

**Complete the sentences:**

1. Water constantly being cycled through the atmosphere, ocean, and land. This process, known as the -----, is driven by -----.
2. Water dissolves greater amounts of a wider variety of substances than do other related solvents. This versatility as a solvent is due in part to ----- and -----.
3. The temperature of a substance is a measure of the average ----- of the particles.
4. Phloem translocation moves the products of photosynthesis from mature leaves ----- to areas of growth and storage; -----.
5. The potential of free pure water at atmospheric pressure and at a temperature of 25°C corresponds to ----- MPa.
6. Soil water content exerts a great influence on some physical and chemical properties of soil, such as the oxygen content, which interferes -----, ----- and -----.
7. Sandy soils have higher conductivity due to greater porosity, but they retain ----- water in relation to clay soils or soils rich in organic matter.
8. Root hairs increase -----.
9. Flowering is sometimes a function of day length. Pigments called ----- are involved in “measuring” day length. The ratio of different forms of this pigments change sets the -----.
10. Auxins responsible for plants bending towards light, this phenomenon known as; -----.
11. A survey of over 500 species representing approximately 100 dicotyledonous families confirms that ----- is almost universal as the dominant sugar in the phloem stream.
12. Chlorophyll molecule composed of a head of ----- with central ----- atom and a ----- tail.
13. ----- are linear molecules with multiple conjugated double bonds. Absorption bands in the ----- nm region give them orange color.
14. ATP and NADPH production of light reaction will be used in the ----- to drive synthesis of glucose.
15. ----- happens in the stroma in which carbon atoms from CO<sub>2</sub> are fixed and used to build -----.
16. The Calvin cycle reactions can be divided into three main stages; -----, ----- and -----.
17. Some plants that are adapted to dry environments, such as cacti and pineapples, use the ----- pathway for photosynthesis.
18. In C<sub>4</sub> plants light-dependent reactions occurring in the ----- cells and the Calvin cycle occurring in special cells around the leaf veins called ----- cells.
19. The water status in plants is measured by -----, a measure of free energy available to do work. The simplified form is; -----.
20. The water flow of a plant is primarily controlled by the -----.
21. Gibberellins controls; -----, ----- and -----.
22. Ethylene is a colorless gas produced in; -----, ----- and -----.
23. The majority (90%) of the volume of water absorbed by plants lost by ----- process.
24. There are two types of respirations: ----- is one in which molecular oxygen is used for the complete oxidation of glucose to yield -----, ----- and ----- molecules. While ----- is one in which glucose is partially oxidized without using oxygen to yield ----- and ----- molecules
25. Vascular diseases caused by pathogens induce water-stress in host by reducing the hydraulic conductivity of the xylem and formation of -----.

26. ----- is the phenomenon in plants where a main shoot dominates and inhibits the outgrowth of other shoots. But ----- can cause a relatively unbranched plant to become bushy, drastically changing its morphology.
27. In ----- materials diffuse across the plasma membrane with the help of membrane proteins and due to a concentration gradient without expending cellular energy.
28. Opening and closing of stomata is brought about by -----.
29. ----- is the particles movement against a concentration gradient and relies on energy from the breakdown of ATP
30. ----- means that the two substances are moving in the same direction through the membrane.
31. ----- is the term applied when transport is out of the cell.
32. The contact zone between the root surface and the soil is called the -----
33. Potential of free pure water at atmospheric pressure and temperature of 25°C corresponds to ----- MPa.
34. ----- is the maximum water content that a given soil can retain by capillarity, after saturation and gravity drainage.
35. With regard to water absorption control in the roots, plants also have membrane water transporter proteins (water-channel proteins), called -----.
36. The ----- is the most widely-accepted model for movement of water in vascular plants.
37. The blocking of a xylem vessel or tracheid by an air bubble or cavity is called as -----.
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**Put the given words in their suitable places: Dry regions, apoplast path way, water potential ( $\Psi$ ), phloem, field capacity, sandy soils, mycorrhizae, rhizosphere, embolism, apical dominance, Transpiration, specific heat, Osmosis, Tree Physiology, Epigeal germination, nitrates, capillary action, too deep, water logged, symporter, active transport.**

1. ----- is the **contact zone** between the **root** surface and the **soil**, only a few millimeters thick.
2. ----- is the phenomenon in plants where a main shoot dominates and inhibits the outgrowth of other shoots.
3. ----- are **beneficial fungi** to trees. They are important because they form a symbiotic relationship.
4. The water content in the soil, plants and atmosphere is usually described as -----.
5. ----- is the maximum water content that a given soil can retain by capillarity, after saturation and gravity drainage.
6. ----- have **higher conductivity** due to **greater porosity**, but they also **retain less water** in relation to clay soils or soils rich in organic matter.
7. The blocking of a xylem vessel or tracheid by an air bubble or cavity is called as -----.
8. In ----- the plants invest more in their roots; the roots can represent upper to 90% of a plant biomass in some species of a desert climate.
9. -----, where the water moves through the intercellular spaces and does not pass through any membranes.
10. **Inner** bark; is made up of **living cells**. The scientific name for the inner layer of bark is -----
11. ----- is the study of how trees grow and develop in terms of genetics, biochemistry, cells, tissues, and organ functions.
12. If a seed is buried ----- within the soil or the soil is -----, the seed can be oxygen starved.
13. ----- is a type of germination whereby the seed leaves or the cotyledons are brought on to the surface or above the soil along with the shoot during germination.

14. Chemicals also, such as ----- in the soil, can substitute for light in stimulating seeds to germinate so that some light requiring seeds will still germinate if covered with fertile soil.
15. In Symport transport the protein involved is called a -----, because the two substances are moving in the same direction through the membrane.
16. ----- is the movement of water through a selectively permeable membrane from a region of higher water concentration to a region of lower water concentration.
17. -----, the evaporative loss of water from leaves of natural and cultivated vegetation, returns to the atmosphere about 60 % of the incident precipitation over land surfaces.
18. In -----; water is attracted to some other material and then through cohesion, other water molecules move too as a result of the original adhesion.
19. The ----- is “the amount of heat per unit mass required to raise the temperature by one degree Celsius.
20. ----- is the method that moves particles from an area of low concentration to an area of high concentration or against a concentration gradient.

**Answer the questions as required:**

1. The surface tension causes drops of liquid to be round.
2. Water has a high heat capacity.
3. Water column is raised through xylem opposite the gravity.
4. Write the significance of osmosis to plant.
5. Why do plants transpire?
6. Explain the types of active transport.
7. Write the routes by which the water travels from root hair cells to the xylem of the root.
8. How do the xerophyte plants well adapted to live where conditions are very dry.
9. Why sucrose is the preferred vehicle for long-distance translocation of photo assimilates as compared to glucose and fructose?
10. Write the types of photosystems with high lighting the difference between its types.
11. What are the main differences between C<sub>3</sub> and C<sub>4</sub> plant?
12. Explain in brief the pressure-flow model mechanism for phloem transport.
13. Illustrate the photosynthesis reactions in C<sub>4</sub> plants.
14. Illustrate the Calvin cycle steps in C<sub>3</sub> plants.
15. What broadly, the Kinetic Theory of Matter says?
16. Write the functions of Auxine.
17. Explain this relation; “Cytokinins vs. Auxins”.
18. What are the important roles of Abscisic acid in plant?
19. Write radial water transport pathways in plants.
20. Explain the theory of water flow from the roots to the shoot of the plant?
21. What is the most widely used description of the water status of **tree species** which had been introduced by Slatyer and Taylor. Discuss and explain its contents.
22. what mechanism or theory explain the upward movement of cell sap? Explain it.
23. *What are the components of light reaction? Where is it happening? And what are the steps in the reaction to generate 1ATP and 1NADPH?*
24. *Discuss the general mechanism to explain the upward movement of water by the cohesion-tension hypothesis.*
25. Write the repair mechanisms that plants adopt to avoid long term damage caused by embolism.

26. Write the three ways of water intake in the roots (radial water transport), which can follow into the root tissue in relation to the route of the epidermis to the endoderm of the root.
27. Throughout the water route between the leaf and the air there are two components that can exert resistance to the transpiration process, discuss them.

**Give the reason for the following:**

1. Water has a high specific heat capacity.
2. Aquaporins are being higher during the photoperiod.
3. Water is a polar molecule?
4. In humid regions, as tropical rain forest the root: shoot ratio  $< 0.15$ , while in dry regions roots can represent upper to 90% of a plant biomass.
5. Gravitational potential ( $\Psi_g$ ) ignored in most cases but it is very important in studies of the water potential of tree species.
6. Why pinching lead to break the apical dominance?
7. Using B-Nine in greenhouse problems; stretching, less compact plants, weaker stems?
8. Using Cytokinins in tissue culture techniques?
9. Explain the three important terms associated with the water content in soil with regard to their physiological aspects.
10. Why Ethylene has an important role in fruit ripening?
11. Write the positive effects of transpiration in the plant. And determine the major factors determining the water potential of a plant.
12. The cell membrane is selectively permeable?
13. gravitational potential ( $\Psi_g$ ) can't be ignored for trees?
14. The range of available water is relatively high in sandy soil as compared to silty soils, somewhat less in clay?
15. In humid regions, as tropical rain forest, plants usually do not require very extensive root systems (i.e. root: shoot ratio  $< 0.15$ ) but in dry regions, the plants invest more in their roots?
16. Freezing cause embolism in sugar maple (*Acer saccharum*) and grapevine (*Vitis* spp.)?
17. Lower concentration of IAA cause lateral buds to remain dormant and a higher concentration cause the apical bud to grow?

Match each term with its correct description:

- A) Radicle
- B) Plumule
- C) Imbibition
- D) Epigeal germination
- E) Physical dormancy

Descriptions:

1. Uptake of water by seeds, causing swelling
2. First root that emerges from the seed coat
3. Type of germination where cotyledons rise above the soil
4. Dormancy caused by a hard seed coat
5. Part of the embryo that develops into the shoot

**Multiple-Choice Questions:**

1. What is the primary role of water in photosynthesis?
  - A) To dissolve nutrients
  - B) To create oxygen
  - C) To transport energy to the plant
  - D) To provide hydrogen and electrons to produce glucose
2. Which property of water allows it to move against gravity in plants?
  - A) Surface tension

**Question bank for TREES PHYSIOLOGY course:**

*By Assist Prof. Dr. Sirwa A. Qadir*

- B) Cohesion
  - C) Adhesion
  - D) Capillary action
3. What is the significance of water's high specific heat for plant life?
- A) It helps regulate the plant's temperature
  - B) It helps the plant to absorb more nutrients
  - C) It increases the rate of transpiration
  - D) It helps the plant grow faster
4. Which of the following is an example of physical dormancy in seeds?
- A) Seed coating that prevents water absorption
  - B) Presence of hormones inhibiting germination
  - C) The need for cold temperatures to break dormancy
  - D) Seeds only germinating when exposed to light

**Short Answer Questions:**

1. Explain how water plays a role in seed germination.
2. What is the difference between cohesion and adhesion in the context of water's behavior?
3. How does the kinetic theory of matter explain why water changes phase from solid to liquid to gas?
4. Why does water have a high specific heat, and why is this important for plant life?
5. How does the polar nature of water affect its ability to dissolve substances?

**True or False**

1. Mycorrhizae are only beneficial in humid regions.
2. Aquaporins help regulate water absorption in roots.
3. Plants in arid regions typically have a lower root: shoot ratio than tropical plants.
4. Field capacity is the amount of water soil retains after saturation and gravity drainage.
5. Transpiration accounts for 90% of the water absorbed by plants.