PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
LESSON NOTES

Subject: Biology **Year/Level:** 11

Week 10

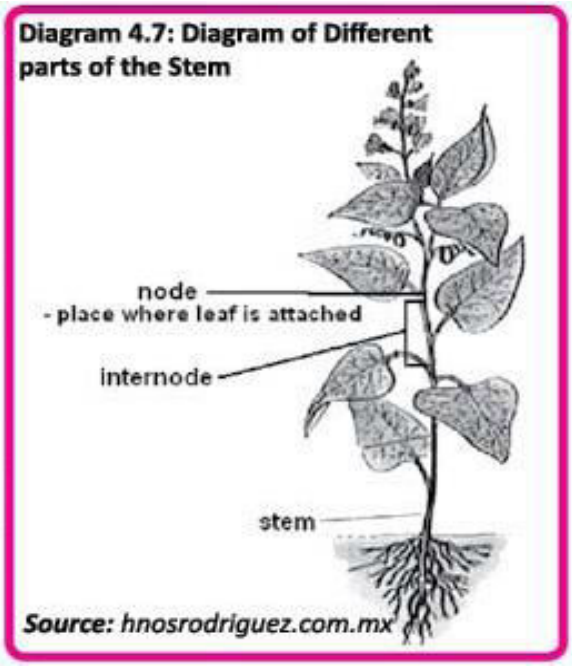
Strand	1 Structure and Life Processes
Sub Strand	1.5 Structure And Functions In Plants
Content Learning Outcome	Discuss stem structures, their functions and adaptations

Students, we already had a look at roots. Now, we will learn about stems.

2. Stems

Functions

- Transportation of water and food between roots and leaves
- Holds and spaces out leaves so that they can receive adequate amount of sunlight and air.
- Holds flowers above the ground and assists in pollination.
- Storage of food. Eg. Sugarcane
- Holds fruits for dispersal.



Stem Structure

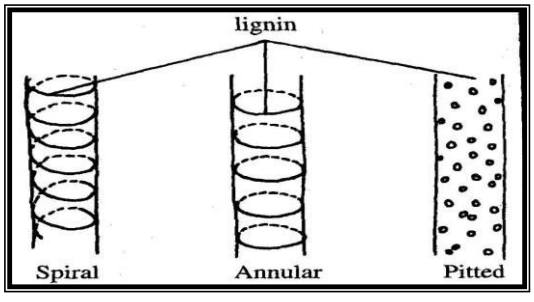
A) External structures

i) **Nodes** – is the region in the stems where leaves and branches come out.
ii) **Internodes** – is the length of stem between two nodes.
iii) **Buds** – growing leaves on a stem.
iv) **Leaf scars** – marks showing the space where the leaf was attached.
v) **Lenticels**- small openings with loosely packed cells that allow gas exchange.

B) Internal Structures

i) **Epidermis** – single layer of loosely fitting cells which prevent loss of water and hold internal cells in shape. Also helps in gas circulation.
ii) **Cortex and pith** – large, thin walled loosely packed cells with air spaces formed from packing tissues, spacing on the vascular bundles. They store food and make the stem rigid (hard).
iii) **Vascular Bundles**

a) **Xylem** – are composed of vessels and supporting cells. Are narrow tubes which carry water and minerals from the roots to the leaves. (3 types as shown on the right)
b) **Phloem** – carries food from leaves to all parts of the plant. It has sieve tubes, sieve plates and companion cells.



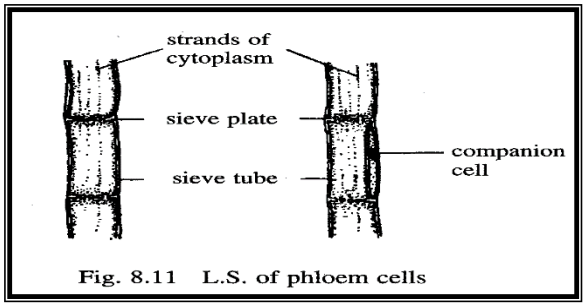


Fig. 8.11 L.S. of phloem cells

Conducting of Food and Water

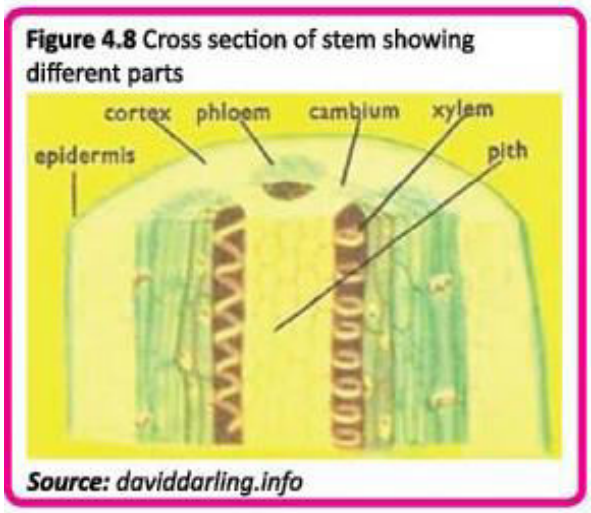


Figure 4.8 Cross section of stem showing different parts

Source: daviddarling.info

- In order to conduct food and water through the plant, **vascular bundles** run up and down the stems and branches.
- The vascular tissue that conducts water and minerals from the roots is known as **xylem** vessels which is lined with **lignin** that provides strength for transportation.
- **Phloem** vessels conduct/ transport food from leaves to the other parts of the plant. These form cylindrical cells with cross walls known as **sieve plates**. The phloem also has **companion cells** which provide:
    1. Energy (ATP) for active transport of food in the form of **sap**.
    2. Determines the direction of food flow – to roots for storage or other cells for energy. This process is called **translocation**.
- Vascular bundles consist of the xylem vessels on the inside and phloem vessels on the outside. The xylem and phloem are separated by **cambium** (in dicots) and **supportive tissue** (in monocots).
- Water lost from the leaves through **transpiration** is replaced by water from the xylem – **transpiration pull**. Other factors aiding in the movement of water through the xylem are:
  *__Turgor pressure__ – pressure in the xylem pushes the water forward.
  ***Transpiration stream** – water flows in a continuous flow from the root hairs to the roots to the xylem and finally veins of the leaves where they are lost through the stomata by the process of **transpiration**.

Activity

1. Name the structure that allows gas exchange in stems. _____
2. Define the term “translocation”.

   _____

   _____
3. What is sap and name the vessel that transports sap?

   _____

   _____
4. State the importance of lignin in xylem and companion cells in phloem.

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