**Chapter 8 - Plant Physiology**

**All Lectures Uploaded on YouTube:**

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**MCQ’s**

1. C
2. D
3. B
4. C
5. A
6. D
7. C
8. A
9. B
10. D

**Short Answers**

1. Transpiration is called a necessary evil because even though it leads to water loss, it is crucial for processes like nutrient transport, cooling of plant, and maintaining the flow of water and mineral salts through the xylem
2. The translocating fluid or ‘sap’ consists of water, sugars/sucrose, amino acids, hormones and minerals
3. Autumn leaves are the fallen leaves from the tree, which contain large quantities of plant waste materials. They act as a natural fertiliser, enriching the soil with organic matter, improving soil texture and providing nutrients as they decompose
4. Higher temperatures increase the rate of transpiration by enhancing evaporation, while lower temperatures slow it down. With every 10 degree increase in temperature, rate of transpiration doubles.
5. Hydrophytes live in aquatic conditions hence, these are the adjustments they’ve made: thin cuticle (since water is abundant), Stomata on the upper surface for efficient gas exchange and large air spaces (aerenchyma) for buoyancy and oxygen storage.
6. At dawn and dusk, the plants are usually at a compensation point, neither absorbing nor releasing any gases in the environment.
7. (omit this question)
8. Definitions

* **Osmotic Adjustment**: Regulation of solute concentration within cells to maintain water balance.
* **Transpiration:** Loss of water vapor from plant surfaces, mainly through stomata.
* **Translocation:** Movement of organic nutrients (mainly sugars) through the phloem from source to sink.
* **Micronutrients:** Essential elements required by plants in small amounts (e.g., zinc, iron).
* **Excretophores:** Structures (or pores) that help in the excretion of waste in plants.
* **Vascular bundle:** A part of the transport system in plants, consisting of xylem and phloem.
* **Xylem:** Tissue responsible for the transport of water and minerals from roots to other plant parts.
* **Adhesion:** The attraction between water molecules and the walls of xylem vessels.
* **Cohesion:** The attraction between water molecules that enables continuous water flow.

1. Differences:
2. **Micronutrients and macronutrients:** Macronutrients are needed in large quantities by the plant for nutrition (e.g., nitrogen and magnesium). Whereas micronutrients are needed in trace quantities or very little amounts (e.g., zinc, copper)
3. **Hydrophytes and xerophytes:** Hydrophytes live in water- aquatic conditions; hence, it has a very thin cuticle with stomata on top. Xerophytes live in desert areas with little to no water availability and, hence, have thick cuticles.
4. **Monocot root and dicot root:** Monocot root has a ring of vascular bundles while dicot root has a cylindrical vascular bundle in a cross shape
5. **Transpiration and Translocation:** transpiration is the water loss through stomata while translocation is the movement of sugar (sucrose) in phloem from source to sink
6. **Translocation and ascent of sap:** translocation moves sugars in the phloem while ascent of sap is the upward movement of water in the xylem through transpiration pull
7. **Xylem and phloem:** Thexylem transports water and minerals in plants. The phloem, on the other hand, transports organic solutes and sugars.
8. **Pattern of gas exchange in leaves and roots:** gas exchange in leaves is mainly through stomata, while roots exchange gases through root hairs and intercellular spaces

**Extensive Questions:**

1. Nitrogen is a key component of amino acids, the building blocks of proteins, and is essential for plant growth. Magnesium is the central atom in chlorophyll molecules, making it vital for photosynthesis.
2. Roots consist of the epidermis, cortex, endodermis, pericycle and vascular bundles. Root hairs are the extensions of epidermal cells that increase the surface area for water and nutrient absorption. **(for detail refer to above notes)**
3. In roots, nutrient absorption is done through both passive and active transport. Passive absorption is done through osmosis and diffusion. Active absorption uses energy (ATP) to transport minerals against the concentration gradient through root cells.
4. Transpiration is the evaporation of water from plant leaves through stomata. Guard cells control stomatal opening and closing based on water availability, regulating transpiration.
5. Temperature*:* Higher temperatures increase evaporation and transpiration. Wind*:* Wind removes humid air around leaves, increasing transpiration. Humidity*:* High humidity reduces transpiration, while low humidity increases it.
6. The *pressure flow hypothesis* suggests that sugars are actively loaded into the phloem, increasing osmotic pressure. Water follows by osmosis, creating pressure that drives the flow of sap from the source (leaves) to the sink (roots, fruits). **(Write the steps of passive flow in detail.)**
7. Plants exchange gases (CO₂, O₂) through stomata in leaves and lenticels in stems. During photosynthesis, CO₂ is absorbed, and O₂ is released. In respiration, O₂ is absorbed, and CO₂ is released.
8. Plants adapt to different environments through structural, physiological, and behavioural changes. Xerophytes have thick cuticles, reduced leaves, and deep roots. Hydrophytes have air spaces and floating leaves with thin cuticle
9. Osmotic adjustment is the accumulation or release of solutes in plant cells to maintain water balance under stressful conditions (e.g., drought or salinity), helping plants survive adverse conditions.



