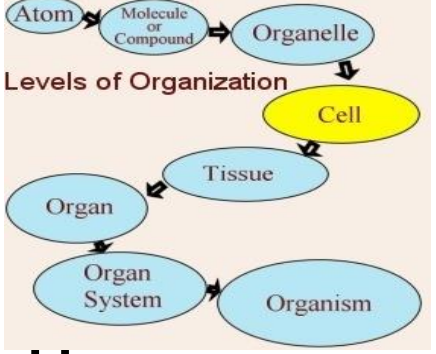
TISSUES and ORGANS

PLANT and ANIMAL TISSUES

BIOTECHNOLOGY

The LEAF as an ORGAN

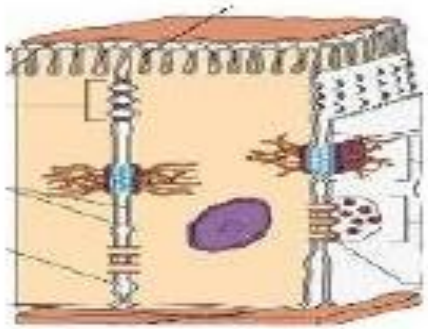
BUILDING UP an ORGANISM



- A ***cell*** is the building block for all living things.
- Cells that are **grouped** together, **look** exactly the same, and do the **same job**, are called a ***tissue***. Like muscle tissue. Or skin tissue. Or brain tissue. Etc.
- When different tissues are grouped together to do a specific job, they are called ***organs***. Like the heart. And your stomach. And lungs.
- When different organs work together, you now have a ***system***. Like your Heart with its system of Blood and Blood Vessels.
- All your systems work together to make you a living ***organism***.

CELL ORGANIZATION

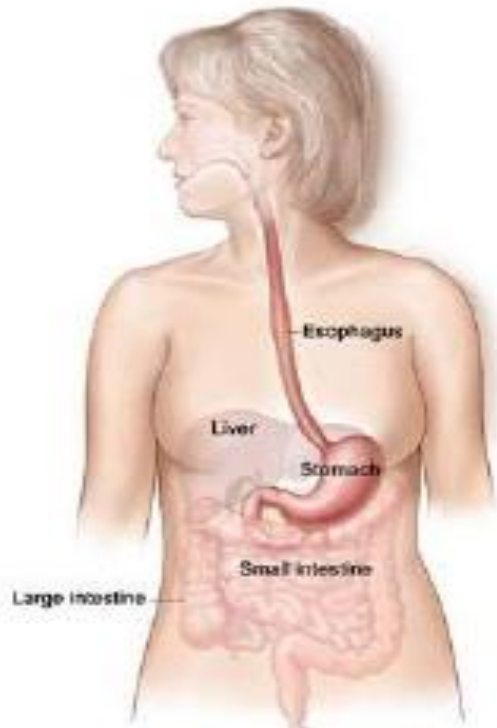
Cells → Tissues → Organs → System



Epithelial cell

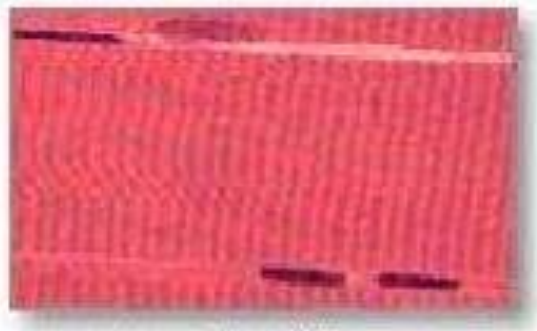
Epithelial tissue

Stomach

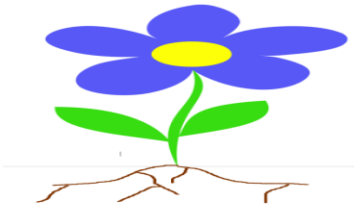


Digestive system

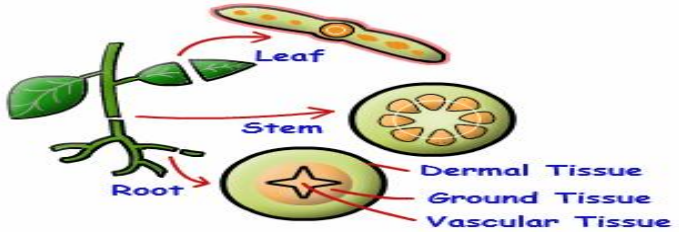
Smooth muscle cell



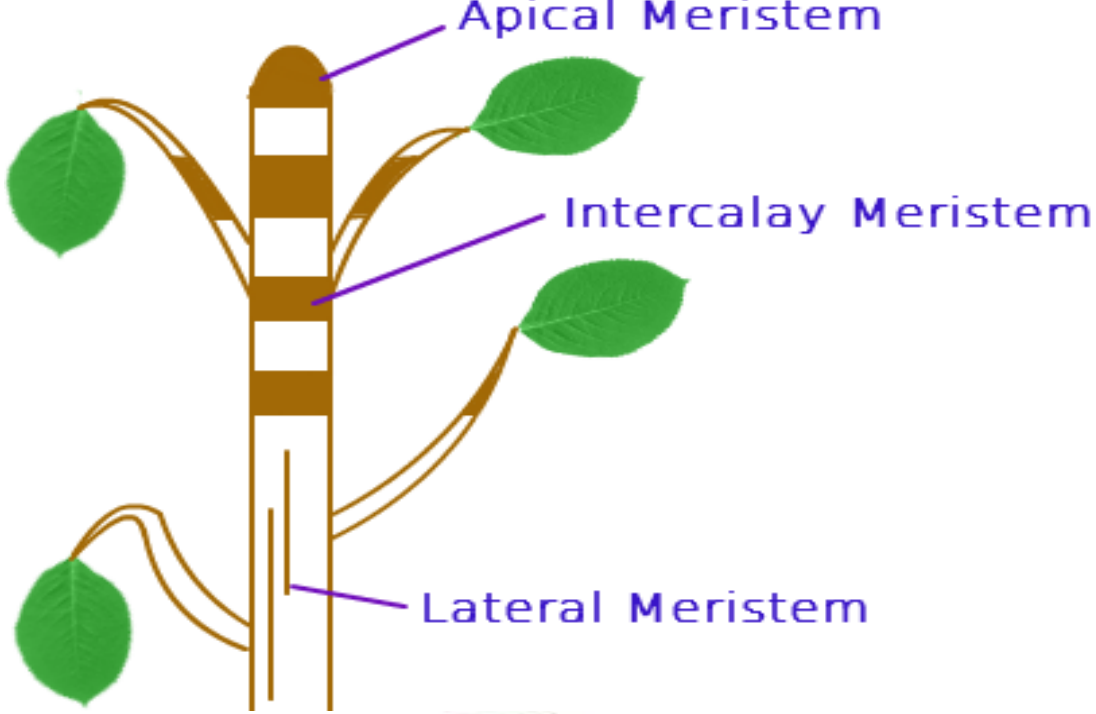
Epithelial tissue

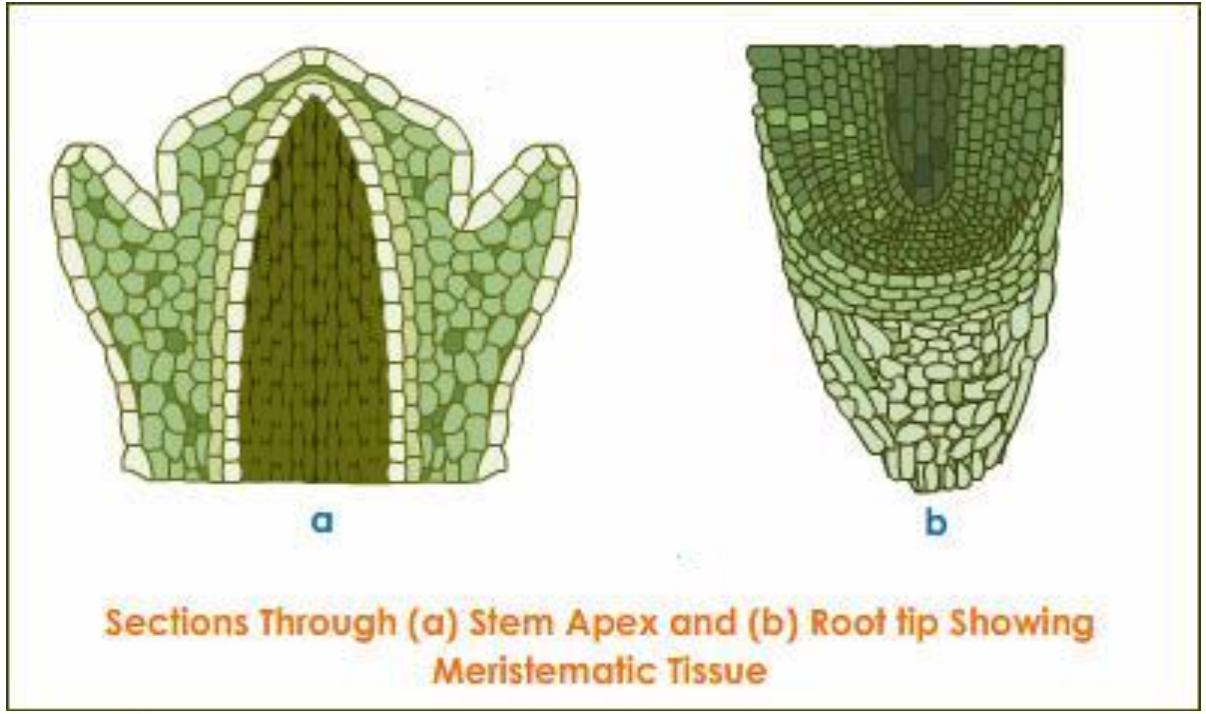


PLANT TISSUES



- **MeriStem** Tissue – this is at both tips (top and bottom) of the plant where cells are just dividing by mitosis and producing **new** cells. These new cells have no job yet – they are waiting to be sent to where they are needed. Once this has happened, these cells develop into *specialised* cells – **permanently** specialised to do the job of their **new** tissue.
- **Permanent** Tissue – these are *specialised* to do specific jobs. They can do ***Simple*** jobs (like cells of ParenChyma, CollenChyma, SclerenChyma) or ***Complex*** jobs (EpiDermal cells in roots, stems, leaves, or Xylem and Phloem cells to conduct water and food).





Sections Through (a) Stem Apex and (b) Root tip Showing Meristematic Tissue

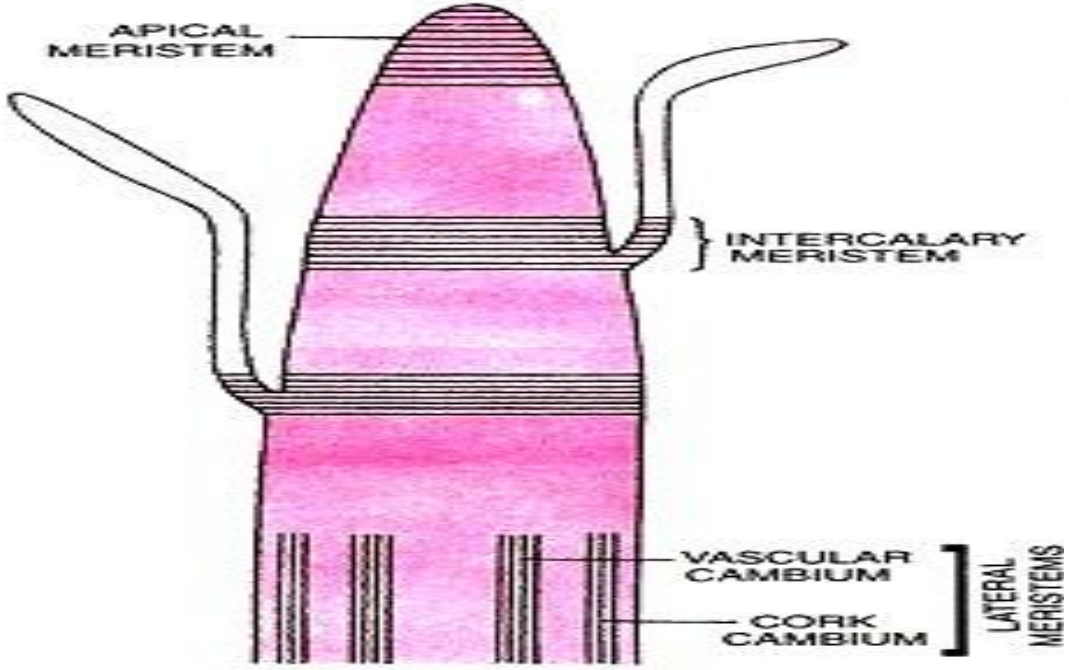
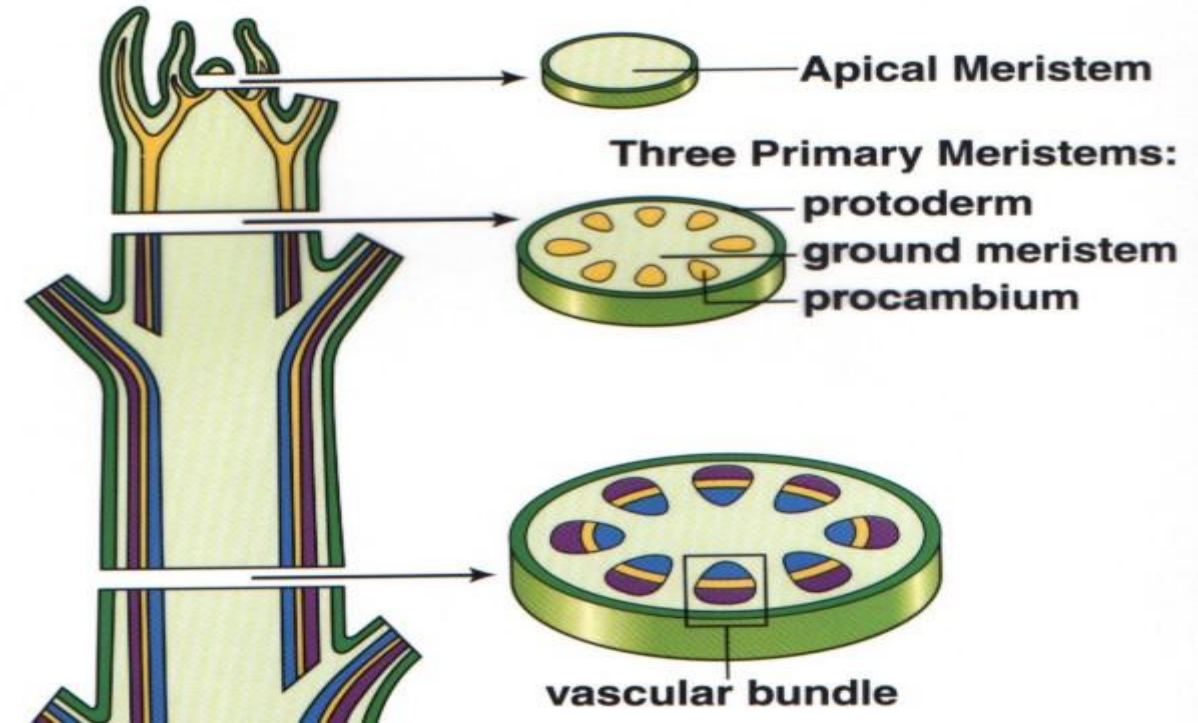
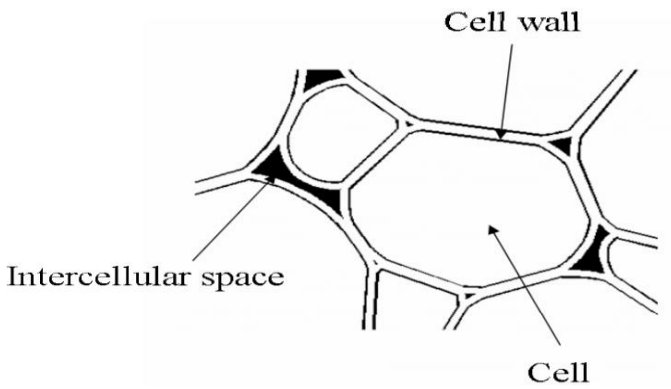


Fig. 6.1. Types of meristems.



SIMPLE (ground) TISSUES

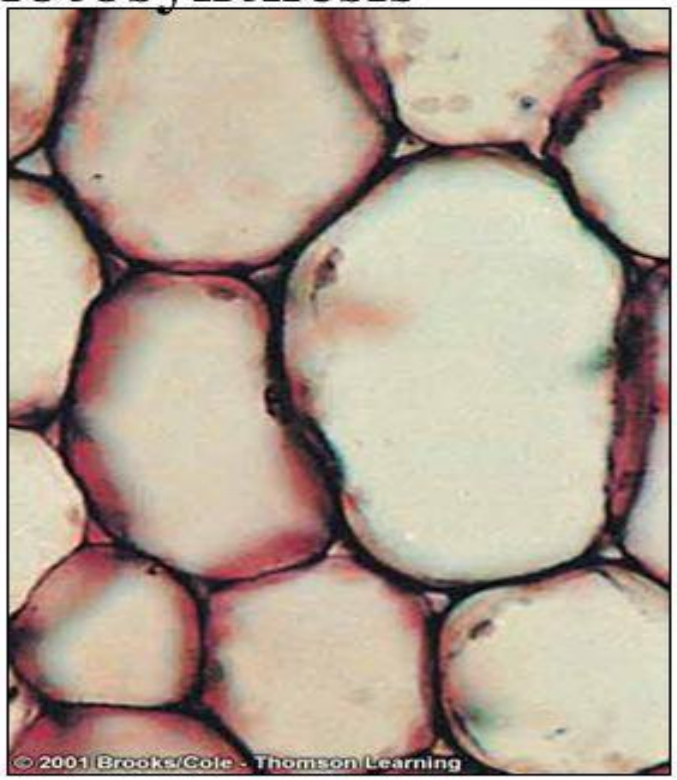


1. PARENCHYMA

- The cells of ParenChyma tissue act as **packaging** (like *bubble-wrap*) around the more sensitive structures in the plant.
- They store starch and water, so have large **vacuoles**.
- They have thin cell walls to allow water to move **through them easily**, as it carries things to (and from) its protected structures.
- They are round and have **large air-spaces** between them – so water can move **around** them as well.
- If they contain chlorophyll, call them **Chloren**Chyma.

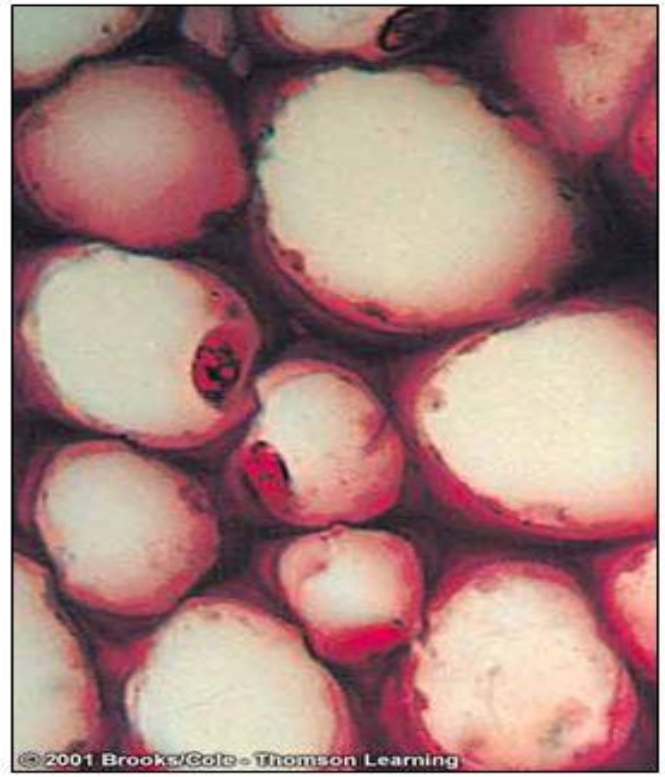
Plant Ground Tissues

- Thin cell wall
- Storage & photosynthesis



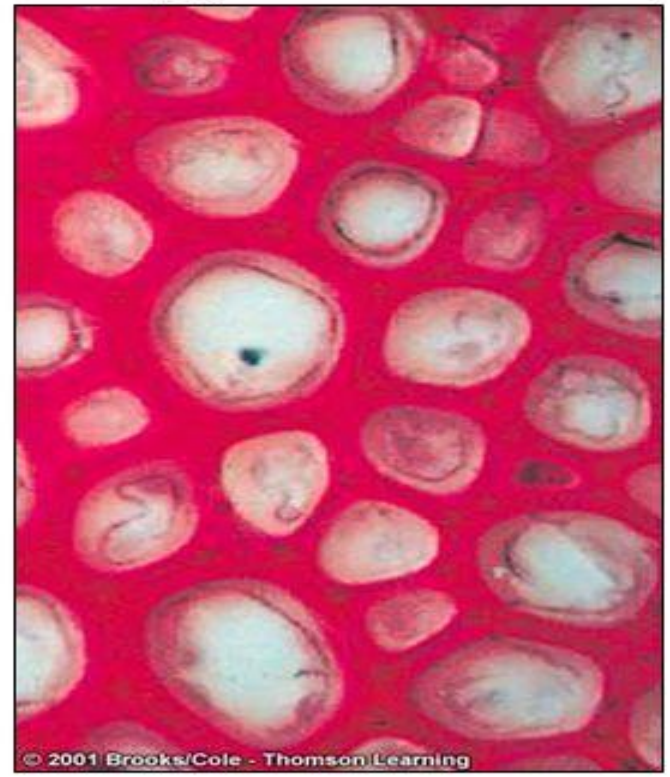
PARENCHYMA

- Uneven cell wall
- Flexible support



COLLENCHYMA

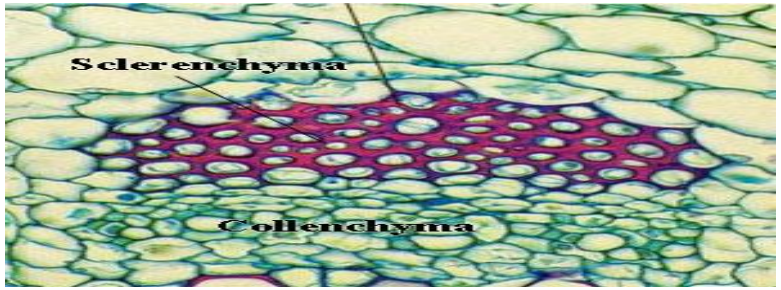
- Thick cell wall
- Strength and support



SCLERENCHYMA

2. COLLENCHYMA

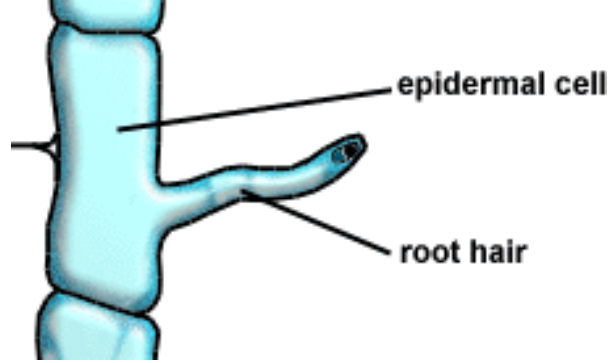
- The cells of CollenChyma tissues have the job of **supporting** structures (in young stems and leaves).
- Their **cell walls** are much thicker than ParenChyma.
- The cells are more **tightly packed**, and do not have air-spaces between them.



3. SCLERENCHYMA

- SclerenChyma cells are for **strong structural support**.
- Younger cells develop, with lignin in their cell walls for **added reinforcing** for mechanical support.
- When they have developed, the **inside** dies off. This leaves the strong **outer** cell-wall in place to do its job. They work as dead cell structures for maximum strength.

COMPLEX TISSUES



1. EPIDERMAL TISSUES

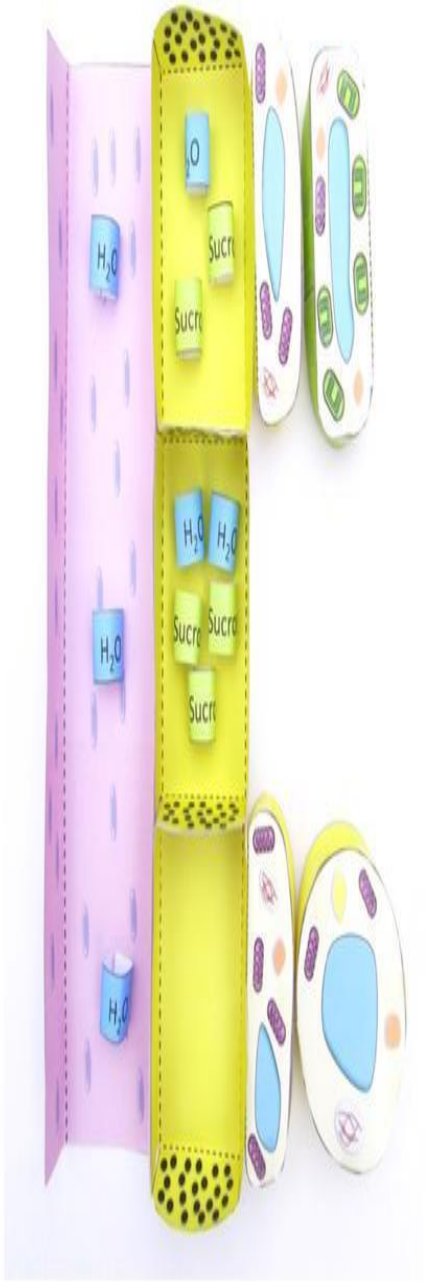
The Epidermis **covers** and **protects** the whole plant. The cells are in a **single layer**, and have **thin cell-walls**.

- In the **leaves and stems**, cells are tightly packed to keep the inside in, and the outside out. It gets added protection from a waxy cuticle, which lets sunlight in, and keeps water and germs out.
- The epidermis in leaves and stems has little holes called Stomata – Guard Cells control what gases go through them, and how much water vapour goes out.
- In the **roots**, the epidermis is designed with large vacuoles to suck water in. It has no cuticle, and many of the cells are shaped as long *root-hairs* to make wider contact with water.

2. CONDUCTING TISSUES

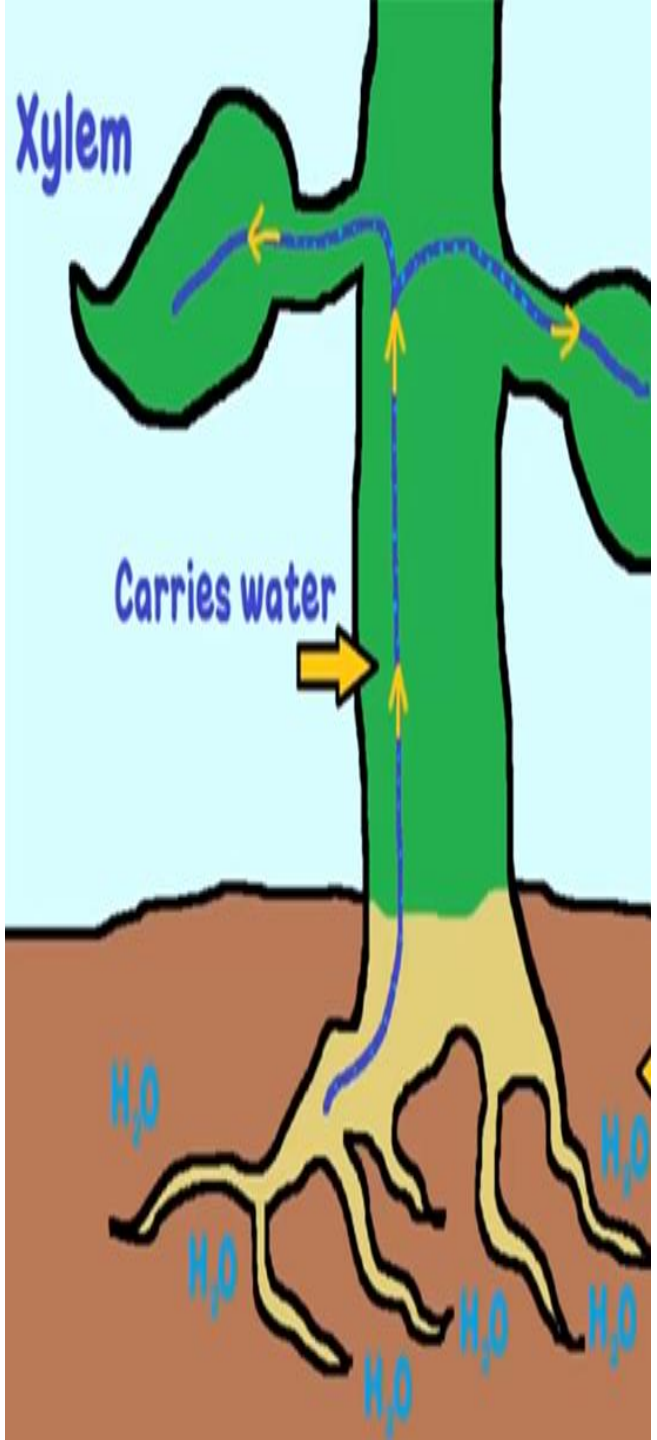
Phloem *tissue conducts liquid* ***food*** *from the leaves to the rest of the plant*.

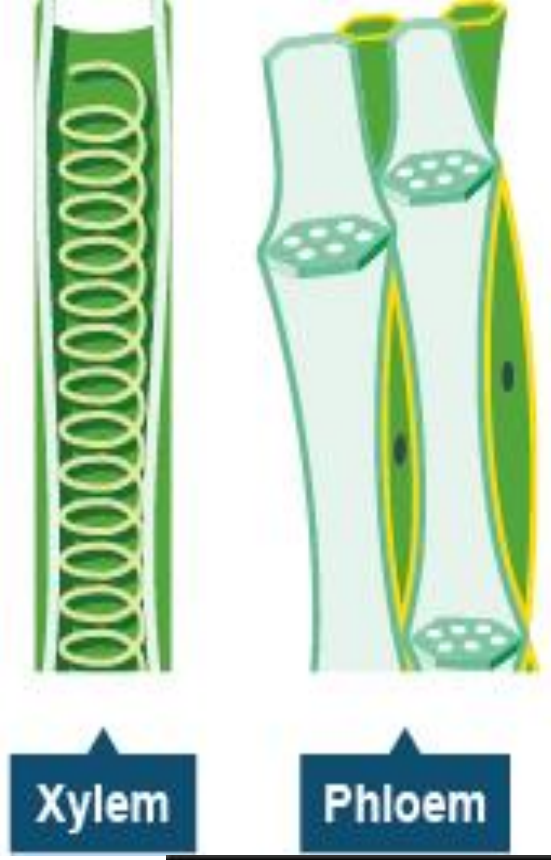
They are made of **two** cell-types that work together. The ***Companion Cell*** carries the Nucleus for full control of both cell-types. The ***Sieve Tubes*** are long and thin cells, and join together to form tubes along which the liquid food can move. Where they join, there are holes that allows the liquid food to be sucked through. These cells are filled with cytoplasm.

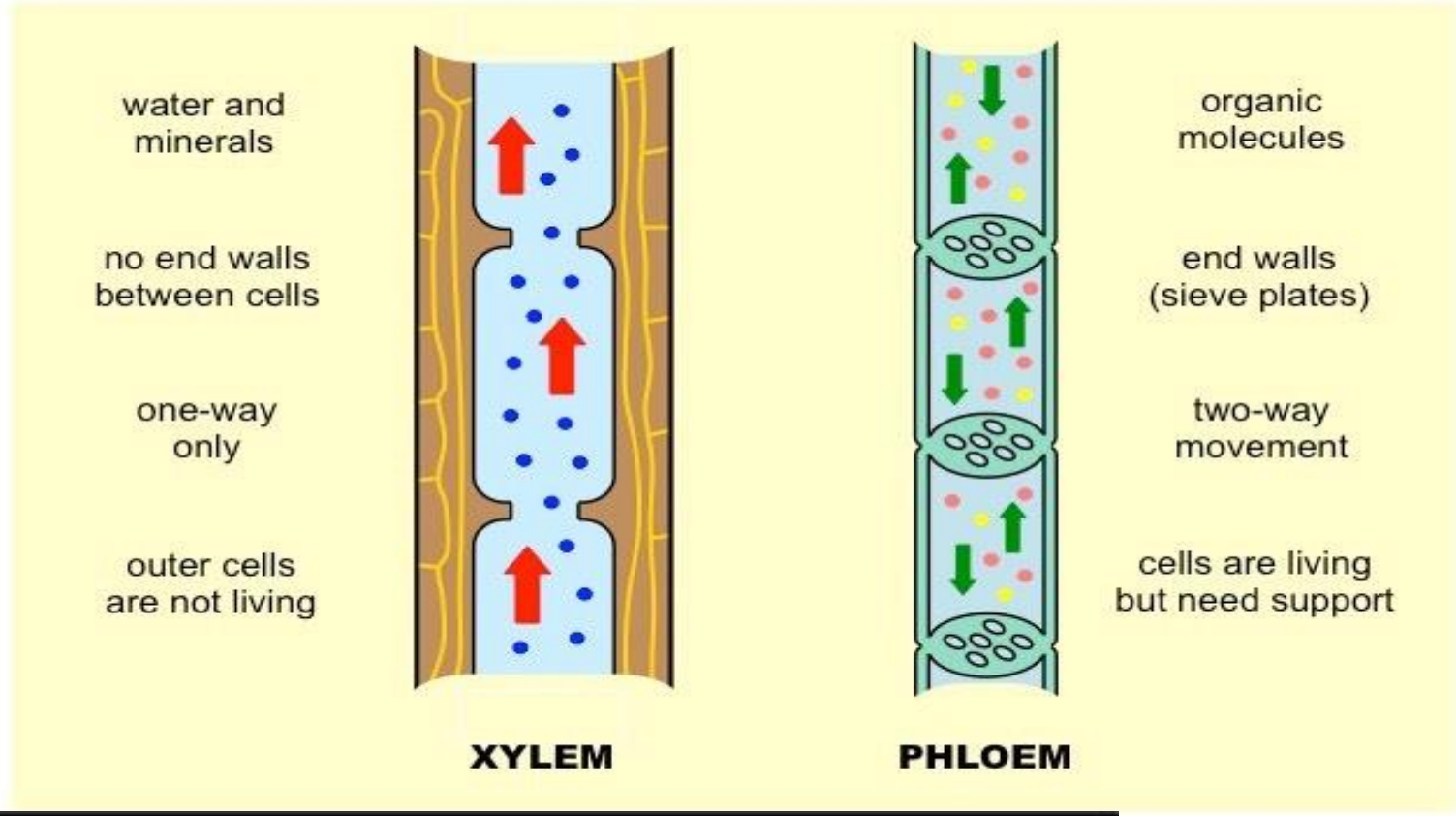


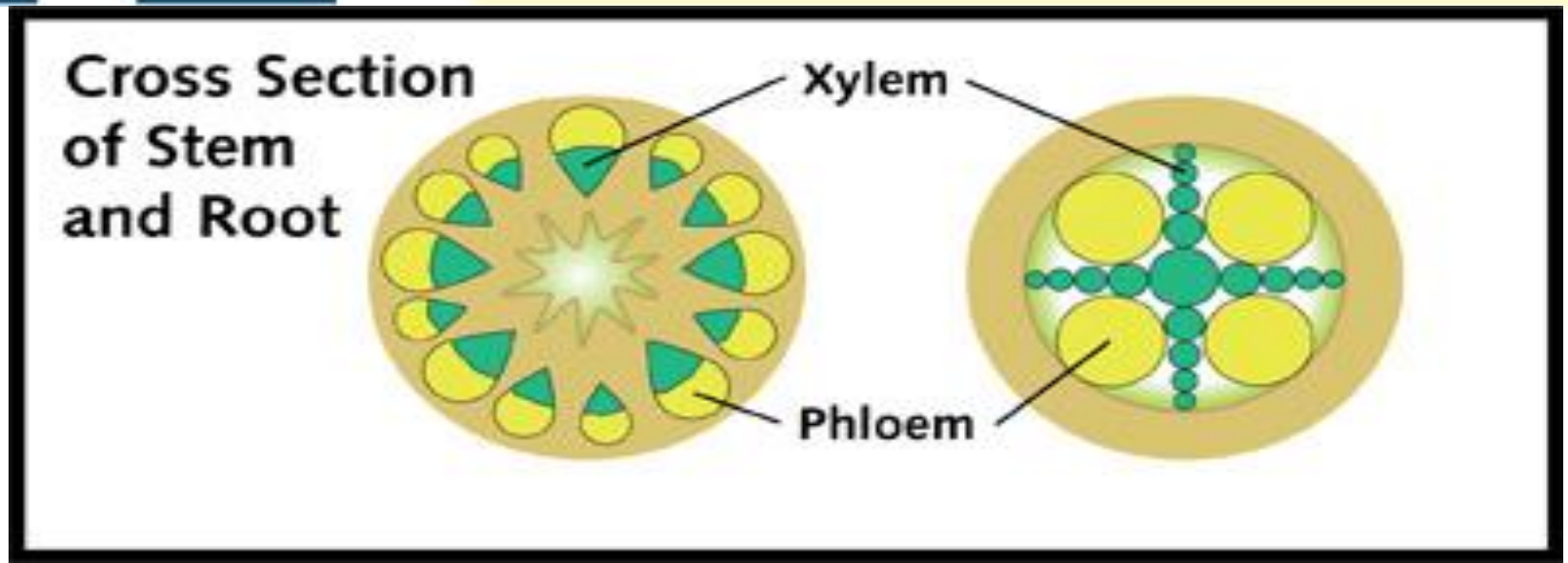
Xylem *tissue conducts* ***water*** *from the roots, through the stems, to the leaves.*

Young cells develop in a way that forms a long xylem straw from the root, through the stem, to the stomata in the leaf. Once the strong outside structure is formed (reinforced with lignin), the insides of all the cells **die**. The sun can now evaporate water from the stoma, and this sucks more water up from the soil through the straw. Thick tubes are made of xylem **vessels**, while thin tubes are made of xylem **tracheids**.




Xylem
Phloem


water and minerals
no end walls between cells
one-way only
outer cells are not living
XYLEM
organic molecules
end walls (sieve plates)
two-way movement
cells are living but need support
PHLOEM


Cross Section of Stem and Root
Xylem
Phloem