

1. What are trace elements?

Ans. The elements required by the plants in very small amounts are called trace elements, e.g., molybdenum.

2. What are chlorophylls?

Ans. These are the magnesium-containing green pigments of the chloroplasts of plants. Chlorophylls trap light energy for photosynthesis.

3. What are the formulae of chlorophyll 'a' and chlorophyll 'b'?

Ans. Chlorophyll 'a' — $C_{55}H_{72}O_5N_4Mg$

Chlorophyll 'b' — $C_{35}H_{70}O_6N_4Mg$

4. What are grana?

Ans. Grana are the stacks of the flat vesicles or thylakoids present in the chloroplast. Light reactions of photosynthesis takes place in the grana.

5. What is chloroplast?

Ans. Chloroplast is a green plastid which contains chlorophyll. Chloroplasts are the actual site for photosynthesis process. It remains surrounded by a double-membrane envelope which encloses grana and stroma.

6. What do you mean by active transport of substances?

Ans. It is the movement of substances across membranes, using energy.

7. What do you mean by turgor?

Ans. Turgor is the tension on a cell wall because of the pressure of water inside the cell.

8. Explain the meaning of turgid.

Ans. Turgid is the state of a cell under which it can absorb no more water by osmosis.

9. What do you understand by semipermeable membrane?

Ans. A membrane, which allows some substances to pass through, but not the others, is called semipermeable membrane.

10. Explain the term osmotic pressure.

Ans. It is a pressure required to prevent the osmotic movement of pure water into a solution across a semipermeable membrane.

11. Explain the phenomenon of osmosis.

Ans. The process of the movement of water across the semipermeable membrane from a hypotonic solution to a hypertonic solution is called osmosis.

12. Differentiate between the terms hypotonic and hypertonic.

Ans. Hypotonic means less concentrated whereas hypertonic means more concentrated.

13. How will you define diffusion?

Ans. The natural movement of molecules of a solute from regions of higher concentration to the regions of lower concentration is called diffusion.

14. Answer and Explain : Phytochrome is involved in

- (a) phototropism
- (b) photorespiration
- (c) photoperiodism
- (d) geotropism.

14. (c): Phytochrome is a photoreceptor molecule which mediates several developmental and morphogenetic responses of plants to light. This is called photoperiodism. Borthwick, Hendicks and Parker in 1952, discovered phytochrome, which is a pigment received light existed in two inter convertible forms active form and inactive form.

15. Answer and Explain:

A bottle filled with previously moistened mustard seeds and water was screw capped tightly and kept in a corner. It blew up suddenly after about half an hour. The phenomenon involved is

(a) diffusion

(b) imbibition

(c) osmosis

15 (b): A bottle filled with previously moistened mustard seeds and water was screw capped tightly and kept in a corner. It blows up suddenly after about half an hour due to phenomenon of imbibition. The absorption of water by the solid particles of an adsorbent causing it to enormously increase in volume without forming a solution is called imbibition.

16. Answer and Explanation:

The principal pathway of water translocation in angiosperms is

(a) sieve cells

(b) sieve tube elements

(c) xylem vessel system

(d) xylem and phloem.

16. (c): The principal pathway of water translocation in angiosperms is xylem vessel system. The sap (i.e., water with

dissolved minerals) is absorbed mainly by roots and is moved upward to all the parts of plants via stem. It occurs mainly through xylem.

17. Passive absorption of minerals depend on

- (a) temperature
- (b) temperature and metabolic inhibitor
- (c) metabolic inhibitor
- (d) humidity.

Answer and Explain:

17 . (a): Rate of salt absorption increases when temperature increases but to a certain limit as salt absorption is inhibited at higher temperature because certain enzymes are not active at higher temperature and carriers are not synthesised. These carriers are required for active transport of salts from outer space in inner space. Rate of diffusion of ions and molecules increases at enhanced temperature due to their increased kinetic activity. Thus passive salt absorption will increase.

18. Answer and Explanation:

Which one of the following elements is almost non-essential for plants?

- (a) Zn
- (b) Na
- (c) Ca
- (d) Mo.

18. (b): The 16 elements necessary for plants called essential elements, are as : C, H, O, N, P, S, K, Mg, Ca, Fe, Cu, B, Zn, Mn, Mo and Cl.

Zn is essential for the synthesis of tryptophan amino acid. Ca is the part of middle lamella, it stabilizes the structure of chromosomes.

Mo is responsible for nodulation in legumes. It is a part of nitrate reductase enzyme which helps in nitrogen fixation.

Na is a non-essential element. It seems to be involved in membrane permeability but its essentiality has not been proved.

19. Answer and Explanation: When water enters in roots due to diffusion, is termed as

- (a) osmosis
- (b) passive absorption
- (c) endocytosis
- (d) active absorption.

19. (b): Water is absorbed from soil by root system and mainly by root tips. There are two independent mechanisms of water absorption in plants active water absorption and passive water absorption. In active water absorption water is absorbed by the activity of the root itself. In passive water absorption transpiration pull is responsible for absorption of water.

According to this theory loss of water from mesophyll cells of leaves in transpiration decreases their . the absorb water from adjacent xylem vessels of leaves. This xylem of the leaves is in continuation with xylem of stem and roots and hence this pull is transmitted downwards. The pull or tension is removed only when water is absorbed through root hair and this is passive water absorption. Thus transpiration pull is responsible for passive water absorption.

**20. Answer and Explanation:
Phytochrome becomes active in**

- (a) red light
- (b) green light –
- (c) blue light
- (d) none of these.

20. (d): Phytochrome is a bright blue or bluish green- pigment which was first of all isolated from plasma membrane of alga Mougeotias. Phytochrome has a light absorbing or light detecting portion (the chromophore) attached to small protein of about 1,24,000 daltons. Phytochrome occurs in 2 forms, i.e., P_R and P_{FR} (i.e., red light and far red light absorbing forms) and these 2 forms are interconvertible.

21. Answer and Explanation

The response of different organisms to the environmental rhythms of light and darkness is called

(a) vernalization

(b) photoperiodism

(c) phototaxis

(d) phototropism.

21. (b): Photoperiodism is **the response of plants to relative length of light and darkness.** Phototaxis is plant movement where the stimulus is light. Phototropism is tropism in which stimulus is light. Vernalization is application of cold treatment to plants to affect flowering. It is a process in which a plant responds to the relative durative duration of daily light and dark periods. Low temperature, 0°C to 10°C or 18°C – 22°C (according to species) treatment of certain species for a specified period for the induction of ability to promote flowering is called vernalisation. It is a tropic movement, which is induced by light, when supplied unidirectionally. The plants, bending towards the source of light are called positively phototropic. Stems in general, are positively phototropic. Bending away from the source of light is called negative phototropism. Some roots show this response as in sunflower.

22. Answer and Explanation:

Which plant is LDP?

(a) tobacco

(b) Glycine max

(c) *Mirabilis jalapa*

(d) spinach.

22. (b): Long day plants (LDP) or Long day flowering plants are plants which flower when they are exposed to longer photoperiod that is, more than critical day length. Examples are spring barley, *Beta vulgaris*, *Hyoscyamus vulgare*, *Spinacea oleracea* etc. They are also regarded as short night plants

23. Answer and Explanation:

Roots of which plant contains a red pigment which have affinity for oxygen

(a) carrot

(b) soyabean

(c) mustard

(d) radish.

23. (b): Leg haemoglobin is a red respiratory pigment found in the root nodules of leguminous plant if *Rhizobium* is present. Soyabean is a legume plant so it contains leghaemoglobin.

24. Answer and Explanation:

Which pigment absorbs the red and far-red light?

(a) cytochrome

(b) phytochrome

(c) carotenoids

(d) chlorophyll.

24. (b): Phytochrome has a light absorbing or light detecting portion (the chromophore) attached to small protein of about 1,24,000 daltons. Phytochrome occurs in 2 forms, i.e., P_K and P_{KR} (i.e., red light and far red light absorbing forms) and these 2

forms are interconvertible. Cytochromes are electron transferring proteins.

They contain iron porphyrin or copper porphyrin as prosthetic groups. Chlorophyll is the fundamental green pigment of photosynthesis. It is localized on the chloroplasts. Carotenoids are lipid compounds and they are yellow, orange, purple etc. in colour. These are found in higher plants red algae, green algae, fungi and photosynthetic bacteria.

25. Answer and Explanation:

Boron in green plants assists in

- (a) activation of enzymes
- (b) acting as enzyme co-factor
- (c) photosynthesis
- (d) sugar transport

25. (d): Boron occurs in the soil as a part of silicates, boric acid, calcium borate and magnesium borate. It is available to the plants as boric acid and borates of calcium and magnesium. It plays a role in carbohydrate metabolism and translocation of sugar is facilitated through the cell membrane through the agency of borate ion as it forms complexes with the carbohydrates.

26. Answer and Explanation :

Which element is located at the centre of the porphyrin ring in chlorophyll?

- (a) calcium
- (b) magnesium
- (c) potassium
- (d) manganese:

26. (b): Chlorophyll is the green pigment present in plants and some photosynthetic bacteria.

The empirical formula of chlorophyll-a molecule is $C_{55}H_{72}O_5N_4Mg$. It consists of a porphyrin head and a phytol tail. Porphyrin is a cyclic tetrapyrrole structure, having a magnesium atom in the centre. Tail is consisted of phytol alcohol and it is attached with one of the pyrrole rings. The chlorophyll-I has empirical formula of $C_{55}H_{70}O_6N_4Mg$. Its molecular structure is comparable with chlorophyll-a.

27. What is a photoperiod?

A photoperiod is the daily time period of light exposure of a living organism. The photoperiod may vary according to the time of the year.

28. What is photoperiodism?

Photoperiodism is the biological response of certain living organisms to their daily amount of light exposure (photoperiod).

29. What plant organs are responsible for the perception of variations in light? What pigment is responsible for this perception?

Leaves are mainly responsible for the perception of light intensity in plants. The pigment that is able to perceive light variations, and which controls photoperiodism, is called phytochrome.

30. How does photoperiodism affect the flowering of some plants?

Flowering is a typical and easy to observe example of photoperiodism. Most flowering plants flower only during specific periods of the year or when placed under certain conditions of daily illumination. This occurs because their blossoming depends on the duration of the photoperiod, which in turn varies with the season of the year. Flowering is also affected by exposure to certain temperatures.

31. What is the critical photoperiod? How can the critical photoperiod of flowering be experimentally determined?

The critical photoperiod is the limit of the duration of the photoperiod after which some biological response occurs. This

limit can be a maximum or a minimum, depending on the characteristics of the biological response and to the studied plant.

To determine the critical photoperiod of flowering, 24 groups of plants of the same species can be used and the following experiment can be carried out: Each group is subject to a different photoperiod: the first group receives 1 hour of daily exposure to light; the second 2 hours; the third 3 hours; and so on, until the last group is exposed to 24 hours. We can observe that beyond a specific duration of light exposure, plants present or do not present flowering, and the remainder submitted to a shorter photoperiod present the opposite behavior. The duration of the light exposure that separates these two groups is the critical photoperiod.

32. How can plants be classified according to their photoperiodism-based flowering?

According to their photoperiodism-based flowering, plants can be classified as: long-day plants, which depend on longer photoperiods than the critical photoperiod to flower; as short-day plants, which depend on shorter photoperiods than the critical photoperiod to flower; and as indifferent plants, whose flowering does not depend on the photoperiod.

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