

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

Subject: Biology

Year/Level: 11

Week 16

Strand	1 Structure and Life Processes
Sub Strand	1.5 Structure And Functions In Plants
Content	Discuss the gas exchange in leaves, define transpiration, factors affecting the rate of transpiration and the adaptations to control it.
Learning Outcome	

GAS EXCHANGE IN PLANTS

Gas Exchange in Leaves

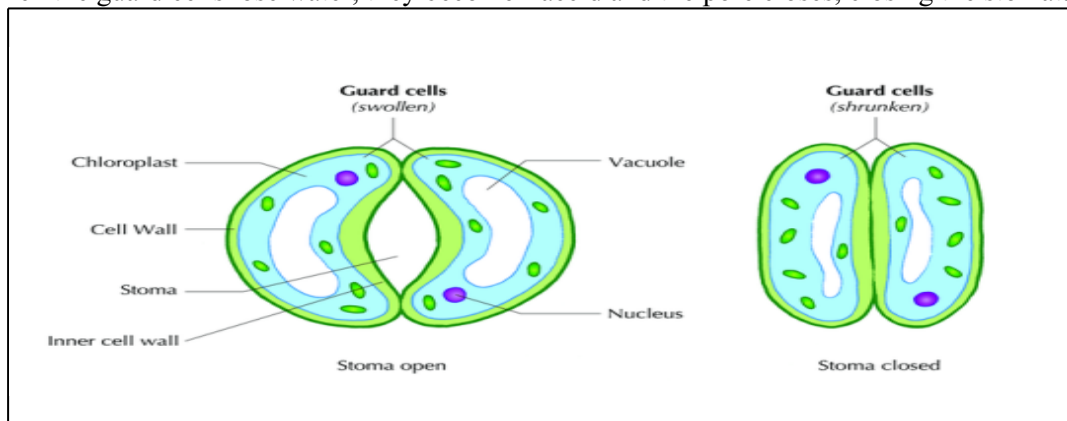
- Exchange of carbon dioxide and oxygen occurs through the tiny holes in the lower epidermis called **stomata**.
- Stomata are present on both sides of the leaf but it is more numerous on the lower surface to prevent excessive water loss.
- The opening and closing of the stomata is controlled by **guard cells**.
- When the guard cells gain water they become turgid.

Open Stoma

- The inner wall, which is thicker and less flexible, stretches less than the outer wall of the guard cells.
- This causes a pore (stoma) to appear between them.

Closed Stoma

- When the guard cells lose water, they become flaccid and the pore closes, closing the stomata.



Transpiration

- Is the process by which plants lose water from the leaves.

Importance of transpiration

1. Transpiration helps to cool the plant.
2. It enables more water to be drawn into the leaves by the process of transpirational stream/pull.
3. It draws mineral salts to the leaves.

Factors affecting transpiration rate

A) Environmental factors

- **Temperature** – as the temperature increases, the transpiration rate also increases i.e. water evaporates faster on hot days.
- **Light intensity** – as the light intensity increases, the transpiration rate also increases i.e. more water is lost on a bright day.

- **Wind movement** – increased air movement removes the damp air on the surface of leaves and replaces it with dry air.
- **Humidity** (moisture content in air) – increases humidity causes the atmosphere to become saturated with water vapor thus transpiration rate is decreases.

B) Internal factors

- **Stomata** – the closing of the stomata by the guard cells reduces the rate of transpiration.
- **Cuticle** – a cuticle reduces the transpiration rate.

Plants have adaptations to control the transpiration rate:

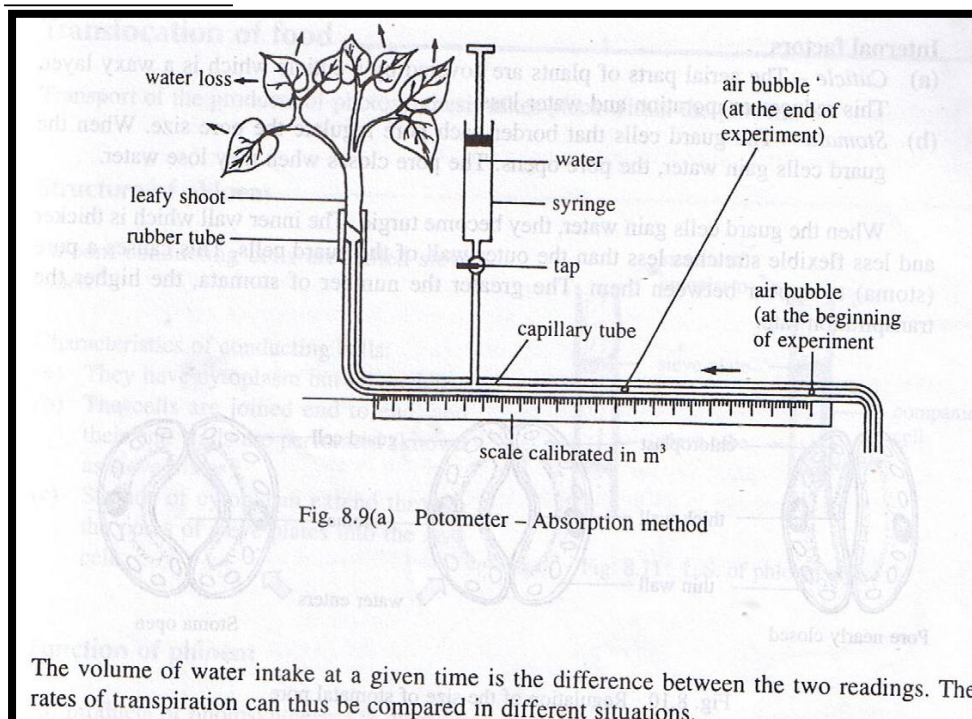
1. Some plants have needle shaped leaves to prevent water loss. E.g. pine trees.
2. Some plants close their stomata when it is very hot.
3. Stomata are more numerous on the lower surface of the leaves.
4. Some plants shed their leaves to prevent water loss.
5. Presence of thick cuticle also reduces transpiration.

Adaptations for living in dry places

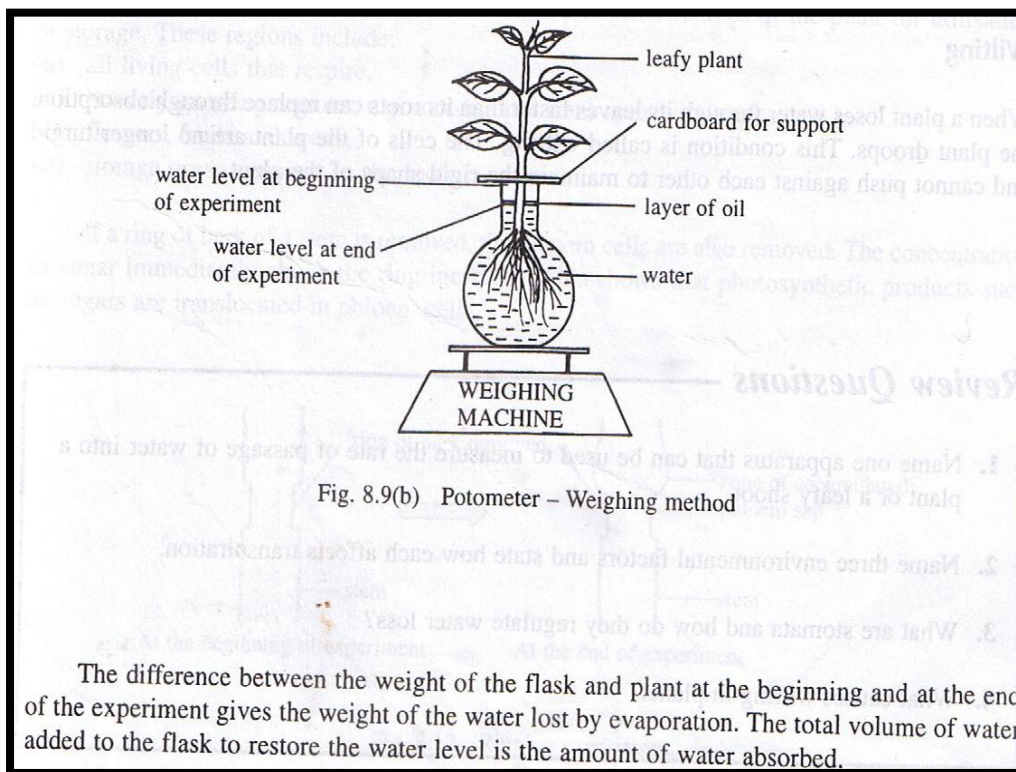
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|---|---|
| 1. Have very few stomata | 6. Shedding of leaves (in deciduous plants) |
| 2. Stomata sunken into pits in the epidermis. | 7. Shallow roots for rapid absorption of rainwater. |
| 3. Folded or rolled up leaves. | 8. Deep going roots |
| 4. Hairy epidermis | 9. Store water in swollen stem or leaf (succulent) |
| 5. Small leaves | |

*The rate of transpiration can be measured using a **Potometer**.*

Bubble Potometer



Weight Potometer



Activity

1. What is the function of the guard cells?

2. In your own words describe how the stomata opens and closes

3. Describe the dilemma that plants face in whether to open or close their leaf stomata.
