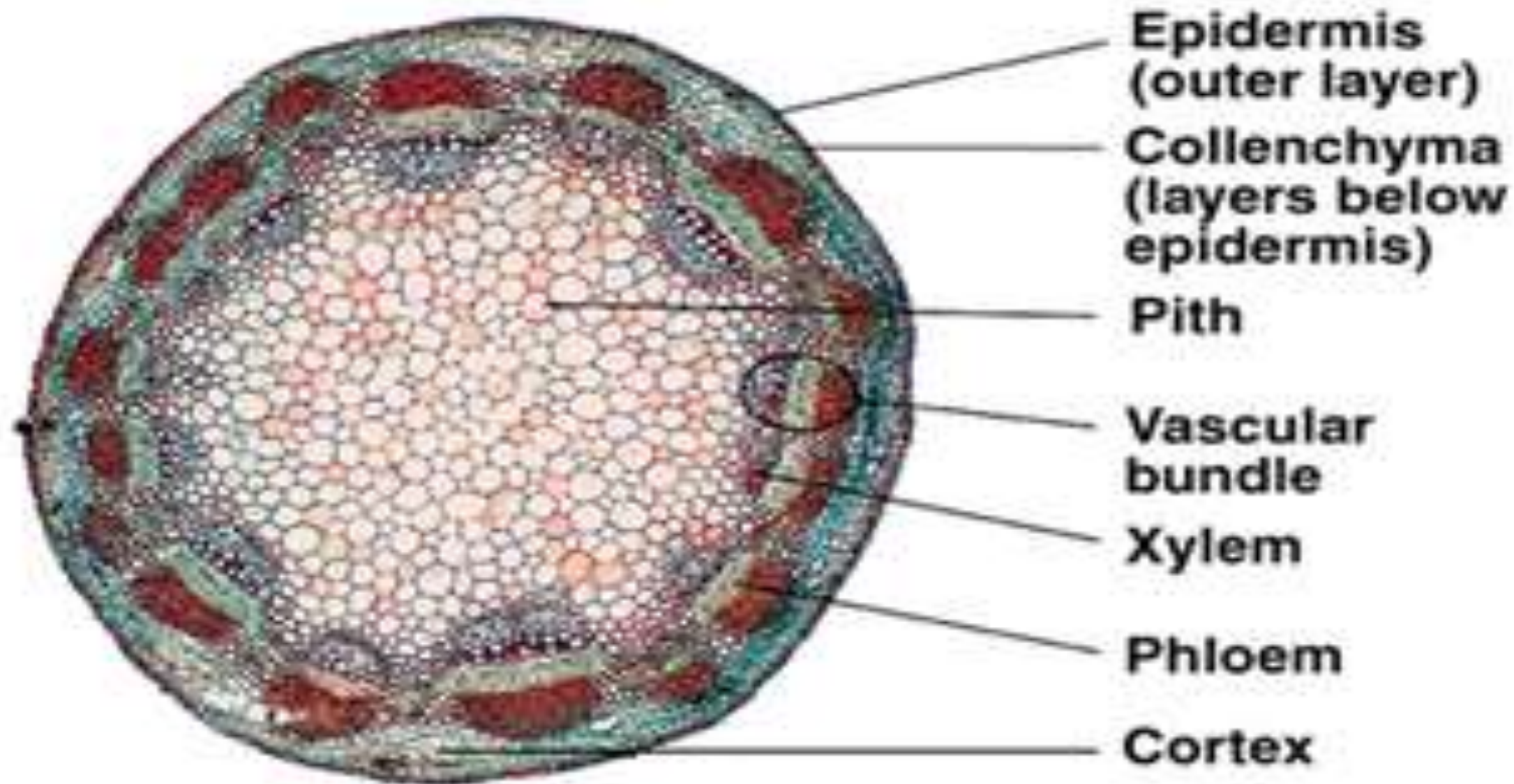


The STEM

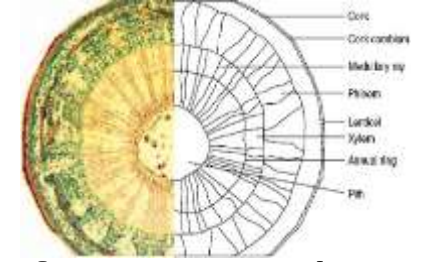


- The job of the stem is to hold all the plant parts that are above the ground. Water also needs to pass through it, as it moves from root to leaf. Food must also pass through it, as it goes from the leaf to all other parts of the plant.
- The stem is mainly made of Packaging **ParenChyma** cells – in the middle it is called the ***Pith***, on the outside it is called the ***Cortex***, and branching between the vascular bundles it is called the ***Rays***.
- Around this is the **HypoDermis** of Collenchyma (or Sclerenchyma) cells, inside the **EpiDermal** layer. A waxy ***cuticle*** surrounds this. On more woody plants, ***cork*** can form ***bark***, coated with oily ***suberin***.
- The **Vascular Bundle** is the **Xylem and Phloem** grouped together to form a ***radial pattern*** round the stem. (*See Diagram, Page 31.*) The xylem is on the inside, separated from the phloem by the ***MeriStem Cambium***. On the outside is a protective ***Sclerenchyma Cap***.

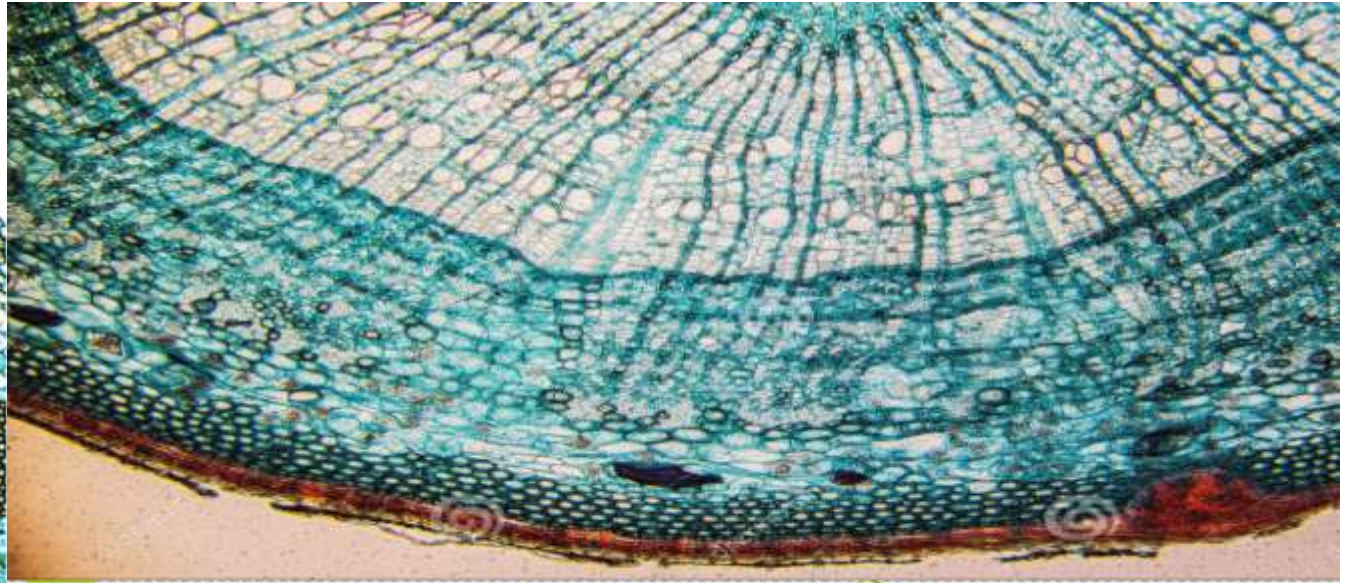
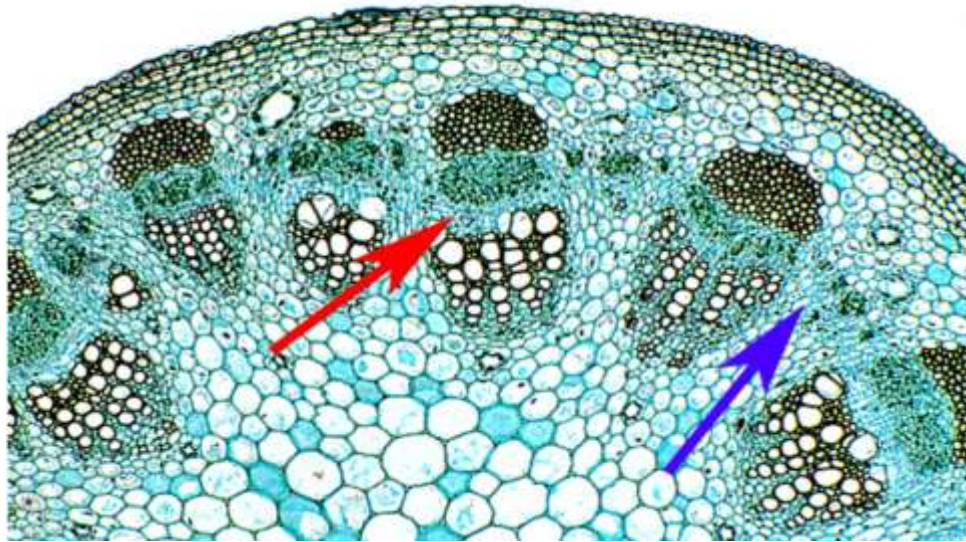
Dicot Stem



SECONDARY GROWTH in STEMS



- As a tree gets older and bigger, it needs to grow **wider**. As the **MeriStem** cells between the xylem and phloem divide, they also spread outwards from each vascular bundle, until they join with each other. (*See Page 32*).
- Those cells on the outside of this **cambium ring** will differentiate to form a ring of **phloem cells**, while those on the inside will develop into a ring of **xylem cells**.
- **Phloem** tubes are **living** cells. **Xylem** straws are **dead** cells.
- Each year, a new ring of phloem cells is replaced, and a new ring of xylem cells is added – the old xylem tissue stays, and can be seen as an **annual ring**. (*Count the number of rings to see how old the tree is.*)
- **Lenticels** are *little holes* in the stem that do the same job as the stomata for the leaves.

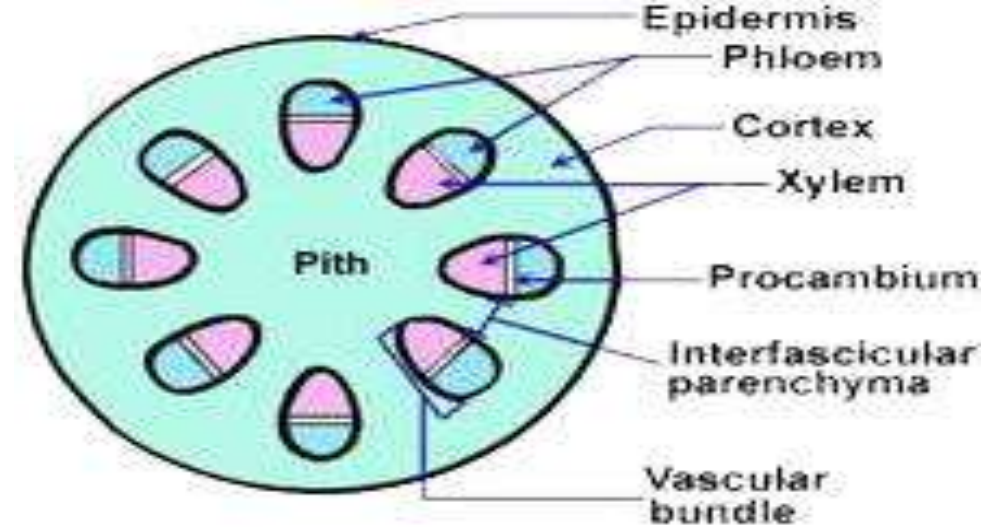


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Young Stem	Mature Stem
<p>primary phloem primary xylem</p> <p>pith</p> <p>cortex epidermis</p>	<p>primary phloem secondary phloem primary xylem secondary xylem</p> <p>vascular cambium cortex</p> <p>pith</p> <p>cork cork cambium</p>

B. Dicot stem



1. REFER TO STUDY GUIDE

2. a. secondary growth is the increase in the thickness of stem as it grows older.

b. annual rings refer to the new rings of xylem and phloem that is produced every year.

c. suberin is the oily substance that prevents water loss from plant stems.

d. lenticels are tiny openings in a stems surface that allows for the exchange of gases.