

Basic Physiological function in plants

1. Water potential is equal to

(a) $T_s + O.P.$

(b) $= T.P.$

(c) $x_l'p + Y,$

Answer and Explanation:

1. (d): Water potential is the difference in the free energy or chemical potential per unit molal volume of water in a system and that of pure water at the same temperature and pressure.

2. Transpiration is least in

(a) good soil moisture

(b) high wind velocity

(c) dry environment

(d) high atmospheric humidity.

Answer and Explanation:

2. (d): Transpiration is least in high atmospheric humidity. The rate of transpiration is directly proportional to the saturation deficit. In other words, transpiration rate depends upon the gradient of vapour pressure. Hence, at high atmospheric humidity transpiration rate is low.

3. Phenyl mercuric acetate (PMA) results in

(a) reduced photosynthesis

(b) reduced transpiration

(c) reduced respiration

(d) killing of plants.

Answer and Explanation:

3. (b): Phenyl mercuric acetate (PMA) results in reduced transpiration. PMA is an antitranspirant. These are some chemicals whose limited application on the leaf surface reduce or checks transpiration. A good antitranspirant increases leaf resistance but does not affect the mesophyll resistance.

4. Stomata open and close due to

(a) circadian rhythm

(b) genetic clock

(c) pressure of gases inside the leaves

(d) turgor pressure of guard cells.

Answer and Explanation:

4. (d): The pressure that develops in a cell due to osmotic diffusion of water inside it, is called turgor pressure. Stomata open and close due to turgor pressure of guard cells. When turgid, they swell and bend outward. As a result, the stomatal aperture opens. When they are flaccid, the tension from the wall is released and the stomatal aperture closes.

5. Movement of leaves of sensitive plant, *Mimosa pudica* are due to

(a) thermonasty

(b) seismonasty

(c) hydrotropism

(d) chemonasty.

Answer:

(b) seismonasty

6. Phytochrome is involved in

(a) phototropism

(b) photorespiration

(c) photoperiodism

(d) geotropism.

Answer and Explanation:

6. (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.

7. Gibberellins promote

(a) seed germination

(b) seed dormancy

(c) leaf fall

(d) root elongation

Answer and Explanation:

7. (a): Gibberellins promotes seed germination. Gibberellins are weakly acidic growth hormones having ring structure and which causes cell elongation of intact plants in general and increased internodal length of genetically dwarfed plants.

Giberellins are synthesized in the apical shoot buds, root tips and developing seeds. During seed germination, especially of cereals giberelin stimulates the production of some messenger RNAs and then hydrolytic enzymes like amylases, lipases, proteases. The enzymes solubilize the reserve food of the seed.

8. Cut or excised leaves remain green for long if induced to root or dipped in

(a) gibberellins

(b) cytokinins

(c) auxins

(d) ethylene.

Answer and Explanation:

8. (b): Cytokinin are plant growth hormones which are basic in nature cytokinins induce formation of new leaves chloroplasts in heaves, which inturn keeps the leaves green for a longer duration of time. Cytokinins applied to marketed vegetables can keep them fresh for several days. Shelf life of cut shoots and flowers is krolonged by employing the hormones.

9. Hormone primarily connected with cell division is

(a) IAA

(b) NAA

(c) cytokinin/zeatin

(d) gibberellic acid

Answer and Explanation:

9. (c): Cytokinin has a very specific effect on cell division (cytokinesis), hence the name cytokinin. They contain kinetin and related compound generally called as kinins chemically, cytokinins are degradation product of adenine, ATP, NAD and

NADP. Cytokinins are essential for cytokinesis though chromosome doubling can occur in their absence. Cytokinins bring about division even in permanent cells.

10. Carbon dioxide joins the photosynthetic pathway in

- (a) PS I
- (b) PS II
- (c) light reaction
- (d) dark reaction.

Answer and Explanation:

10. (d): The dark reactions or Blackman's reactions or biosynthetic phase involves three steps: (i) which is fixation of CO_2 , (ii) Reduction of CO_2 and (iii) synthesis of other compound from glucose. It is independent of light. Pigment System I is relatively very weakly fluorescent while pigment system II is strongly fluorescent. Light energy absorbed by pigment in the two systems is ultimately trapped by the P700 and P680. Light reaction is associated with the grana of the chloroplasts. It takes place in the presence of light only.

11. NADP^+ is reduced to NADPH in

- (a) PS I
- (b) PS II
- (c) Calvin cycle
- (d) noncyclic photophosphorylation.

Answer and Explanation:

11. (d): The excited chlorophyll transfer an electron from chlorophyll through various steps until the reduction of NADP is completed. NADP is a coenzyme

which is reduced to NADPH₂ the hydrogen required for the formation of NADPH₉ comes from the breaking of water molecule.

12. Minerals absorbed by root move to the leaf through

- (a) xylem
- (b) phloem
- (c) sieve tubes
- (d) none of the above.

Answer and Explanation:

12. (a): Minerals absorbed by roots move to the leaf through xylem. Xylem plays an important role in conduction of water. Hence, when water moves upward through xylem, minerals are also absorbed by the roots and move towards leaves through xylem only. This is known as ascent of sap.

13. Phosphorous and nitrogen ions generally get depleted in soil because they usually occur as

- (a) neutral ions
- (b) negatively charged ions
- (c) positively charged ions
- (d) both positively and negatively charged but disproportionate mixture.

Answer and Explanation:

13. (b): Phosphorous and nitrogen ions generally get depleted in soil because they usually occur as negatively charged ions. Both the elements are essential for plants and acts as macromolecules which are required in large quantities.

14. Which one is an essential mineral, not constituent of any enzyme but stimulates the activity of many enzymes

- (a) Zn
- (b) Mn
- (c) K
- (d) Mg.

Answer and Explanation:

14. (c): Potassium is an essential mineral. It is not a constituent of any enzyme but accelerates the rate of activity of many enzymes. Potassium is rich in actively dividing cells of buds, young leaves root tips. It is needed for proper growth and development. It regulates movement of stomata. A high amount of potassium is required in the process of protein synthesis.

15. Which one increases in the absence of light?

- (a) uptake of minerals
- (b) uptake of water
- (c) elongation of internodes
- (d) ascent of sap.

Answer and Explanation:

15. (c): Stem elongation takes place in the absence of light due to etiolation. But uptake of minerals, uptake of water and ascent of sap all these processes are related to photosynthesis which takes place only in the presence of light.

16. Mowing grass lawn facilitates better maintenance because

- (a) wounding stimulates regeneration
- (b) removal of apical dominance and stimulation of intercalary meristem

(c) removal of apical dominance

(d) removal of apical dominance and promotion of lateral meristem.

Answer and Explanation:

16. (b): Mowing grass lawn facilitates better maintenance. Because of removal of apical dominance and stimulation of intercalary meristem.

17. Leaf fall can be prevented with the help of

(a) abscisic acid

(b) auxins

(c) florigen

(d) cytokinins.

Answer and Explanation:

17. (d): Cytokinins delay senescence of leaves and other organs by mobilisation of nutrients. Abscissic acid promotes abscission of flowers and fruits. Its excessive presence stops protein and RNA synthesis in the leaves and hence stimulates their senescence.

18. Which of the following hormones can replace vernalisation?

(a) auxin

(b) cytokinin

(c) gibberellins

(d) ethylene.

Answer and Explanation:

18. (c): Gibberellin is a hormone that replaces vernalisation. Vernalization is a period of cold treatment for plants, usually perennials or trees. Some plants won't bloom without it. In vernalization plants are exposed to low temperature in order to stimulate flowering or to enhance seed production. The biennials form their vegetative body in the first year. Then they pass through a winter season and then produce flowers and fruits in the second year. By exogenous application of gibberellins many biennials can be induced to behave as annuals and they no more require the natural chilling treatment for their flowering.

19. The size of chlorophyll molecule is

(a) head 15 x 15 A, tail 25 A

(b) head 20 x 20 A, tail 25 A

(c) head 15 x 15 A, tail 20 A

(d) head 10 x 12 A, tail 25 A.

Answer and Explanation:

19. (c): Chlorophyll are the magnesium porphyrin (head, 15 x 15 A) compounds. The porphyrin ring consists of four pyrrole rings joined together by CH bridges. A long chain of C atoms called as phytol (tail; 20 A) chain is attached to porphyrin ring.

20. The substrate for photorespiration is

(a) phosphoglyceric acid

(b) glycolate

(b) serine

(d) glycine

Answer and Explanation:

20. (b): Glycolate (glycolic acid) is the chief metabolite of photorespiration and also its substrate. Other important metabolites are the amino acids glycine and serine. But, phosphoglyceric acid is a lipid and it is not a substrate of photorespiration.

21. In C₄ plants, Calvin cycle operates in

(a) stroma of bundle sheath chloroplasts

(b) grana of bundle sheath chloroplasts

(c) grana of mesophyll chloroplasts

(d) stroma of mesophyll chloroplasts.

Answer and Explanation:

21. (a): The C-4 plants have a characteristic leaf anatomy called kranz anatomy. Here two types of chloroplasts are present – bundle sheath chloroplasts and mesophyll chloroplasts. In C-4 plants, there are two carboxylation reactions which occur first in mesophyll chloroplasts and then in bundle sheath chloroplasts. CO₂ acceptor molecule in mesophyll chloroplasts is PEP (Phospho-enol pyruvate) and not Ribulose 1, 5- biphosphate. Further it has enzyme PEP-carboxylase. RUBP-carboxylase is absent in mesophyll chloroplasts but is present in bundle sheath chloroplasts. The first product formed is oxaloacetic acid and this is because it is known as C₄ cycle. Bundle sheath cells fix CO₂ through C₃ cycle.

22. Greatest producers of organic matter are

(a) crop plants

(b) forests

(c) plants of the land area

(d) phytoplankton of oceans.

Answer and Explanation:

22. (d): Phytoplanktons in oceans are the greater producers of organic matter.

23. A very efficient converter of solar energy with net productivity of 204 kg/m² or more is the crop

(a) wheat

(b) sugarcane

(c) rice

(d) bajra.

Answer and Explanation:

23. (b): A very efficient converter of solar energy with net productivity of 2-4 kg/m² or more is sugarcane, maize which are C₄ plants others are C₃ plants.

24. 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

(d) D.P.D.

Answer and Explanation:

24. (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.

25. The principal pathway of water translocation in angiosperms is

- (a) sieve cells
- (b) sieve tube elements
- (c) xylem vessel system
- (d) xylem and phloem.

Answer and Explanation:

25. (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.

26. Which of the following movement is not related to auxin level?

- (a) bending of shoot towards light
- (b) movement of root towards soil
- (c) nyctinastic leaf movements
- (d) movement of sunflower head tracking the sun.

Answer and Explanation:

26. (c): Nyctinastic leaf movements is not related to auxin level. It is a movement of leaves of many species from nearly horizontal leaves during the day and nearly vertical at night.

These movements are controlled by biological clock, while the other conditions bending of shoot towards light, movement of root towards soil and movement of sunflower head tracking the sun are the conditions related to auxins.

27. Phototropic and geotropic movements are linked to

(a) gibberellins

(b) enzymes

(c) auxin

(d) cytokinins

Answer and Explanation:

27. (c): Auxin regulates some of the important plant growth movements like phototropism and geotropism. Phototropism means growth of plants in response to light and geotropism means growth of plants towards gravity.

28. Abscissic acid controls

(a) cell division

(b) leaf fall and dormancy

(c) shoot elongation

(d) cell elongation and wall formation.

Answer and Explanation:

28. (b): Before a leaf fall, a special zone of cells is formed at the base of the pedicel or petiole. This zone is called as abscission zone. It is delimited by a protection layer on the stem side and a separation layer on the organ side. The leaf is ultimately separated and phenomenon is abscission. ABA is also a growth inhibitor. It regulates the dormancy of seeds and buds perhaps by inhibiting the growth process. The ABA level decreases in the whole seed as their dormancy is broken.

29. Phytohormones are

(a) chemical regulation flowering

(b) chemical regulation secondary growth

(c) hormones regulating growth from seed to adulthood

(d) regulators synthesised by plants and influencing physiological processes.

Answer and Explanation:

29. (d): Growth hormones or phytohormones are defined as organic substances which are synthesized in minute quantities in one part of the plant body and transported to another part where they influence specific physiological processes. Phytohormones are chemical substances which are synthesized by plants and are naturally occurring.

30. Highest auxin concentration occurs

(a) in growing tips

(b) in leaves

(c) at base of plant organs

(d) in xylem and phloem.

Answer and Explanation:

30. (a): Auxins are well known to promote elongation of stem and coleoptile. However when exogenous auxin is given to intact plants this is not observed because the required amount of auxin is already present in plants. When the apex of shoot is removed, then the exogenous application of auxin promotes growth, this clearly indicates that growing apex, having meristematic cells, is the site where endogenous auxins are present in sufficient amount; once the apex is removed the source of auxin is also removed.

31. Kranz anatomy is typical of

(a) C₄ plants

(b) C₃ plants

(c) C2 plants

(d) CAM plants

Answer and Explanation:

31. (a): Refer answer 21.

32. The first carbon dioxide acceptor in C4-plants is

(a) phosphoenol-pyruvate

(b) ribulose 1, 5-diphosphate

(c) oxalo-acetic acid

(d) phosphoglyceric acid.

Answer and Explanation:

32. (a): The primary acceptor of CO₂ is a 3 carbon compound phosphoenol pyruvic acid. Addition of CO₂ to any compound is called carboxylation. In C₄ cycle, CO₂ combines with phosphoenol pyruvic acid to form oxaloacetic acid. The enzyme is phosphoenol pyruvate carboxylase. The oxaloacetic acid breaks up into pyruvic acid and CO₂ which combines with RUDP to form PGA as in Calvin cycle.

33. In soil, the water available for root absorption is

(a) gravitational water

(b) capillary water

(c) hygroscopic water

(d) combined water.

Answer and Explanation:

33. (b): Capillary water in soil is available for root absorption. Capillary water fills the spaces between non- colloidal soil particles and forms films around them. This water is held by the capillary forces around and between the particles and is of greatest importance to plant life.

34. The most widely accepted theory for ascent of sap in trees is

(a) capillarity

(b) role of atmospheric pressure

(c) pulsating action of living cell

(d) transpiration pull and cohesion theory of Dixon and Jolly.

Answer and Explanation:

34. (d): Transpiration pull cohesion theory for ascent of sap in trees is most widely accepted. This concept was proposed by Dixon and Joly, 1884. It is based up on three basic assumptions which are cohesion in between water molecules, continuity of water column and transpiration pull.

35. Twining of tendrils is due to

(a) thigmotropism

(b) seismonasty

(c) heliotropism

(d) diageotropism.

Answer and Explanation:

35. (a): The tropic movement in response to the stimulus of contact is thigmotropism e.g. coiling of tendrils and stems, haustoria in Cuscuta.

36. A chemical believed to be involved in flowering is

(a) gibberellin

(b) kinetin

(c) florigen

(d) IBA.

Answer and Explanation:

36. (c): Chailakhyan in 1937 gave the view that flower hormone namely florigen is synthesized in the leaves under favourable photoperiodic conditions. This hormone is transmitted to the growing point where the flowering occurs.

37. The hormone responsible for apical dominance is

(a) IAA

(b) GA

(c) ABA

(d) Florigen.

Answer and Explanation:

37. (a): In vascular plants especially the taller ones, if the apical bud is intact and growing of the lateral bud remains suppressed, removal of apical bud causes fast growth of lateral buds. This influence of apical bud in suppressing the growth of lateral buds is termed as apical dominance.

Indole-3-acetic acid (IAA) is a natural auxin which is responsible for apical dominance. GA is Gibberellic acid causes rapid elongation growth. ABA (abscisic acid) is a powerful growth inhibitor. Florigen is a chemical involved in flowering.

38. Absciscic acid causes

(a) stomatal closure

- (c) leaf expansion
- (b) stem elongation
- (d) root elongation.

Answer and Explanation:

38. (a): Absciscic acid is a hormone which produced during adverse environmental condition. It also causes the closure of stomata under conditions of water stress as also under high concentration of CO_2 in the guard cells. Absciscic acid inhibits the K^+ uptake by guard cells and promotes the leakage of malic acid. It results in reduction of osmotically active solutes so that the guard cells become flaccid and stomata get closed.

39. Photosynthetic pigments found in the chloroplasts occur in

- (a) thylakoid membranes
- (b) plastoglobules
- (c) matrix
- (d) chloroplast envelope.

Answer and Explanation:

39. (a): Photosynthetic pigments are found in the thylakoids membrane of chloroplasts. The grana lamellae are paired to form sac like structures and form thylakoids. Chlorophylls and other photosynthetic pigments are confined to grana.

40. Dark reactions of photosynthesis occur in

- (a) granal thylakoid membranes
- (b) stromal lamella membranes
- (c) stroma outside photosynthetic lamellae

(d) periplastidial space.

Answer and Explanation:

40. (c): The dark reactions of photosynthesis is purely enzymatic and slower than the primary photochemical reaction. It takes place in stroma portion of the chloroplast and is independent of light i.e., it can occur either in presence or in absence of light provided that assimilatory power available.

41. Which technique has helped in investigation of Calvin cycle?

(a) X-ray crystallography

(b) X-ray technique

(c) radioactive isotope technique

(d) intermittent light.

Answer and Explanation:

41. (c): By employing C^{14} labelled carbon dioxide $^{14}CO_2$ in photosynthesis and observing the appearance of characteristic radiations in different reactions intermediates and product in different experiments. Calvin and his co-workers were able to formulate the complete metabolic path of carbon assimilation in the form of cycle which is called as Calvin cycle.

42. During monsoon, the rice crop of eastern states of India shows lesser yield due to limiting factor of

(a) CO_2

(b) light

(c) temperature

(d) water.

Answer and Explanation:

42. (b): Rate of yield is dependent of light as photosynthesis is dependent on light. Maximum rate of photosynthesis occur when light is brightest. But during monsoon, the light is dim and so this reduces rate of photosynthesis and hence yield.

43. Ferredoxin is a constituent of

- (a) PS I
- (b) PS II
- (c) Hill reaction
- (d) P680.

Answer and Explanation:

43. (a): In photosystem-I, the ejected electron is trapped by FRS (ferredoxin reducing substance) which is an unknown oxidation – reduction system. The electron is now transferred to a non-heme iron protein called ferredoxin (Fd) from which electron is transferred to NADP' intermediate protein electron carrier ferredoxin- NADP reductase. So that NADP^+ is reduced to $\text{NADPH} + \text{H}^+$.

44. Water movement between cells is due to

- (a) T.P.
- (b) W.P.
- (c) D.P.D.
- (d) incipient plasmolysis.

Answer and Explanation:

44. (c): Water movement between cells is due to DPD. If a cell is placed in pure water it shows endosmosis and as a result water enters into the cell. Thus, the

osmotic entry of water is due to high osmotic pressure of the cell sap. The inward movement of water is, therefore due to the fact that it's $OP > TP$. The net force with which water is drawn into a cell is equal to the difference of OP and TP , known as diffusion pressure deficit. $DPD = OP - TP$.

45. Which of the following is used to determine the rate of transpiration in plants?

- (a) poromeer/hygrometer
- (b) potometers
- (c) auxanometer
- (d) tensiometer/barometer.

Answer and Explanation:

45. (b): Potometer is an instrument used to determine the rate of transpiration. There are four types of potometers. Simple, Ganong's, Bose's and Farmer's potometer. With the help of potometers we actually measure suction of water due to transpiration. Porometer is an apparatus for knowing the relative size of stomata.

Tensiometer is an instrument that measures soil water tension. Auxanometer is an apparatus used for measuring increased or rate of growth in plants.

46. Guttation is mainly due to

- (a) root pressure
- (b) osmosis
- (c) transpiration
- (d) imbibition.

Answer and Explanation:

46. (a): The loss of water through water stomata (hydathodes) is called as guttation. Guttation occurs when transpiration rate is very low as compared to rate of water absorption, due to this, root pressure is developed and water is pushed out through specialized pores at vein endings called hydathodes therefore guttation is not due to the activity of hydathodes but due to root pressure.

47. In terrestrial habitats, temperature and rainfall conditions are influence by

(a) water transformations

(b) transpiration

(c) thermoperiodism

(d) translocation.

Answer and Explanation:

47. (b): In terrestrial habitats, temperature and rainfall conditions are influenced by transpiration. The rate of transpiration is directly proportional to the saturation deficit of atmosphere. Plants growing in region where transpiration is meagre do not show overheating. So transpiration prevents overheating.

48. Conversion of starch to organic acids is required for

(a) stomatal opening

(b) stomata! closing

(c) stomatal formation

(d) stomatal activity.

Answer and Explanation:

48. (a): There is evidence to believe that besides organic acids the turgidity of guard cells is usually controlled by K^+ , Cl^- and H^+ . The opening of stomata is initiated by exertion of H^+ by guard cells, intake if K^+ and Cl^- , disappearance of starch and appearance of organic acids like malic acid.

49. At constant temperature, the rate of transpiration will be higher at

- (a) sea level
- (b) 1 km below sea level
- (c) 1 km above sea level
- (d) 1.5 km above sea level.

Answer and Explanation:

49. (d): At constant temperature, the rate of transpiration will be higher at 1.5 km above the sea level. At lower atmospheric pressure there is increase in the rate of evaporation.

50. In guard cells when sugar is converted into starch, the stomatal pore

- (a) closes completely
- (b) opens partially
- (c) opens fully
- (d) remains unchanged.

Answer and Explanation:

50. (a): In guard cells when sugar is converted into starch, the stomatal pore closed completely. At night time, the CO₂ released during respiration accumulates. As a result, the acidity of the guard cells increases and pH decreases. The decreased pH favours conversion of sugar to starch. Pressure of the guard cells falls and hence they become flaccid. As a result, stomatal aperture closes.

51. Which is employed for artificial ripening of banana fruits?

- (a) auxin

(b) coumarin

(c) ethylene

(d) cytokinin.

Answer and Explanation:

51. (c): Ethylene is a hormone which is used for ripening of fruit. In case of unripe banana, it can be made to ripe before proper time if they are kept in ethylene atmosphere. Uncontrolled application of this gas may spoil the fruits. Ethylene is produced in mature but unripe fruits and then it initiates a chain of reactions that finally lead to ripening.

52. Cytokinins

(a) promote abscission

(b) influence water movement

(c) photoperiod less than 12 hours photoperiod below a critical length and uninterrupted long night long night

(d) short photoperiod and interrupted long night.

Answer and Explanation:

52. (c): Richmond and Land, 1967 observed that degradation of protein and chlorophyll was delayed in the detached leaves, if there was cytokinin in the medium. The senescence in the detached leaves was controlled by cytokinin first by keeping the stomata open thus allowing more CO₂ to enter. This suppresses the action of ethylene which promotes senescence.

54. Apical dominance is caused by

(a) abscisic acid in lateral bud

- (b) cytokinin in leaf tip
- (c) gibberellin in lateral buds
- (d) auxin in shoot tip.

Answer and Explanation:

54. (d): According to Thimann and co-workers, auxin is responsible for the dominance of apical bud. The apical dominance is due to interaction between auxin and cytokinin. If the auxin concentration is higher than cytokinin, the apical bud will dominate the growth.

55. Bananas can be prevented from over-ripening by

- (a) maintaining them at room temperature
- (b) refrigeration
- (c) dipping in ascorbic acid solution
- (d) storing in a freezer.

Answer and Explanation:

55. (c): In artificial ripening of banana, uncontrolled application of ethylene gas may cause over ripening of banana. It can be prevented from over-ripening by dipping in ascorbic acid solution.

56. Flowering dependent on cold treatment is

- (a) cryotherapy
- (b) cryogenics
- (c) cryoscopy
- (d) vernalisation.

Answer and Explanation:

56. (d): In several plants, particularly bienniales and perennials, light does not seem to be the only factor controlling the process of flowering. Temperature, particularly the low temperature treatment induce flowering. Vernalization means ability of low temperature to convert winter cereal into spring cereal as a result of satisfaction of their low temperature requirement.

57. Dwarfness can be controlled by treating the plant with

- (a) cytokinin
- (b) gibberellic acid
- (c) auxin
- (d) antigibberellin.

Answer and Explanation:

57. (b): Giberellins helps in the reversal of dwarfism in many genetically dwarf plants. External supply of Gibberellic acid causes rapid elongation of growth, e.g. Rosette plant of sugarbeet when treated with GA, undergoes marked longitudinal growth of axis.

58. The enzyme that catalyses carbon dioxide fixation in C₄ plants is

- (a) RuBP carboxylase
- (b) PEP carboxylase
- (c) Carbonic anhydrase
- (d) Carboxydismutase.

Answer and Explanation:

58. (b): Addition of CO₂ to any compound is called carboxylation. In C₄ cycle, CO₂ combines with phosphoenol pyruvic acid to form oxaloacetic acid. The enzyme is

phosphoenol pyruvate carboxylase. The oxaloacetic acid breaks up into pyruvic acid and CO₂ which combines with RUDP to form PGA as in Calvin cycle.

59. Photosystem II occurs in

- (a) stroma
- (b) cytochrome
- (c) grana
- (d) mitochondrial surface.

Answer and Explanation:

59. (c): Photosystem II has almost equal number of chlorophyll a and chlorophyll b molecules. It is dark green in colour and located mostly in the appressed parts of grana thylakoids towards the inner surface of membranes.

60. Chlorophyll a occurs in

- (a) all photosynthetic autotrophs
- (b) in all higher plants
- (c) help retain chlorophyll
- (d) inhibit protoplasmic streaming.

Answer and Explanation:

60. (c): Chlorophyll-a occur in all photosynthesizing plants except bacteria. Chlorophyll-a is the only one common to all organisms that possess chlorophyll (the only one in blue green algae) and is believed to be specifically required. In a few photosynthetic bacteria other kinds of chlorophyll, bacteriochlorophylls, occur.

61. Which is produced during water stress that brings stomatal closure?

- (a) ethylene
- (b) abscisic acid
- (c) ferulic acid
- (d) coumarin.

Answer and Explanation:

61. (b): Absciscic &cid is produced during water stress that brings stomatal closure. Absciscic acid is a stress hormone and it is produced during water scarcity, when the transpiration rate exceeds absorption, the plant faces water stress condition. As a result, incipient wilting occurs. Under water stress condition ABA increases which induces stomatal closure.

62. An adaptation for better gaseous exchange in plant leaves is

- (a) hair on lower surface
- (b) multiple epidermis
- (c) waxy cuticle
- (d) stomata on lower surface away from direct sun rays.

Answer and Explanation:

62. (d): Stomata are tiny pores found in the epidermis of leaves and other soft aerial parts. Stomata occur both on the upper and lower epidermal surfaces in mesophytic plants. Stomata are meant for gaseous exchange and are also the main source of transpiration. So an adaptation for better gaseous exchange in plant leaves is stomata are present on the lower surface which are away from direct sunlight are very much effective for gases exchange.

63. Klinostat is employed in the study of

- (a) osmosis

(b) growth movements

(c) photosynthesis

(d) respiration.

Answer and Explanation:

63. (b): Klinostat is used to study growth movements. Klinostat comprises a disc with pot which is rotated by an axial rod with the help of a motor. Auxin gets uniformly distributed on all sides and, hence the stem grows horizontally forward.

64. The hormone produced during adverse environmental conditions is

(a) benzyl aminopurine

(b) bichlorophenoxy acetic acid

(c) ethylene

(d) abscisic acid.

Answer and Explanation:

64. (d): Absisic acid is a hormone which produced during adverse environmental condition. It also causes the closure of stomata under conditions of water stress as also under high concentration of CO₂ in the guard cells. ABA plays an important role in plants during water stress and drought conditions. The concentration of ABA increases in the leaves of plants facing such stresses; hence it is called as a stress hormone.

65. The regulator which retards ageing/senescence of plant parts is

(a) cytokinin

(b) auxin

(c) gibberellin

(d) abscisic acid.

Answer and Explanation:

65. (a): Richmond and Lang, 1967 observed that degradation of protein and chlorophyll was delayed in the detached leaves, if there was cytokinin in the medium. The senescence in the detached leaves was controlled by cytokinin first by keeping the stomata open thus allowing more CO₂ to enter. This suppresses the action of ethylene which promotes senescence.

66. Removal of apical bud results in

- (a) formation of new apical bud
- (b) elongation of main stem
- (c) death of plant
- (d) formation of lateral branching.

Answer and Explanation:

66. (d): Removal of apical bud shows lateral branching. This is because auxins controls apical dominance and apex inhibits the growth of axillary buds.

67. Translocation of carbohydrate nutrients usually occurs in the form of

- (a) glucose
- (b) maltose
- (c) starch
- (d) sucrose.

Answer and Explanation:

67. (d): Transaction of carbohydrates nutrients usually occurs in the form of sucrose through sieve tube of phloem. Starch is converted to soluble sucrose form.

68. Which one is a C₄-plant?

(a) papaya

(b) pea

(c) potato

(d) maize/corn

Answer and Explanation:

68. (d): For a long time, Calvin cycle (C₃ cycle) was considered to be the only photosynthetic pathway for reduction of CO₂ into carbohydrates.

M.D. Hatch and Slack (1966) reported that a 4-C compound oxaloacetic acid (OAA) is the first stable product in CO₂ reduction process.

This led to an alternative pathway of CO₂ fixation which is known as Hatch and Slack's cycle or C₄ cycle. It occurs in sugarcane, maize etc.

These C₄ plants have a characteristic leaf anatomy called Kranz anatomy.

69. The carbon dioxide acceptor in Calvin cycle/ C₃-plants is

(a) phospho-enol pyruvate (PEP)

(b) ribulose 1, 5-diphosphate (RuBP)

(c) phosphoglyceric acid (PGA)

(d) ribulose monophosphate (RMP).

Answer and Explanation:

69. (b): In Calvin cycle, CO_2 is accepted by Ribulose -1,5- diphosphate (RuDP) already present in the cells and a 6-carbon addition compound is formed which is unstable. It soon gets converted into 2 molecules of 3-phosphoglyceric acid due to hydrolysis and dismutation. Phosphoenol pyruvate (PEP) and Phosphoglyceric acid (PGA) are formed in glycolysis.

70. Maximum solar energy is trapped by

- (a) planting trees
- (b) cultivating crops
- (c) growing algae in tanks
- (d) growing grasses.

Answer and Explanation:

70. (c): Maximum solar energy is trapped by growing algae in tanks. The light spectrum of red and blue light are most effective in performing photosynthesis for growing algae.

71. A photosynthesising plant is releasing I_2O more than the normal. The plant must have been supplied with

- (a) O_3
- (b) H_2O with 1800
- (c) CO_2 with 150
- (d) $\text{C}_6\text{H}_{12}\text{O}_6$ with 180.

Answer and Explanation:

71. (b): Water molecule breaks up into hydrogen and oxygen in the illuminated chloroplasts is called photolysis of water. A photosynthesising plant is releasing 150 more than the normal. The plant must have been supplied with H_2O with 180.

72. Plants, but not animals, can convert fatty acids to sugars by a series of reactions called

- (a) photosynthesis
- (b) Kreb's cycle
- (c) glycolysis
- (d) glyoxylate cycle.

Answer:

- (d) glyoxylate cycle.

73. During light reaction of photosynthesis, which of the following phenomenon is observed during cyclic phosphorylation as well as non-cyclic phosphorylation?

- (a) release of O₂
- (b) formation of ATP
- (c) formation of NADPH
- (d) involvement of PS I and PS II pigment systems.

Answer and Explanation:

73. (b): Non-cyclic photophosphorylation involves both PS-I and PS-II. Here electrons are not cycled back and are used in the reduction of NADP to NADPH₂. Here water is utilized and O₂ evolution occurs. One molecule of ATP is produced between plastoquinone and cytochrome f. Whereas in cyclic photophosphorylation only PS-I is involved. Here electrons from P-700 are recycled back to P-700. Water is not utilized here and O₂ evolution does not occur. It involves production of two ATP molecules, no NADPH₂ is produced. Thus ATP synthesis occurs in both PS-I and PS-II.

74. Which of the following pigments acts as a reaction- centre during photosynthesis?

- (a) carotene
- (b) phytochrome
- (c) P700
- (d) cytochrome.

Answer and Explanation:

74. (c): During photosynthesis a portion of light energy absorbed by chlorophyll and carotenoids is eventually stored as chemical energy via the formation of chemical bonds. This conversion of energy from one form to another is a complex process that depends on cooperation between many pigment molecules and a group of electron transfer proteins. The majority of pigments serve as an antenna complex, collecting light and transfusing energy to the reaction center complex.

There are two photochemical complexes, known as photosystem I and II. PS-II absorbs far red light of wavelengths greater than 680 nm and PS-I absorbs red light of wavelengths greater than 700 nm. Both those complexes are involved in light reactions of photosynthesis.

75. If the growing plant is decapitated, then

- (a) its growth stops
- (b) leaves become yellow and fall down
- (c) axillary buds are inactivated
- (d) axillary buds are activated.

Answer and Explanation:

75. (d): Decapitating a growing plant means removing shoot apex of the plant. Auxin, a growth promoting phytohormone present in apex inhibits the growth of

axillary buds so that only the apex continues to grow. When the apex containing auxin is removed or decapitation is done, then axillary buds show their growth, this is because the apical dominance is removed. This practice of removal of apical dominance is applied in tea gardens, hedges, rose gardens etc.

76. The movement of auxin is largely

- (a) centripetal
- (b) basipetal
- (c) acropetal
- (d) both 'a' and 'c'.

Answer and Explanation:

76. (b): Auxin is a growth promoting phytohormone. It moves mainly from the apical to the basal end (basipetally). This type of unidirectional transport is termed polar transport. Auxin is the only plant growth hormone known to be transported polarly. Recently it has been recognized that a significant amount of auxin transport also occur acropetally (from basal end to the apical end) in the root.

77. The 1992 Nobel Prize for medicine was awarded to Edmond H. Fischer and Edwin J. Krebs for their work concerning

- (a) reversible protein phosphorylation as a biological regulation mechanism
- (b) isolation of the gene for a human disease
- (c) human genome project
- (d) drug designing involving inhibition of DNA synthesis of the pathogen.

Answer and Explanation:

77. (a): The 1992 Nobel prize for medicine was awarded to edmond H. fischer and Edwin J. Krebs for their work concerning reversible protein phosphorylation as

biological regulation mechanism. The winners of 192 Noble prizes in Physiology and Medicine discovered a 'life switch' that turns on and off a variety of biological functions of the cell, including the breakdown of fats and the generation of chemical energy. The prize – winning discovery is known as "reversible protein phosphorylation".

78. The closure of lid of pitcher in pitcher plant, is due to

- (a) paratonic movement
- (b) autonomous movement
- (c) turgor movement
- (d) tropic movement.

Answer and Explanation:

78. (a): Plants have the capacity of changing their position, in response to external or internal stimuli which are known as plant movements. The movements which occur due to internal stimuli are called autonomic movements and those that occur due to external stimuli | are called paratonic movements.

Nepenthes (pitcher plant) is an insectivorous plant. In this the leaf lamina is modified to form a pitcher and leaf apex forms a coloured lid. When the insect enter the pitcher it is an external stimulus, so the closure of the lid is paratonic movement.

79. The movement of water, from one cell of cortex to adjacent one in roots, is due to

- (a) accumulation of inorganic salts in the cells
- (b) accumulation of organic compounds in the cells
- (c) water potential gradient
- (d) chemical potential gradient.

Answer and Explanation:

79. (c): Movement of water always occurs from low DPD to high DPD. During water absorption by roots, water as well as solutes enters through root hair. After absorption of water by root hair, its T.P. is increased and thus D.P.D. or S.P. is decreased. Then water from root hair moves to the cells of the cortex along the concentration gradient and finally reaches the xylem.

80. The CO₂ fixation during C₄ pathway occurs in the chloroplast of

- (a) guard cells
- (b) bundle sheath cells
- (c) mesophyll cells
- (d) spongy parenchyma.

Answer and Explanation:

80. (c): The C₄ plants have a characteristic leaf anatomy called kranz anatomy. Here two types of chloroplasts are present – bundle sheath chloroplasts and mesophyll chloroplasts. In C₄ plants, there are two carboxylation reactions which occur first in mesophyll chloroplasts and then in bundle sheath chloroplasts. CO₂, acceptor molecule in mesophyll chloroplasts is PEP (Phospho-enol pyruvate) and not Ribulose, 5-biphosphate. Further it has enzyme PEP-carboxylase. RUBP-carboxylase is absent in mesophyll chloroplasts but is present in bundle sheath chloroplasts. The first product formed is oxaloacetic acid and this is because it is known as C₄ cycle. Bundle sheath cells fix CO₂ through C₃ cycle.

81. The twinning of tendrils around a support is a good example of

- (a) phototropism
- (b) chemotropism
- (c) nastic movements
- (d) thigmotropism.

Answer and Explanation:

81. (d): Thigmotropism involves nastic movements resulting from touch. It occurs in tendrils which coil around support and help the plant in climbing. Phototropism is a paratonic movement in response to unidirectional light stimulus.

Chemotropism is a directional paratonic movement that occurs in response to a chemical stimulus.

82. The primary acceptor, during CO₂ fixation in C₃ plants, is

- (a) phosphoenolpyruvate (PEP)
- (b) ribulose 1, 5-diphosphate (RuDP)
- (c) phosphoglyceric acid (PGA)
- (d) ribulose monophosphate (RMP).

Answer and Explanation:

82. (b): In C₃ cycle, CO₂ acceptor molecule is RuBP or RuDP (i.e., Ribulose 1, 5-biphosphate or Ribulose 1, 5-diphosphate). There occurs covalent bonding of CO₂ to RuBP and the enzyme catalyzing this reaction is RuBP- carboxylase/oxygenase (Rubisco). It leads to formation of 2 molecules of phosphoglyceric acid.

As Calvin cycle take in only one carbon (as CO₂) at a time, so it takes six turns of the cycle to produce a net gain of six carbons (i.e., hexose or glucose).

83. Which of the following element plays an important role in biological nitrogen fixation?

- (a) copper
- (b) molybdenum
- (c) zinc

(d) manganes.

Answer:

(b) molybdenum

84. In C4 plants, CO₂ fixation is done by

(a) sclerenchyma

(b) chlorenchyma and hypodermis

(c) mesophyll cells

(d) guard cells.

Answer and Explanation:

84. (c): Refer answer 80.

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

(a) Zn

(b) Na

(c) Ca

(d) Mo.

Answer and Explanation:

85. (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.

86. In C₄ plants, CO₂ combines with

- (a) phosphoenol pyruvate
- (b) phosphoglyceraldehyde
- (c) phosphoglyceric acid
- (d) ribulose diphosphate.

Answer and Explanation:

86. (a): In C₄ plants, there are 2 carboxylation reactions, first in mesophyll chloroplast and second in bundle sheath chloroplast. CO₂ acceptor molecule in mesophyll chloroplasts is PEP (phospho-enol pyruvate) and not RuBP. Further, PEP-carboxylase (PEPCO) is the key enzyme (RuBP-carboxylase enzyme is negligible or absent in mesophyll chloroplast).

The first product formed in C₄ cycle is oxaloacetic acid. It is a 4-C compound, so it is called as C₄ cycle.

87. When water enters in roots due to diffusion, is termed as

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

87. (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 T.P. and hence increases their D.P.D. or S.P. As a result of their increased DPD, they 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.

88. Photorespiration is favoured by

- (a) high temperature and low O₂
- (b) high humidity and temperature
- (c) high O₂ and low CO₂
- (d) high CO₂ and low O₂.

Answer and Explanation:

88. (c): Photorespiration is the respiration which occurs in green cells in the presence of light. Respiratory substrate in photorespiration is a 2-carbon compound Glycollic acid (2C). Enzyme involved is RuBP- carboxylases which in normal O₂/CO₂ conc. acts as 'carboxylase'. Used as respiratory substrate in photorespiration. A high O₂/CO₂ ratio means that O₂ should be high and CO₂ should be low because then only RuBP-carboxylase can act as RuBP-oxygenase.

89. What will be the number of Calvin cycles to generate one molecule of hexose?

- (a) 8
- (b) 9
- (c) 4
- (d) 6.

Answer:

(d) 6

90. 'The law of limiting factors' was proposed by

(a) Leibig

(b) Hatch and Slack

(c) Blackman

(d) Arnon.

Answer and Explanation:

90. (c): Blackman (1905) gave the law of limiting factors which states that when a process is conditioned as to its rapidity by a number of separate factors, the rate of the process is limited by the pace of the slowest process. It is the factor which is present in minimum amount.

91. The correct sequence of electron acceptor in ATP synthesis is

(a) Cyt. b, c, a₃, a

(b) Cyt. c, b, a, a₃

(c) Cyt. o, a, b, c

(d) Cyt. b, c, a, a₃.

Answer and Explanation:

91. (d): Last step of aerobic respiration is oxidation of reduced co-enzymes, i.e., NADH and FADH₂ by molecular oxygen through FAD, CoQ (ubiquinone). Cyt. b, Cyt. C, Cyt. c, Cyt. a and Cyt. a₃. Two hydrogen atoms or electrons move from NADH₂ and travel through this ETS chain and finally combine with half molecule of O₂ to form water.

During this electron transport FAD and Fe of different cytochromes are successively reduced and oxidised and at certain points, enough energy is released which is used to bind ADP with ip to form ATP (figure).

92. Bidirectional translocation of solutes takes place in

- (a) parenchyma
- (b) cambium
- (c) xylem
- (d) phloem.

Answer and Explanation:

92. (d): The movement of organic food or solute in soluble form from one organ to another organ is called translocation of solutes, e.g., from leaves to stem and roots for consumption.

The movement of organic material is bidirectional.

Because xylem is responsible for upward movement of water and minerals, so it cannot account for downward translocation of solute at the same time. Cortex and pith are not structurally suitable for this purpose. Thus only phloem is left where there is end to end arrangement of sieve tubes united by sieve pores which is responsible for translocation of solutes in both directions.

93. Gibberellic acid induces flower

- (a) in short day plants under long day conditions
- (b) in day-neutral plants under dark conditions
- (c) in some gymnospermic plants only
- (d) in long day plants under short day conditions.

Answer and Explanation:

93. (d): Gibberellins are growth promoting phytohormones. Some of plants species flower only if the light period exceeds a critical length, and others flower only if this period is shorter than some critical length. Gibberellins can substitute for the long-day requirement in some species, showing an interaction with light.

94. If a tree flowers thrice in a year (Oct., Jan. and July) in Northern India, it is said to be

- (a) photo and thermo-insensitive
- (b) photo and thermo-sensitive
- (c) photosensitive but thermo-insensitive
- (d) thermosensitive but photo-insensitive.

Answer and Explanation:

94. (a): Flower formation is a transitional phase in the life cycle of plant. During flowering, vegetative shoot apex is converted into reproductive shoot apex.

The physiological mechanism for flowering is controlled by 2 factors: photoperiod or light period, i.e., photoperiodism and low temperature, i.e., vernalization.

95. What will be the effect on phytochrome in a plant subjected to continuous red light?

- (a) phytochrome synthesis will increase
- (b) level of phytochrome will decrease
- (c) phytochrome will be destroyed
- (d) first (b) then (a).

Answer and Explanation:

95. (d): Phytochrome is the photoreceptive pigment. It 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., PR and P_r.R (i.e., red light and far red light absorbing forms) and these 2 forms are interconvertible.

When continuous red light is given the level of PR decreases as most of it is converted to PFR form. When the concentration of PR reaches below a critical value, it starts synthesis of more phytochromes in the PR form so that there is equilibrium between synthesis and destruction of PR form.

96. With an increase in the turgidity of a cell, the wall pressure will be

- (a) fluctuate
- (b) remain unchanged
- (c) increase
- (d) decrease.

Answer and Explanation:

96. (c): When a cell is placed in a hypotonic solution then endosmosis occurs it means water enters in the cell and makes the cell turgid. This entry of water in the cell develops in a cell turgor pressure, which exerts pressure on the cell membrane or on the cell wall. If the cell wall is absent as is the case in animal cells then the cells burst due to turgor pressure. But in case of plant cells, wall is present to counteract the turgor pressure. This prevents the plant cells from bursting in a hypotonic solution.

97. Which of the following is not caused by deficiency of mineral nutrition?

- (a) etiolation
- (b) shortening of internode
- (c) necrosis
- (d) chlorosis.

Answer and Explanation:

97. (a): When the plants are kept in dark, they become pale yellow in colour and also become abnormally long with considerable internodal elongation, it is called etiolation. It is because 'flavanoids', which are inhibitors of GA are not formed in dark and hence in absence of flavanoids, GA show their full effect, i.e., elongation (etiolation). Chlorosis involves non-development or loss of chlorophyll. It occurs due to deficiency of nitrogen and sulphur.

Necrosis involves death of tissues. It occurs due to deficiency of copper. Stunted growth occurs due to deficiency of potassium.

98. When a cell is fully turgid, which of the following will be zero?

- (a) turgor pressure
- (b) water potential
- (c) wall pressure
- (d) osmotic pressure.

Answer and Explanation:

98. (b): In a full turgid cell, $DPD = 0$ because it has $T.P. = O.P.$ It means that the cell has no further capacity to absorb any water. Water potential is equal but opposite in sign to D.P.D. So in a fully turgid cell the water potential is zero.

99. NADPH₂ is generated through

- (a) photosystem II
- (b) anaerobic respiration
- (c) glycolysis
- (d) photosystem I.

Answer and Explanation:

99. (d): Non-cyclic photophosphorylation involves both PS-I and PS-II. Here electrons are not cycled back and are used in the reduction of NADP to NADPH₂. Here one molecule of ATP is produced between plastoquinone and cytochrome f, whereas in cyclic photophosphorylations only PS-I is involved. Here electrons from p-700 are recycled back to p-700. It involves production of two ATP molecules, no NADPH, is produced. Hence only PS-I produces NADPH₂.

100. A pigment which absorbs red and far-red light is

- (a) Cytochrome
- (b) xanthophyll
- (c) phytochrome
- (d) carotene.

Answer and Explanation:

100. (c): Phytochrome is a photoreceptive pigment. It has a light absorbing or light detecting portion attached to small protein of about 1,24,000 daltons. Phytochrome occurs in 2 forms, i.e., PR and P_r.R (i.e., red light and far red light absorbing forms) and these 2 forms are interconvertible.

It is involved in the perception of photoperiodic stimuli controlling flowering and other morphogenetic phenomenon in plants.

101. The core metal of chlorophyll is

- (a) Ni
- (b) Cu
- (c) Fe
- (d) Mg.

Answer and Explanation:

101. (d): The core metal of chlorophyll is Mg. Chlorophyll is a chlorin pigment, which is structurally similar to and produced through the same metabolic pathway as other porphyrin pigments such as heme. At the centre of the chlorin ring is a magnesium. Magnesium is a component of chlorophyll.

102. Chlorophyll-a molecule at its carbon atom 3 of the pyrrole ring II has one of the following

(a) carboxylic group

(b) magnesium

(c) aldehyde group

(d) methyl group.

Answer and Explanation:

102. (d): The empirical formula of chlorophyll – a molecule is $C_{55}H_{72}O_5Mg$. It has tadpole like configuration. It is consisted of a porphyrin head and a phytol tail. Porphyrin is a cyclic tetrapyrrole structure, having a magnesium atom in the centre. Chlorophyll-a

A methyl group (CH_3) is attached to the third carbon in the porphyrin head.

103. Which one among the following chemicals is used for causing defoliation of forest trees?

(a) malic hydrazide

(b) 2, 4-D

(c) am-1618

(d) phosphon D.

Answer and Explanation:

103. (b): 2,4-D is a famous herbicide or weedicide which especially kills broad leaved weeds. It kills weeds perhaps by over stimulated root growth. Other auxins like 2, 4, 5 -T have also been used as defoliants during early sixties.

104. Phytochrome becomes active in

(a) red light

(b) green light –

(c) blue light

(d) none of these.

Answer and Explanation:

104. (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., PR and PFR (i.e., red light and far red light absorbing forms) and these 2 forms are interconvertible.

105. The water potential and osmotic potential of pure

(a) 100 and 200

(b) zero and 100

(c) 100 and zero

(d) zero and zero.

Answer and Explanation:

105. (d): Water potential or chemical potential in pure water is zero bar, arbitrarily. Osmotic potential or solute potential represents the effect of dissolved solutes on water potential solutes reduce the free energy of water by diluting the water. The osmotic potential of pure water is zero. If solutes are added to water

its potential becomes less than that of pure waters is expressed as a negative value.

106. Which combination of gases is suitable for fruit ripening?

- (a) 80 % CH₄ and 20% CO₂
- (b) 80% CO₂ and 20% O₂
- (c) 80% C₂H₄ and 20% CO₂
- (d) 80% CO₂ and 20% CH₂.

Answer and Explanation:

106. (c): In most of the plants, there is a sharp rise in respiration rate near the end of the development of fruit, which sets in progress those changes, which are involved in ripening of fruit. The ripening on demand can be induced in these fruits by exposing them to normal air containing about 1 ppm of ethylene.

Suitable combination of gases in atmosphere for fruit ripening is 80% ethylene (C₂H₄) and 20% CO₂.

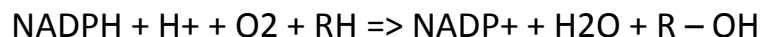
107. Which one of the following statements about cytochrome P450 is wrong?

- (a) it is a coloured cell
- (b) it is an enzyme involved in oxidation reactions
- (c) it has an important role in metabolism
- (d) it contains iron.

Answer and Explanation:

107. (a): Cytochrome P450 (CyP) is a host of enzymes that use iron to oxidise, often as part of the body's strategy to dispose of potentially harmful substances making them more water soluble. These are found in plants, animals and microbes and are involved in a variety of oxidative reaction in cells. These catalyse

a variety of reactions including epoxidation, A-dialkylation, o-dialkylation, .s-oxidation and hydroxylation. A typical cytochrome P450 catalysed reactions is



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

- (a) vernalization
- (b) photoperiodism
- (c) phototaxis
- (d) phototropism.

Answer and Explanation:

108. (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.

109. A plant hormone used for inducing morphogenesis in plant tissue culture is

- (a) cytokinins
- (b) ethylene
- (c) abscisic acid

(d) gibberellins.

Answer and Explanation:

109. (a): Cytokinins are growth promoting phytohormones. Cytokinin plays an important part in organ formation (morphogenesis) with auxin. Different auxin/cytokinin ratio decides the development of root shoot ratio. The major physiological function of cytokinins is to enhance cell division. If cytokinin to auxin ratio is low, then root formation takes place but if the ratio of cytokinin to auxin is high, then, there is formation of meristematic cells in the callus.

110. The closing and opening of the leaves of *Mimosa pudica* is due to

(a) seismonastic movement

(b) chemonastic movement

(c) thermonastic movement

(d) hydrotropic movement.

Answer and Explanation:

110. (a): Refer answer 5.

111. The rate of photosynthesis is higher in

(a) very high light

(b) continuous light

(c) red light

(d) green light.

Answer and Explanation:

111. (c): Plants can use a small portion of light which falls upon them. Chlorophyll-a and chlorophyll-b absorb too much light in the blue and red region. Carotenoids absorb light mostly in the blue region of spectrum of light. In monochromatic lights, maximum photosynthesis occurs in red light, followed by blue light and poor photosynthesis in green light. Under very high light intensity solarization phenomenon occurs. It involves photo-oxidation of different cellular components including chlorophyll.

112. ABA is involved in

- (a) shoot elongation
- (b) increased cell division
- (c) dormancy of seeds
- (d) root elongation.

Answer and Explanation:

112. (c): Absciscic acid (ABA) is a growth inhibiting phytohormone. Absciscic acid is found in vascular plants, some mosses, some fungi and some green algae.

If ABA is applied exogenously, seed germination is inhibited. It has been suggested that ABA inhibits the synthesis of some enzymes, for germination. These enzymes are synthesised under the direction of nucleic acids. A view has been expressed that the translation of a particular messenger RNA is inhibited by ABA and the result is that protein synthesis is blocked.

113. In soil, water available for plants is

- (a) gravitational water
- (b) chemically bound water
- (c) capillary water
- (d) hygroscopic water.

Answer and Explanation:

113. (c): Water occurs in the soil in the different forms as : Free water, gravitational water, hygroscopic water, chemically combined water and capillary water.

Free water is that water which runs away and is not held by the soil. Obviously it is not available to the plants. Gravitational water goes down into the deeper strata of earth and it is also, not available to the plants. Hygroscopic water is present in the form of thin films around the soil particles and it is also not available to the plants under normal condition but it may be available under adverse conditions. Chemically combined water is not available to the plants at all.

The only water which is available to the plants capillary water. Capillary water makes up about 75% of the total water available to plants. The rest of soil water (hygroscopic, combined, free, gravitational and 25% capillary water) are not available to plants. These are called echard or unavailable water.

114. Carbon dioxide acceptor in C₃-plants is

- (a) PGA
- (b) PEP
- (c) RuDP
- (d) none of these.

Answer and Explanation:

114. (c): An enzyme ribulose biphosphate carboxylase catalyses the dark reaction, pertaining to the addition of CO₂ to ribulose-1-5-diphosphate. It is found in abundance in leaves and it is believed that it is the single most abundant protein on earth. It is clear that the first acceptor of CO₂ is Ribulose 1-5 diphosphate.

The first product formed after fixation of CO₂ is 3-pliosphoglyceric acid.

115. The first step for initiation of photosynthesis will be

- (a) photolysis of water
- (b) excitement of chlorophyll molecules due to absorption of light
- (c) ATP formation
- (d) glucose formation.

Answer and Explanation:

115. (b): Photosynthesis is actually oxidation reduction process in which water is oxidized and CO_2 is reduced to carbohydrates. The reduction of CO_2 to carbohydrates needs assimilatory powers, i.e., ATP and NADPH_2 . The process of photosynthesis involves two steps-

- (i) Light dependent phase or photochemical reaction.
- (ii) Light independent these or dark reaction.

Light reaction occurs in grana fraction of chloroplast and in this reaction are included those activities, which are dependent on light. Assimilatory powers (ATP and NADPH_2) are mainly produced in this light reaction. The grana of chloroplasts contain many collaborating molecules of pigment. A quantum of light is absorbed by a single antenna chlorophyll, then it migrates from one molecule to the other till it reaches the reaction centre. This quantum of light is used for generating ATP and NADPH .

116. When the plants are grown in magnesium deficient but urea rich soil, the symptoms expressed are

- (a) yellowish leaves
- (b) colourless petiole
- (c) dark green leaves
- (d) shoot apex die.

Answer and Explanation:

116. (a): Magnesium is important constituent of chlorophyll, thus it is found in all green plants and is essential for photosynthesis. It also helps in binding of ribosomal particles where protein synthesis occurs. It is also part of many enzymes of respiration. The deficiency symptoms of magnesium includes interveinal chlorosis in leaves and yellowing of leaves starting from basal to younger ones.

117. For the synthesis of one glucose molecule the calvin cycle operates for

(a) 2 times

(b) 4 times

(c) 6 times

(d) 8 times.

Answer and Explanation:

117. (c): Refer answer 89.

118. Plants take zinc in the form of

(a) ZnSO_4

(b) Zn

(c) ZnO

(d) Zn.

Answer and Explanation:

118. (b): Zinc is available to the plants for absorption in the divalent form. The availability of soil decreases when the pH of soil shifts towards alkaline side. Zinc may form zinc phosphate in the soil which is insoluble and in that case, it is not available to the plants. It is essential for synthesis of tryptophan amino acid,

which forms IAA (Indole Acetic Acid) its deficiency causes chlorosis of older leaves.

119. For assimilation of one CO_2 molecule, the energy required in form of ATP and NADPH_2 are

- (a) 2 ATP and 2 NADPH_2
- (b) 5 ATP and 3 NADPH_2
- (c) 3 ATP and 2 NADPH_2
- (d) 18 ATP and 12 NADPH_2 .

Answer and Explanation:

119. (c): Photosynthesis is actually oxidation reduction | process in which water is oxidised and CO_2 is reduced to carbohydrates. The reduction of CO_2 to carbohydrates, needs assimilatory powers, i.e., ATP and NADPH ,. The process of photosynthesis involves two steps-

- (i) Light dependent phase or photochemical reaction.
- (ii) Light independent phase or dark reaction.

In calvin cycle, CO_2 acceptor molecule is RuBP or RuDP. The enzyme catalyzing this reaction is RuBP-carboxylase/ oxygenase (Rubisco). As Calvin cycle takes in only one carbon (as CO_2) at a time, so it takes six turns of the cycle to produce a net gain of six carbons (i.e., hexose or glucose). In this cycle, for formation of one mole of hexose sugar (Glucose), 18 ATP and 12 NADPH_2 are used. For 6 molecules of CO_2 it needs 18 ATP and 12 NADPH , molecules so for one molecule of CO_2 it needs 3 ATP and 2 NADPH_2 molecules.

120. Which is the first CO_2 acceptor enzyme in C_4 PLANTS?

- (a) RuDP carboxylase
- (b) phosphoric acid

(c) RUBISCO

(d) PEP-carboxylase.

Answer and Explanation:

120. (d): Refer answer 86.

121. Which hormone is responsible for fruit ripening?

(a) ethylene

(b) auxin

(c) ethyl chloride

(d) cytokinin.

Answer and Explanation:

121. (a): Ethylene is a growth inhibiting phytohormone.

It has been established that ethylene is fruit ripening hormone. Ethylene stimulates all the biochemical changes which take place upto fruit ripening. It might be increasing permeability of membranes of cells in the tissues before ripening of fruits. Ethylene might be producing certain enzymes, essential for fruit ripening.

122. By which action a seed coat becomes permeable, to water

(a) scarification

(b) stratification

(c) vernalization

(d) all of the above.

Answer and Explanation:

122. (a): Scarification means the application of those methods by which the hard seed coat is ruptured or softened so that it becomes permeable to water, gases and the embryo can expand. There are two methods of scarification as mechanical scarification and chemical scarification. This helps in overcoming seed dormancy.

123. The movement of ions against the concentration gradient will be

(a) active transport

(b) osmosis

(c) diffusion

(d) all of the above

Answer and Explanation:

123. (a): Active transport involves movement of materials across the membrane against the concentration gradient of the solute particles. It requires energy in the form of ATP and carrier molecules.

124. Mg is a component of

(a) chlorophyll

(b) cytochrome

(c) haemoglobin

(d) haemocyanin.

Answer and Explanation:

124. (a): Magnesium is important constituent of chlorophyll, thus is found in all green plants and essential for photosynthesis. Iron is constituent of cytochrome and haemoglobin. Copper is present in haemocyanin.

125. If the apical bud has been removed then we observe

- (a) more lateral branches
- (b) more axillary buds
- (c) plant growth stops
- (d) flowering stops.

Answer and Explanation:

125. (a): Apical dominance is the phenomenon by which presence of apical bud does not allow the nearby lateral buds to grow. When apical bud is removed the lateral buds sprout.

126. Which pair is wrong?

- (a) C₃-maize
- (b) C₄-kranz anatomy
- (c) Calvin cycle-PGA
- (d) Hatch and Slack cycle – O.A.A.

Answer and Explanation:

126. (a): For a long time, Calvin cycle (C₃ cycle) was considered to be the only photosynthetic pathway for reduction of CO₂ into carbohydrates. M.D. Hatch and Slack (1966) reported that a 4-C compound oxaloacetic acid (OAA) is the first stable product in CO₂ reduction process. This led to an alternative pathway of CO₂ fixation which is known as Hatch and Slack's cycle or C₄ cycle. It occurs in sugarcane, maize etc. These C₄ plants have a characteristic leaf anatomy called Kranz anatomy.

127. Which hormone breaks dormancy of potato tuber?

- (a) gibberellins

(b) IAA

(c) ABA

(d) zeatin.

Answer and Explanation:

127. (a): Gibberellin is the hormone that breaks seed/ bud dormancy. The tubers of potato reproduce vegetatively to give rise to new plants. So the dormancy of these tubers can be overcome by applying gibberellin to tubers.

128. Hormone responsible for senescence is

(a) ABA

(b) auxin

(c) GA

(d) cytokinin.

Answer and Explanation:

128. (a): Abscissic acid is a growth inhibiting phytohormone. It induces senescence in leaves by promoting the degradation of chlorophyll and proteins. Auxin is a growth promoting phytohormone that results in cell division, cell enlargement and apical dominance. Cytokinin is a growth promoting phytohormone that causes cell division, morphogenesis and seedling growth. Gibberellins are growth promoting phytohormone that results in overcoming seed dormancy and bolting.

129. Which of the following prevents the fall of fruits?

(a) GA3

(b) NAA

(c) ethylene

(d) zeatin.

Answer and Explanation:

129. (b): α -Naphthalene acetic acid (NAA) is a synthetic or exogenous auxin. It prevents the formation of abscission layer, which is a layer of dead cells in the petiole and pedicel that causes fall of leaf or fruit. NAA prevents formation of this layer and so it prevents fall of leaf or fruit.

130. Loading of phloem is related to

- (a) increase of sugar in phloem
- (b) elongation of phloem cell
- (c) separation of phloem parenchyma
- (d) strengthening of phloem fiber.

Answer and Explanation:

130. (a): When the phloem cells, just near the source, for example green leaves attain higher concentration of sugars, it is called the process of phloem loading. Sucrose is photosynthesised in the chloroplasts of mesophyll cells of leaves. Mesophyll cells are connected with each other through plasmodesmata. Similarly plasmodesmata are also present between the mesophyll cells and companion cells and also between mesophyll cells and sieve tubes. These plasmodesmata are the "channels" meant for the passage of sucrose.

131. Which pigment system is inactivated in red drop?

- (a) PS-I and PS-II
- (b) PS-I
- (c) PS-II
- (d) none of the above.

Answer and Explanation:

131. (c): Emerson and Lewis worked on Chlorella and Calculated the quantum yield for different wavelengths. Emerson observed that rate of photosynthesis declines in the red region of the spectrum. This decline in photosynthesis is called "Red drop". It was observed that the quantum yield falls when the light of wavelengths more than 680 or 690 nm are supplied. As the PS-II (P- 680) is driven by red light, so it remains inactive during red drop.

132. Which plant is LDP?

- (a) tobacco
- (b) Glycine max
- (c) Mirabilis jalapa
- (d) spinach.

Answer and Explanation:

132. (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

133. What is true for photolithotrops?

- (a) obtain energy from radiations and hydrogen from organic compounds
- (b) obtain energy from radiations and hydrogen from inorganic compounds
- (c) obtain energy from organic compounds
- (d) obtain energy from inorganic compounds.

Answer and Explanation:

133. (b): Photolithotrophs are those plants that obtain energy from radiation and hydrogen from inorganic compounds.

134. Glycolate induces opening of stomata in

- (a) presence of oxygen
- (b) low CO₂ concentration
- (c) high CO₂
- (d) CO₂ absent.

Answer and Explanation:

134. (b): Zelitch (1963) suggested that glycolic acid is formed in the guard cells. This acid is formed under low concentration of CO₂. Glycolate formed gives rise to carbohydrates. Under this condition, osmotically active material is produced and ATP synthesis also takes place. ATP is produced during glyoxylate- glycolate shuttle. This ATP helps in the active pumping of water in the guard cells and stomata open. Stomata close when this process is reversed.

135. Passive absorption of minerals depend on

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

Answer and Explanation:

135. (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.

136. Cytochrome is

- (a) metallo flavo protein
- (b) Fe containing porphyrin pigment
- (c) glycoprotein
- (d) lipid.

Answer and Explanation:

136. (b): Cytochromes are electron transferring proteins often regarded as enzymes. They contain iron porphyrin or copper porphyrin as prosthetic groups. Cytochrome a, b and c are hemochromogens widely occurring in cells and acting as oxygen carriers during cellular respiration.

137. What is the best pH of the soil for cultivation of plants?

- (a) 3.4 – 5.4
- (b) 6.5 – 7.5
- (c) 4.5 – 8.5
- (d) 5.5 – 6.5.

Answer and Explanation:

137. (d): Soil may be alkaline, acidic or neutral depending upon its pH. Highly acidic and highly saline, alkaline soil often remain injurious for plant growth, microorganisms etc. Soil pH strongly affects the microbial activities. Neutral or slightly acidic soil (5.5 – 6.5) remains best for the growth of majority of plants.

138. Which aquatic fern performs nitrogen fixation?

- (a) Azolla
- (b) Nostoc
- (c) Salvia
- (d) Salvinia.

Answer and Explanation:

138. (a): Azolla is an aquatic fern which is inoculated in the rice field to increase the yield. Azolla contain nostoc andcmabaena (BGA) in its leaves cavities which perform nitrogen fixation.

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

- (a) carrot
- (b) soyabean
- (c) mustard
- (d) radish.

Answer and Explanation:

139. (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.

140. Which pigment absorbs the red and far-red light?

- (a) cytochrome
- (b) phytochrome
- (c) carotenoids

(d) chlorophyll.

Answer and Explanation:

140. (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., PK and PKR (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.

During night or dark:

CO₂ conc. increases in sub-stomatal cavities —» ABA participation K⁺ ions exchange stopped —» K⁺ ions transported back into subsidiary cells —> Decreased pH —> Starch synthesized in guard cells —» Decreased O.P. of guard cells —» Exosmosis from guard cell —» Stomata close.

141. Opening and closing of stomata is due to the

- (a) hormonal change in guard cells
- (b) change in turgor pressure of guard cells
- (c) gaseous exchange
- (d) respiration.

Answer:

(b) change in turgor pressure of guard cells

142. In photosynthesis energy from light reaction to dark reaction is transferred in the form of

- (a) ADP
- (b) ATP
- (c) RuDP
- (d) chlorophyll.

Answer and Explanation:

142. (b): Photosynthesis consists of light dependent phase and light independent phase or dark reaction. In light dependent phase occurs in grana fraction of chloroplast. It involves cyclic and non-cyclic photophosphorylation where assimilatory powers (ATP and NADPH₂) are produced. In dark reaction, which occurs in stroma fraction of chloroplast, actual reduction of CO₂ to carbohydrates takes place using the assimilatory powers (ATP and NADPH₂) produced in the light dependent phase.

It needs 18 ATP and 12 NADPH₂ molecules to produce one molecule of glucose.

143. Which of the following absorb light energy for photosynthesis?

- (a) chlorophyll
- (b) water molecule
- (d) RuBP.

Answer and Explanation:

143. (a): Photosynthesis occurs in chloroplasts that contain photosynthetic pigments – chlorophylls, carotenoids etc. The light energy required for photosynthesis comes from sunlight. The sunlight travels in the form of small particles called photons. Each photon has a quantum of energy.

This quantum of energy is absorbed by single antenna chlorophyll and then migrates from one molecule to the other till it reaches the reaction center. The reaction center is P 700 chlorophyll that releases electron as a result of

transferred energy. This electron is transferred between various acceptors and generates ATP and NaDPH₂ in the light reaction of photosynthesis.

144. Main function of lenticel is

- (a) transpiration
- (b) guttation
- (c) gaseous exchange
- (d) bleeding.

Answer and Explanation:

144. (c): Lenticels generally appear under stomata. The lenticel of phellogen itself also has intercellular spaces. Because of this relatively open arrangement of cells, the lenticels are regarded as structures permitting the entry of air through the periderm.

Lenticels are characteristics of woody stem but they are also found in roots of trees and other perennials for entry of oxygen through them.

145. Choose the correct match Bladderwort, sundew, venus flytrap:

- (a) Nepenthes, Dionea, Drosera
- (b) Nepenthes, Utricularia, Vanda
- (c) Utricularia, Drosera, Dionea
- (d) Dionea, Trapa, Vanda.

Answer and Explanation:

145. (c): Bladderwort or Utricularia is a rootless free floating insectivorous plant. Its stem is green and bears green lobed or dissected leaves. Some lobes of the leaves become modified into bladder like structures for catching insects. Sundew or Drosera is another insectivorous plant which has leaves that are green and

bear many glandular hairs or tentacles having shining droplets to attract the insects and later trap them. Venus fly trap or *Dionea* is also an insectivorous plant in which the leaf is modified into two jaws like structures.

Each jaw has long sensitive hairs on its upper surface and also has many digestive enzymes. These jaws interlock to trap the insect that enters in it. Thus *Utricularia*, *Drosera* and *Dionea* are all insectivorous plants.

146. Seed dormancy is due to the

- (a) ethylene
- (b) abscisic acid
- (c) IAA
- (d) starch.

Answer and Explanation:

146. (b): Viable seeds of some plants are unable to germinate even after getting all the necessary conditions. This inability of viable seeds to germinate even under favorable conditions is called dormancy of seeds. This is considered to be due to some barriers or blocks inside the seeds.

Some common causes of seed dormancy are:

- (i) Mechanically hard seed coat, which does not allow proper growth of embryo inside it, e.g., *Brassica campestris*.
- (ii) Presence of impermeable (impervious) seed coat to H_2O , e.g. many seeds of legumes.
- (iii) Presence of impermeable seed coat to oxygen; e., g. *Xanthium* (cocklebur).
- (iv) Presence of germination inhibitors like ABA (abscisic acid) and phenolics, etc., in seed coat or fruit pulp, e.g., in tomato, inhibitor is present in fruit pulp.

Seed coats may contain relatively high concentrations of growth inhibitors that can suppress germination of the embryo. Absciscic acid (ABA) is a common germination inhibitor present in the seed coats. Repeated washing and heavy rainfall removes such substances from the seed coat.

147. Cellular totipotency is demonstrated by

- (a) only gymnosperm cells
- (b) all plant cells
- (c) all eukaryotic cells
- (d) only bacterial cells

Answer and Explanation:

147. (b): Most of the plant cells are totipotent but in animal cells only fertilized egg (zygote) and embryonic stem cells are totipotent. Animal cells have pluripotency which means the potential ability of a cell to develop any type of the cell in the animal body, e.g. nerve cells or kidney cells or heart cells.

148. Which one of the following concerns photophosphorylation?

ADP + AMP ATP

- (b) ADP + Inorganic PQ,
- (c) ADP + Inorganic P_{O4} ATP
- (d) AMP + Inorganic PQ, ATP

Answer and Explanation:

148. (b): The light dependent and O_2 independent production of ATP from ADP + IP in the chloroplasts is called photophosphorylation. Photophosphorylation is of 2 types –

Cyclic photophosphorylation – It involves only PS-I, water is not utilized and so no oxygen is evolved. Here two ATP molecules are produced.

Non-cyclic photophosphorylation – It involves both PS- I and PS-II, water is utilized and so oxygen is evolved. Here one ATP molecule and one NADPH₂ molecule are produced.

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

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

Answer and Explanation:

149. (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-b has empirical formula of $C_{55}H_{70}O_6N_4Mg$. Its molecular structure is comparable with chlorophyll-a.

150. Stomata of CAM plants

- (a) are always open
- (b) open during the day and close at night
- (c) open during the night and close during the day
- (d) never open

Answer and Explanation:

150. (c): Stomatas of most plants open at sunrise and close in darkness to allow the entry of CO₂ needed for photosynthesis during the daytime. Certain succulents that are native to hot, dry conditions (e.g., cacti, Kalanchoe, and Bryophyllum) act in an opposite manner. They open their stomatas at night, fix carbon dioxide into organic acids in the dark, and close their stomatas during the day. This is an appropriate way to absorb CO₂ through open stomatas at night, when transpiration stress is low, and conserve water during the heat of the day. These plants show Crassulacean Acid Metabolism.

151. Differentiation of shoot is controlled by

- (a) high auxin : cytokinin ratio
- (b) high cytokinin : auxin ratio
- (c) high gibberellin : auxin ration
- (d) high gibberellin : cytokinin ratio

Answer:

- (b) high cytokinin : auxin ratio

152. In sugarcane plant ¹⁴CO₂ is fixed in malic acid, in which the enzyme that fixes CO₂ is

- (a) ribulose biphosphate carboxylase
- (b) phosphoenol pyruvic acid carboxylase
- (c) ribulose phosphate kinase
- (d) fructose phosphatase

Answer and Explanation:

152. (b): C₄ pathway was first reported in members of family Gramineae (grasses) like sugarcane, maize sorghum, etc..

These C-4 plants have a characteristic leaf anatomy called Kranz anatomy. So in chloroplasts of mesophyll cells – Phosphoenol pyruvic acid + Carbondioxide

Oxaloacetic acid

Oxaloacetic acid is a 4-C compound and is the first stable product so this pathway is known as C-4 cycle.

153. Stomata of a plant open due to

- (a) influx of potassium ions
- (b) efflux of potassium ions
- (c) influx of hydrogen ions
- (d) influx of calcium ions

Answer and Explanation:

153. (a): Refer answer 141.

154. Plants deficient of element zinc, show its effect on the biosynthesis of plant growth hormone

- (a) auxin
- (b) cytokinin
- (c) ethylene
- (d) abscisic acid

Answer and Explanation:

154. (a): Zinc is available to the plants for absorption in the divalent form. It occurs in the form of minerals as hornblende, magnetite, biotite etc., from where it is released by weathering.

It is involved in the synthesis of indole-acetic acid in plants. It is an activator in the enzyme tryptophan synthetase. Tryptophan is the precursor of Indole-acetic acid.

155. Which one of the following is wrong in relation to photorespiration?

- (a) it occurs in chloroplast
- (b) it occurs in day time only
- (c) it is a characteristic of C4 plants
- (d) it is a characteristic of C3 plants

Answer:

- (c) it is a characteristic of C4 plants

156. Which fractions of the visible spectrum of solar radiations are primarily absorbed by carotenoids of the higher plants?

- (a) blue and green
- (b) green and red
- (c) red and violet
- (d) violet and blue

Answer and Explanation:

156. (d): Carotenoids of higher plants are fat soluble compound that includes carotenes and xanthophylls. Most of them absorb light of violet and blue range. Green light is absorbed in less amounts.

157. *Nicotiana sylvestris* flowers only during long days and *N.tabacum* flowers only during short days. If raised in the laboratory under different photoperiods, they can be induced to flower at the same time and can be cross-fertilized to

produce self-fertile offspring. What is the best reason for considering *N.sylvestris* and *N.tabacum* to be separate species?

- (a) they cannot interbreed in nature
- (b) they are reproductively distinct
- (c) they are physiologically distinct
- (d) they are morphologically distinct

Answer and Explanation:

157. (a): According to biological species concept a species is a natural inbreeding or panmictic species or group of natural populations which have essentially similar morphological traits, they are genetically distinct and reproductively isolated from others. Since under laboratory conditions *N. labacum* and can produce self- fertile offspring so they are not reproductively isolated. They are considered as separate species because since their flowering periods are different so cross pollination is not possible between them naturally. This makes them different species.

158. Boron in green plants assists in

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

Answer and Explanation:

158. (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.

159. Coconut milk factor is

- (a) an auxin
- (b) a gibberellin
- (c) abscisic acid
- (d) cytokinin

Answer and Explanation:

159. (d): Many experiments were done to sustain the proliferation of normal stem tissues in culture. The growth of culture was most dramatic when the liquid endosperm of coconut, also known as coconut milk, was added to the culture medium. This finding indicated that coconut milk contains a substance or substances that stimulate mature cells to enter and remain in the cell division cycle. Eventually coconut milk was shown to contain the cytokinin zeatin, but this finding was not obtained until several years after the discovery of the cytokinins. The first cytokinin to be discovered was the synthetic analog kinetin.

160. Gray spots of oat are caused by deficiency of

- (a) Cu
- (b) Zn
- (c) Mn
- (d) Fe

Answer and Explanation:

160. (c): Gray spot diseases of oat is caused due to deficiency of manganese. Its symptoms include greyish – brown elongated specks and streaks, empty panicles, interveinal chlorosis on stem and leaves.

The symptoms that occur only on leaves are irregular, greyish brown lesions which coalesce and bring about collapse of leaf. This is called grey speck symptom.

161. If by radiation all nitrogenase enzyme are inactivated, then there will be no

- (a) fixation of nitrogen in legumes
- (b) fixation of atmospheric nitrogen
- (c) conversion from nitrate to nitrite in legumes
- (d) conversion from ammonium to nitrate in soil.

Answer and Explanation:

161. (a): The process by which N_2 is reduced to NH_4^+ is called nitrogen fixation. Nitrogenase enzyme catalyzes this reduction. It is only carried out by prokaryotic microorganisms. Principal N_2 -fixers include certain free living cyanobacteria in symbiotic associations with fungi in lichens or with ferns, mosses, and liverworts, and by bacteria or other microbes associated symbiotically with roots, especially those of legumes. About 15 percent of the nearly 20,000 species in the fabaceae (Leguminosae) family have been examined for N_2 fixation, and approximately 90 percent of these have root nodules in which fixation occurs. So without active nitrogenase enzyme there will be no N_2 fixation in legumes.

162. One set of the plant was grown at 12 hours day and 12 hours night period cycles and it flowered while in the other set night phase was interrupted by flash of light and it did not produce flower. Under which one of the following categories will you place this plant?

- (a) long day
- (b) darkness neutral
- (c) day neutral
- (d) short day.

Answer and Explanation:

162. (d): Plants require a day length or light period for flowering, this light period is called as photoperiod. It was first studied by Garner and Allard (1920).- Short day plants (SDP's) flower in photoperiods less than critical day length, e.g., *Nicotiana tabacum*, *Glycine max* (Soybean), *Xanthium strumarium*. Further these plants require long uninterrupted dark period and hence are called long night plants.

Long day plants (LDP's) flower in photoperiod more than critical day length, e.g., *Hyocymus niger* (Henbane), radish, Beta, spinach, *Plantago*, etc. Day neutral plants flower in any photoperiod, e.g., tomato, maize, cucumber, etc.

163. In C₃ plants, the first stable product of ' photosynthesis during the dark reaction is

- (a) malic acid
- (b) oxaloacetic acid
- (c) 3-phosphoglyceric acid
- (d) phosphoglyceraldehyde.

Answer and Explanation:

163. (c): The calvin cycle is also known as C₃ cycle because CO₂ reduction is cyclic process and first stable product in this cycle is a 3-C compound (i.e., 3-phosphoglyceric acid or 3-PGA).

In this cycle, CO₂ acceptor molecule is RuBP or RuDP (i.e., Ribulose 1, 5-biphosphate or Ribulose 1, 5- diphosphate). There occurs covalent bonding of CO₂ to RuBP and the enzyme catalyzing this reaction is RuBP- carboxylase/oxygenase (Rubisco).

164. Cell elongation in internodal regions of the green plants takes place due to

- (a) indole acetic acid

- (b) cytokinins
- (c) gibberellins
- (d) ethylene.

Answer and Explanation:

164. (c): Gibberellins play a role in the elongation of internodes in 'rosette' plants. Before reproductive stage there is too much elongation of internodes but there is less leaf formation. An elongated internode without leaves is called a "bolt" like structure and the process is called "bolting" flowering takes place after bolting. Gibberellins induce cell division and cell elongation, when bolting takes place.

165. Plants adapted to low light intensity have

- (a) larger photosynthetic unit size than the sun plants
- (b) higher rate of CO₂ fixation than the sun plants
- (c) more extended root system
- (d) leaves modified to spines.

Answer:

- (a) larger photosynthetic unit size than the sun plants

166. Anthesis is a phenomenon which refers to

- (a) reception of pollen by stigma
- (b) formation of pollen
- (c) development of anther
- (d) opening of flower bud.

Answer and Explanation:

166. (d): Anthesis is the process of opening floral buds. Reception of pollen by stigma is called pollination. Formation of pollen is called microsporogenesis.

167. Which of the following propagates through leaf- tip?

(a) walking fern

(b) sprout-leaf plant

(c) Marchantia

(d) moss.

Answer and Explanation:

167. (a): In *Adiantum caudatum*, adventitious buds develop at the leaf tips. When such leaf tips happen to touch the soil, they form new plant. This process helps in propagation of this fern to a large area. *Adiantum caudatum* is commonly called as walking fern.

168. The ability of the Venus Flytrap to capture insects is due to

(a) specialized “muscle-like” cells

(b) chemical stimulation by the prey

(c) a passive process requiring no special ability on the part of the plant

(d) rapid turgor pressure changes.

Answer and Explanation:

168. (d): Thigmonastic movements are exhibited by some insectivorous plants such as *Dionaea*, venus Fly trap, *Drosera* etc. These plants have tentacles, which are sensitive to the stimulus of touch. In the case of the venus flytrap turgor pressure changes occur in which hydrogen ions are rapidly pumped into the walls of cells on the outside of each leaf in response to the action potentials from the trigger hairs. The protons apparently loosen the cell walls so rapidly that the

tissue actually becomes flaccid so that cells quickly absorb water, causing the outside of each leaf to expand and the trap to snap shut.

169. Photosynthesis in C₄ plants is relatively less limited by atmospheric CO₂ levels because

- (a) effective pumping of CO₂ into bundle sheath cells
- (b) rubisco in C₄ plants has higher affinity for CO₂
- (c) four carbon acids are the primary initial CO₂ fixation products
- (d) the primary fixation of CO₂ is mediated via PEP carboxylase.

Answer and Explanation:

169. (d): Photosynthetic rates are enhanced not only by increased irradiance levels but also by higher CO₂ concentrations. The additional CO₂ decreases photorespiration by increasing the ratio of CO₂ to O₂ reacting with rubisco. Photorespiration decreases with increasing CO₂ to O₂, ratios, which leads to faster net photosynthesis.

At high CO₂ concentrations, high irradiance levels increase photosynthesis more than at low CO₂ concentrations, and that to saturate photosynthesis a high than at low irradiance levels. In contrast, photosynthesis of C₄ species is generally saturated by CO₂ levels near 400 μ l/l. just above normal atmospheric concentrations, even at high irradiance levels in which demands for CO₂ are greatest.

Some C₄ species are even saturated by normal atmospheric CO₂ concentrations. Both plants fix CO₂ until the CO₂ compensation point of the C₃ plant is reached, but the C₄ plant will photosynthesize at still lower CO₂ concentrations using CO₂ lost by respiration.

The lower CO₂ compensation points in C₄ than in C₃ species arise from the much lower photorespiratory release of CO₂ by C₄ plants.

170. Photosynthetic Active Radiation (PAR) has the following range of wavelengths.

(a) 340-450 nm

(b) 400-700 nm

(c) 500-600 nm

(d) 450-950 nm.

Answer and Explanation:

170. (b): Wavelengths between 400 and 700 nm, which comprise the visible range of electromagnetic spectrum are capable of causing photosynthesis. These are called photosynthetically active radiations. Chlorophyll a and b absorb too much light in the blue and red region of spectrum of light. Carotenoids mostly absorb is the blue region of the spectrum.

171. As compared to a C3-plant, how many additional molecules of ATP are needed for net production of one molecule of hexose sugar by C4-plants?

(a) two

(b) six

(c) twelve

(d) zero.

Answer:

(c) twelve

172. The deficiencies of micronutrients, not only affects growth of plants but also vital functions such as photosynthetic and mitochondrial electron flow. Among the list given below, which group of three elements shall affect most, both photosynthetic and mitochondrial electron transport?

(a) Co, Ni, Mo

(b) Ca, K, Na

(c) Mn, Co, Ca

(d) Cu, Mn, Fe.

Answer and Explanation:

172. (d): Iron is mainly available in the ferrous form and it is absorbed in the ferric form, also. It is a part of catalases, peroxidases, cytochromes etc. and plays a role

in electron transport system in photosynthesis. Manganese is absorbed by the plants when it is in the bivalent form. Manganese participates in the photolysis of water in pigment system II during photosynthesis and thus it helps in the electron transport from water to chlorophyll.

Copper is absorbed on the clay particles as divalent cations, from where it can be absorbed by the plants by exchange mechanism. It is constituent of plastocyanin which takes part in electron transport during photosynthetic phosphorylation.

173. Potometer works on the principle of

(a) osmotic pressure

(b) amount of water absorbed equals the amount transpired

(c) root pressure

(d) potential difference between the tip of the tube and that of the plant.

Answer and Explanation:

173. (b): Potometer is an instrument or apparatus with the help of which, rate of transpiration can be measured. Main types of potometers are as under:

Simple potometer. Farmer's potometer and Ganong's | potometer.

The whole instrument is made of glass and is consisted of a long tube, having a side tube, bent at right angles. A fresh plant shoot is cut under water and is

inserted into the side tube through a cork, fitted into the mouth of this tube. The whole apparatus is filled with water and the joints are made air tight. The apparatus is placed in the sunlight.

Air bubble enters the tube and after this lower end of the tube is placed in the beaker, containing water. Water is absorbed by the shoot and is transpired through the leaves. Transpiration pull is created and the air bubble begins to move along with the transpiration pull. Readings are taken for the air bubble and thus amount of water absorbed and transpired is calculated.

174. The translocation of organic solutes in sieve tube members is supported by

- (a) cytoplasmic streaming
- (b) root pressure and transpiration pull
- (c) P-proteins
- (d) mass flow involving a carrier and ATP

Answer and Explanation:

174. (c): P-proteins (Phloem proteins) are components found in large amounts in phloem sieve tubes.

The main function of these bodies is to seal off the sieve tube element or sieve cell by bringing about the blockage of sieve plate. These bodies perform this function when the sieve element is injured. These bodies and callose together block the pores of sieve tube elements. P-Protein bodies and callose form blocking plugs. These bodies remain along the walls of sieve tube elements. A P-Protein body are assigned some in the translocation of food material in the sieve tubes but is not universally accepted.

175. In photosystem-I, the first electron acceptor is

- (a) an iron-sulphur protein
- (b) ferredoxin

(c) cytochrome

(d) plastocyanin

Answer and Explanation:

175. (a): In light reaction of photosynthesis two types of photosystems are involved. PS-I consists of plenty of chlorophyll-a and very less quantity of chlorophyll-b. These pigments absorb light energy and transfer it to the reaction centre – P-700. After absorbing adequate amount of light energy electron gets excited from P-700 molecule and moves to iron-sulphur protein complex, designated as A (Fe-S). It gets reduced after accepting electrons. It later gives these electron to ferredoxin and gets oxidized again.

176. During photorespiration, the oxygen consuming reaction(s) occur in

(a) stroma of chloroplasts

(b) stroma of chloroplasts and mitochondria

(c) stroma of chloroplasts and peroxisomes

(d) grana of chloroplasts and peroxisomes

Answer and Explanation:

176. (c): Photorespiration is a process the rate of which increases under the influence of light, CO₂ is released and O₂ is used but no ATP is formed. It involves three organelles chloroplasts, mitochondria and peroxisomes.

In chloroplast O₂ is utilized as, ribulose biphosphate is oxidised and a molecule of phosphoglycolic acid and a molecules of 3-phosphoglyceric acid are formed. This oxidation takes place under the influence of high light intensity. Ribulose diphosphate carboxylase, an enzyme, facilitates this reaction as it behaves as an oxygenase. Only one molecule of oxygen is fixed here.

177. Sulphur is an important nutrient for optimum growth and productivity in

(a) oilseed crops

(c) cereals

(b) pulse crops

(d) fibre crops

Answer and Explanation:

177. (a): Sulphur is present in all the cells of the body in association with proteins made of sulphur containing amino acids, viz., cystine, cysteine and methionine. Members of Cruciferae and animal proteins are rich sources of sulphur; other vegetable proteins (e.g., pulses) have only little sulphur.

Plants absorb sulphur from soil in the form of sulphate ions (SO_4^{2-}). It is a constituent of ferredoxin and some of the lipids present in chloroplasts. Pungent flavour and odour of mustard, cabbage, turnip etc. of family Brassicaceae is due to the presence of sulphur containing oils. Application of 40 kg S/ha to oilseed based cropping system is found to increase the yield, oil and protein content of the seeds.

178. Treatment of seeds at low temperature under moist conditions to break its dormancy is called

(a) stratification

(b) scarification

(c) vernalization

(d) chelation

Answer and Explanation:

178. (c): Vernalization is the method of promoting flowering by exposing young plants to cold treatment e.g., winter varieties of wheat, barley, oats and rye are given artificial cold treatment and planted in spring in areas of very harsh winters such as Soviet Union to promote flowering in them.

In most cereals optimum temperature for vernalization is 4°C Receptive organ to chilling is the apical meristem

Chelation is the process by which certain micronutrients are treated to keep them readily available to a plant once they are introduced into the soil. Stratification is a process by which seeds are pretreated to simulated winter conditions so that germination may occur. The degradation of the seed coat is called scarification. This process permits water to pass through the seed coat so that embryo can begin metabolism.

179. How does pruning help in making the hedge dense?

- (a) it releases wound hormones
- (b) it induces the differentiation of new shoots from the rootstock
- (c) it frees axillary buds from apical dominance
- (d) the apical shoot grows faster after pruning

Answer and Explanation:

179. (c): Pruning is the process of cutting shoot tips to promote lateral growth of branches. Removal of shoot tips involves removal of apical buds. In the shoot tips auxins are produced. Auxins are growth promoting phytohormones.

They cause apical dominance by promoting the growth of apical buds and suppressing the growth of axillary buds. So when the auxins produced in the shoot tips are removed by decapitation it results in lateral growth and plants thus show bushy appearance. This is because of a relatively high concentration of auxin in the apical bud than in the lateral buds.

180. Farmers in a particular region were concerned that pre-mature yellowing of leaves of a pulse crop might cause decrease in the yield. Which treatment could be most beneficial to obtain maximum seed yield?

- (a) application of iron and magnesium to promote synthesis of chlorophyll

(b) frequent irrigation of the crop

(c) treatment of the plants with cytokinins along with a small dose of nitrogenous fertilizer

(d) removal of all yellow leaves and spraying the remaining green leaves with 2, 4, 5-trichlorophenoxy acetic acid.

Answer and Explanation:

180. (c): Nitrogen is the fourth most abundant element. Chief source of Nitrogen for plants is nitrates of Ca and K. It is important for plants as it is a component of nucleic acids, proteins chlorophyll and cytochromes. Deficiency of nitrogen causes poor root development, lower respiration rate, chlorosis of older leaves etc. Cytokinins are also very important for plant development they are associated with the control of apical dominance, i fruit development, root growth, cambial activity.

So a nitrogenous fertilizer like NPK and Cytokinins are most beneficial to the plant.

181. An enzyme that can stimulate germination of barley seeds is

(a) invertase

(b) α -amylase

(c) lipase

(d) protease

Answer and Explanation:

181. (b): The process by which the dormant embryo of seed resumes active growth and forms a seedling is known as germination.

The initial step in germination process is the uptake of water and rehydration of the seed tissues by the process of imbibition. The first visible sign of germination is the emergence of the radicle from the seed. But this event is preceded by a

series of biochemical reactions. Imbibition of water causes the embryo within seed to produce α - and P-amylases. These enzymes hydrolyze the starch stored in endosperm into glucose which is necessary for use both as a respiratory substrate and as a source of carbon skeletons of the molecules needed for growth.

182. A plant requires magnesium for

- (a) protein synthesis
- (b) chlorophyll synthesis
- (c) cell wall development
- (d) holding cells together.

Answer and Explanation:

182. (b): Magnesium is an important constituent of ; chlorophyll, found in all green plants and essential for photosynthesis. The chlorophyll molecule has a tetrapyrrolic or porphyrin head and a phytol tail. Mg atom is present in the centre of porphyrin head, it is like tennis racket.

183. Two cells A and B are contiguous. Cell A has osmotic pressure 10 atm, turgor pressure 7 atm and diffusion pressure deficit 3 atm. Cell B has osmotic pressure 8 atm, turgor pressure 3 atm and diffusion pressure deficit 5 atm. The result will be

- (a) no movement of water
- (b) equilibrium between the two
- (c) movement of water from cell A to B
- (d) movement of water from cell B to A.

Answer and Explanation:

183. (c): Diffusion pressure deficit is the reduction in the diffusion pressure of water in a system over its pure state. It is given by $DPD = O.P - W.P (T.P)$. DPD

determines the direction of net movement of water. It is always from an area or cell of lower DPD to the area or cell of higher DPD. So, cell A having lower DPD, water will move from cell A to B.

184. Opening of floral buds into flowers, is a type of

- (a) autonomic movement of variation
- (b) paratonic movement of growth
- (c) autonomic movement of growth
- (d) autonomic movement of locomotion.

Answer and Explanation:

184. (c): Movement may be of two types, movement of locomotion and movement of curvature. Movement of curvature is movement of individual parts in relation to other parts. Curvature movement may be growth movements and turgor movements. Growth movements are caused by differential growth in different part of an organ. Opening of floral buds into flowers is such a type of growth movement. Mostly floral bud opening shows thermonastic movement i.e. opening and closing are controlled by temperature. Sometimes movements are controlled by presence or absence of light, eg. Oxalis.

185. The first acceptor of electrons from an excited chlorophyll molecule of photosystem II is

- (a) iron-sulphur protein
- (b) ferredoxin
- (c) quinone
- (d) cytochrome.

Answer and Explanation:

185. (c): Type I photosystems use ferredoxin like iron- sulphur cluster proteins as terminal electron acceptors, while type II photosystems ultimately shuttle electrons to a quinone terminal electron acceptor. One has to note that both reaction centres types are present in chloroplasts of plants and cyanobacteria, working together to form an unique photosynthetic chain able to extract electrons from water, evolving oxygen as a byproduct.

186. In the leaves of C₄ plants, malic acid formation during CO₂ fixation occurs in the cells of

- (a) bundle sheath
- (b) phloem
- (c) epidermis
- (d) mesophyll.

Answer and Explanation:

186. (d): C₄ cycle occurs in some tropical plants like maize which have Kranz anatomy. Bundle sheath chloroplasts are larger, agranal and without PS-II activity. Mesophyll cells fix CO₂ with the help of PEP in presence of PEPase to form OAA. This OAA is converted to malic acid and stored for transport to bundle sheath.

187. Which one of the following elements is not an essential micronutrient for plant growth?

- (a) Zn
- (b) Cu
- (c) Ca
- (d) Mn.

Answer and Explanation:

187. (c): Calcium is an essential macronutrient for plant growth. Macronutrients are essential elements which are required by plants in quantity more than 1 mg/g dry matter. It is used as calcium pectinate for the formation of middle lamella in cell wall for lipid metabolism, for cell division and cell enlargement, helps in translocation of carbohydrates and also activates enzyme activity in plants. All other like Zn, Cu and Mn are micronutrients of plants.

188. Which one of the following pairs, is not correctly matched?

- (a) gibberellic acid – Leaf fall
- (b) cytokinin – Cell division
- (c) IAA – Cell wall elongation
- (d) abscissic acid – Stomatal closure.

Answer and Explanation:

188. (a): Gibberellic acid is a simple weakly acidic plant growth hormone which promotes cell elongation of both leaves and stems in general and internodal length of genetically dwarf plants in particular. It is in general a growth promoting hormone and does not inhibit growth. So leaf abscission is not associated with gibberellic acid but with abscissic acid.

189. The wavelength of light absorbed by Pr form of phytochrome is

- (a) 680 nm
- (b) 720 nm
- (c) 620 nm
- (d) 640 nm.

Answer and Explanation:

189. (a): Phytochrome is the photoreceptor pigment that controls flowering. It has two forms as Pr and Pfr. Pr is bluish phytochrome it absorbs light at 660 to

680 nm of wavelength. Pfr is (far red) yellowish green and absorbs light at 730 nm of wavelength.

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