BIOLOGY

NEET & AIIMS

PHOTOSYNTHESIS IN HIGHER PLANTS

Example

1. Why do chloroplasts aligh, thhemselves along the walls of the mesopgyll cells ?

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2. Why do chloroplast align themseles in vertical position along the lateral walls of the lateral walls of the mesphyll cells ?

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3. which molecule in non-cyclic photophsphorylation donates electron to PS II ?

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4. Cyclic photophosphorylation occurs when only light of wavelengths _____ are available.

(i) Below 680 nm (ii) Beyond 680 nm

(iii) 400 nm and below (iv) Beyond 400 nm

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5. Why NADPH + H^+ is not synthesize3d during the cyclic photophosphorylation ?

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6. Why do the C_4 plants show better yield and high productivity than C_3 plants ?

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7. What is the net consumpition of ATP and NADPH for every CO_2 molecule fixed in C_4 plants ?

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8. How the light intensity affects the rate of photosynthesis ?

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9. Define the law of limiting factors.

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Try Yourself

1. One which greem alga, action specturm of potosntheic pigents was studed by Engelmann ?

A. Nostoc

B. Cladophora

C. Chlorella

D. Scenedesmus

Answer: B

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2. Dark reactions of phtosynthesis occur in

A. Grana

B. Thylakoid

C. Stroma lamellae

D.) Stroma

Answer: D

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3. Mark out the incrorect statement

A. PS II is found ini both grana and stoma lamellae

B. PS II is involved in photolysis of water

C. PS II participates in both cyclic as well as non-cyclc flow of electrons

D. The raction centre in PS II is P_{680}

Answer: A

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4. An esternal souce of electrons is not required in

A. Cyclic photophosphorylation

B. Non-cyclic photophosporyation

C. Z-scheme of flow of elections

D. All of these

Answer: A

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5. Regeneration step in C_3 cycle per Co_2 fixation requires

A. 1ATP

B. 6 ATP

C. 1NADPH $+ H^+$ and 1 ATP

D. 3 ATP and 2 NADPH $+ H^+$

Answer: A

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6. The primary enzyme necessary for carboxylation in C_4 plants is presnt in

A. Chloroplast of mesophyll cells

B. Cytoplasm of mesophyll cells

C. Cytoplasm of bundle sheath cells

D. Chlorplast of bundle sheath cells

Answer: B

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Exercise

1. Select the incorect statement w.r.t photosyntheseis

A. Anabolic , endergonic and redox process

B. Physico- chemical process using light energy to drive the synthesis of organic compounds

C. of the total world's photosynthesis , 90% is carried out by fresh water plants

D. Annually 4×10^{13} kg of carbon is fixed through photosythesis in biosphere

Answer: C

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2. Action spectrum of photosyntheic pigments was studied by Englemann on _____ in the presence of _____ bacteria

A. Spirogyra , Anaerobic

B. Cladphora , Aerobic

C. Chlorella , Aerobic

D. Scenedesmus, Anaerobic

Answer: B

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3. Anoxygeni and oxygenic photosynthesis are respectively shown by

A. Green algae & algae

B. Red algae & monocots

C. Pigmented sulphur bacteria & cyanobacteria

D. BGA & higher plants

Answer: C

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4. OEC is located in/on

A. Outer surface of granal membrane

B. Lumen of stoma lamellae

C. inner surface on thylakoid membrane

D. Stroma

Answer: C

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5. Pigments are organised into two discrete photochemical light harvesting complexes within the PSI and PS II These are named in

A. The sequence of discovery

B. Which they funcation in light reaction

C. The sequence of arrangment of chlorophylls

D. More than one option is corect

Answer: A

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6. Select incorrt statatment

A. Each phoyosytem has all the pigments except one molecule of chlorophyll a

B. Action spectra is greater in blue and red light

C. Chlorophyll a & b are primay pigments associated with photosynthesis

D. PS II is involved in evolution of O_2

Answer: C

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7. Primary electron acceptor in cyclic photophosphorylation is

A. Phaeophylin

B. Fe-S

C. PC

D. Cyt$-b_6-f$ complex

Answer: B

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8. whole scheme of transfer of electrons , starting from the PS II, uphill to the acceptor, down the electron transport chain to PS I ,excitation of elecitations, transfer to another acceptor, and finally down hill to NADP+ causing it to be reducedd to $NADPH + H^+$ is called

A. Oxidative phosphorylation

B. Cycllic photophosphorylation

C. PCR cycle

D. Z-scheme

Answer: D

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9. Which of the following is not a requirement of chemiosmosis ?

A. RuBisCO

B. Membrane

C. ATPase enzyme

D. Pyoton pump

Answer: A

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10. Stroma lamellae membrane lacks

A. PS I only

B. PS II only

C. PS I and electron carriers

D. PS II and NADP reductase

Answer: D

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11. The most crcial step of the Calvin cycle is

A. Decarboxylation

B. Carboxylation

C. Reduction

D. Regeneration

Answer: B

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12. Which on of the following statement is incorrect for carboxylating enzyme in C_3 plants

A. Bifuncational nature

B. Can bind with CO_2 only

C. Its old name was carboxydismutase

D. Located is stroma or matrix chloroplasta

Answer: B

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13. ATP as well as NADPH $+H^+$ both are required during the conversion of _____ in C_3 cycle

A. RuBP + $CO_2 \rightarrow 2 \times$ PGA

B. $PGA \rightarrow PGAL$

C. $PGAL \rightarrow DHAP$

D. Fructose 1, 6 biphosphate $\rightarrow$ Glucose

Answer: B

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14. Regeneration of each RuBP in C_3 cycle requires

A. 1 ATP

B. 6 ATP

C. 1 ATP and 1 NADPH $+H^+$

D. 3 ATP and 2 NADPH $+H^+$

Answer: A

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15. Dobule carboxylation with spatial differnece is characteristic of

A. triticum

B. pisum

C. Saccharum

D. Bryophyllum

Answer: C

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16. primary carboxylating enzme in C_4 plants is found in

A. Chloroplast of mesophyll cells

B. Cytoplasm of mesophyll cells

C. Chlorophlast of bundles sheath cells

D. Cytoplasm of bundle sheath cells

Answer: A

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17. How many additional ATP are used during synthesis of two molecules of hexose sugar in maxize than tmato ?

A. 12

B. 36

C. 24

D. 8

Answer: C

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18. In photorespiration , glycolate and glycine synthesis occurs respecitvely in

A. Chloroplast and mitochondria

B. peroxisome and chloroplast

C. chloroplast and peroxisome

D. peroxisome and mithochondria

Answer: C

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19. Photorespiration occurs in

A. plants having dimorphic chloroplasts

B. Plants possessing kranz anatomy

C. C_3 plants

D. Both C_4 and C_3 plants

Answer: C

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20. The primary CO_2 acceptor molecule during the C_3 cycle is a

A. Ketose sugar

B. 5 C compound

C. PEP

D. Both (1) & (2)

Answer: D

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21. Factors that affect the rate of photosynthesis in plants are dependent on the

A. Genetic predisposition

B. External factors

C. Growth of the plant

D. More thant one option is correct

Answer: D

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22. The C_3 plants show CO_2 satruration

A. At about $360\mu L^{-1}$

B. Only below $450\mu L^{-1}$

C. Only beyond $540\mu L^{-1}$

D. only beyond $450\mu L^{-1}$

Answer: D

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23. Plants show light saturation effect at _____ of full sunlight

A. 0.1

B. 0.5

C. 0.7

D. 1

Answer: A

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24. mark the odd one (w.r.t internal factors affecting photosythesis)

A. Amount of chlorophyll

B. Light intensity

C. Mesophyll cells

D. Orientation of leaves

Answer: B

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25. Minimum photosythesis takes place in

A. Green light

B. red light

C. Blue light

D. White light

Answer: D

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26. Major limiting factor for photosythesis in C_3 plants is

A. CO_2

B. Temperature

C. Light

D. Water

Answer: D

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27. Optimum temperature for the photosynthetic process of C_3 plants is

A. $20 - 25^\circ C$

B. $10 - 20^\circ$

C. $30 - 45^\circ$ C

D. $45 - 55^\circ$ C

Answer: A

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28. Photosynthetic process utilitzes _____ of water absorbed by a plant.

A. 0.1

B. 0.15

C. Less than 1%

D. 0.05

Answer: C

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29. Which of the following fator does not have direct effect on photosynithesis ?

A. Temperature

B. water

C. Atmosheric CO_2 concentration

D. Light

Answer: B

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30. In Zea Mays optimum CO_2 concentration for photosynthesis is

A. 450 ppm

B. 360 ppm

C. 0-10 ppm

D. 10-20 ppm

Answer: B

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Assignment Section A

1. Coose incorrect w.r.t. photosynthesis

A. it is a physico-chemical process

B. Oxygen is evolved as a by- product in all photoautotrophs

C. Occurs in unicellular and muiticellular photoaututrophs

D. Anabolic and reductive process

Answer: B

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2. A milestone contribution to the understanding of photosythesis was made by Cornellus van Niel, which was based on the studies of

A. Bacteria

B. Alga

C. Angiospermic

D. Lower plant

Answer: A

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3. The essential role of air in the growth of green plants was revealed by

A. Priestley

B. Van Niel

C. Blackmann

D. Emerson

Answer: A

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4. which equation represents the process of photostnthesis most adequately ?

A. $C_6H_{12}O_6 + 6O_2 \xrightarrow[\text{Chlorophyll}]{\text{sunlight}} 6CO_2 + 6H_2O$

B. $6CO_2 + 6H_2O \xrightarrow[\text{chlorophyll}]{\text{Sunlight}} C_{16}H_{12}O_6 + 6O_2$

C. $Co_2 + H_2O \xrightarrow[\text{chlorophyll}]{\text{Sunlight}} CH_2O + O_2$

D. $6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{sunlight}} C_6H_{12}O_6 + 6O_2 + 6H_2O$

Answer: D

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5. Moll,s half leaf experiment was done to show _____ was required for photosynthesis.

A. H_2O

B. Chlorophyll

C. Light

D. CO_2

Answer: D

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6. Curve showing the effectiveness of differnent wavelength of light in photosynthesis was fist given by Engleman using all , except

A. Filamentous green alga Cladophora

B. Unicelular green alga chlorella

C. Suspension of aerobic bacteria

D. Prism to split the light in its components

Answer: B

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7. Grana present in chloroplast refers to

A. Stroma lamellae

B. Stracks of quantansomes

C. stacks of thylakoids

D. Double membranous envelops

Answer: C

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8. Photosystem is composed of

A. Light harvesting complex

B. Reaction centre

C. Accessory pigments

D. Accessory pigments

Answer: D

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9. In the chloroplast, the stroma lamellae lack the

A. PS I , NADP reductase

B. PS II, PS I

C. NADP reductase , enzyme, P_{700}

D. NADP, reductase , PS II

Answer: D

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10. The movement of electrons as per Z - schems in light reaction is

A. From low to high energy level

B. Uphill in redox potential scale

C. Downgill in redox potential scale

D. Both (2) & (3)

Answer: D

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11. The assimilatory power produced during light released in the

A. ATP , NADPH $+H^+$

B. NAD^+

C. NADP

D. ATP & NADH

Answer: A

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12. The protons formed by splitting of water are released in the

A. Lumen of the thylakoids

B. Outer side of the memvbrane

C. Both (1) & (2)

D. Stroma of Chloroplast

Answer: A

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13. Oxygen liberated during photosynthesis comes from

A. CO_2

B. water

C. Photosynthetic enzymes

D. carbonhydrates

Answer: B

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14. Chemiosmotic hypothesis for generation of ATP during light reaction was fist explained by

A. Hill

B. Arnold

C. P. Mithchell

D. Van Niel

Answer: C

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15. The photosystem connected with splitting of water is

A. PS II

B. PS I

C. Carotenoid

D. P_{700}

Answer: A

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16. NADPH is generated through

A. Anaerobic respiration

B. Cyclic photophorylation

C. Non-cyclic photophosphorylation

D. Glycolysis

Answer: C

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17. Read the following statements:

A. F_0 Part if ATP ase is associated with breakdown of proton gradient .

B. A H- Carrier contributes in creation of proton gradient.

C. Movement of electrons in ETS is coupled to pumpling of protons into the lumen.

D.

Answer: C

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18. How many componens listed below are part of cyclic ETS ?

P_{700}, P_{680}, NADP reductase, Hydrogen carrier, PS I, Water Splitting Complex, PS II

A. Two

B. One

C. Four

D. There

Answer: B

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19. The initial CO_2 acceptor in C_4 plants is

A. RuBP

B. PGA

C. PEP

D. OAA

Answer: A

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20. In $C_3 plants, \ firststab \leq \prod uctof$CO_(2)` fixation is

A. 3-PGA

B. Starch

C. OAA

D. Pyruvate

Answer: A

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21. Which is not a step in Calvin cycle ?

A. Caboxylation

B. Reduction

C. Photophosporylation

D. Regeneration

Answer: C

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22. The enzyme respondsible for carboxylation rection $(CO_2$ fixation) in C_3 plants is

A. RuBP oxygenase

B. Pryuvate decarboxlase

C. RuBP carboxylase

D. PEP carboxylase \

Answer: C

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23. Regeneration of four molecules of RuBP in C_3 cycle requires the expenditure of _____ ATP.

A. 1

B. 4

C. 3

D. 2

Answer: B

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24. The enzyme RuBP carboxylase

A. Activity occurs in C_3 and C_4 plants

B. In present in inner thylakoid membrane

C. Is low temperature sensitive enzyme

D. Show greater affinity for CO_2

Answer: A

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25. Which of the following statements is not true regarding the C_4 plants ?

A. The show kranz anatomy

B. Decarboxylation process occurs in bundle sheath cells

C. Granal chloroplast is present in bundle sheath cells.

D. PEPcase enzyme activity occurs in mesophyll cells.

Answer: C

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26. In C_4 plants, first stable product of CO_2 fixation is

A. OAA

B. RuBP

C. 3-PGA

D. Malic Acid

Answer: A

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27. In C_4 plants, sugar is produced in

A. Bundle sheath cells

B. mesophyll cells

C. palisade leaf cells

D. spongy mesophyll

Answer: A

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28. The C_4 and C_3 plants differ from each other in

A. Type of pigment involved in pholosythesis

B. The primary acceptor of CO_2 during carbon fixation

C. Type of end products of photosynthesis

D. Number of NADPH that are consumed during the starch synthesis process.

Answer: B

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29. which one is a C_4-plant ?

A. Papaya

B. potato

C. Maize

D. Pea

Answer: C

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30. The CO_2 fixation during the Hatch and Slack pathway occurs in

A. Large thick walled cells

B. Mesophyll cells

C. Vascular bundles

D. Bundle sheath cell cytoplasm

Answer: B

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31. Kranz, anatomy of leaves is found in

A. C_4 plants

B. C_3 plants

C. CAM plants

D. All plants

Answer: A

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32. The enzyme required for the CO_2 fixation in the C_4.

A. PEP Carboxylase

B. RuBP oxygenase

C. RuBP carboxylase

D. PGA dehydrogenase

Answer: A

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33. Which of the following statement is correct regarding the C_4 plants ?

A. The carbon fixation is catalysed by PEP carboxylase

B. Mesophyll cells lack the RuBisCO enzyme

C. Photorespiration is absent

D. More than one option is correct

Answer: D

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34. RuBisCO in C_4 plants shown minimum oxygenase activity due to

A. Abundance of RuBisCO

B. Formation of C_4 acid

C. Decarboxylation of C_4 acid

D. Cyclic photophosphorylation

Answer: C

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35. The primary acceptor of CO_2 in C_4 plants is

A. RuBP

B. phosphoenol pyruvice acid

C. OAA

D. Malic Acid

Answer: B

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36. A wasteful processs which involves oxidation of organic compounds in plants in presence of light is called

A. Photorespiration

B. PCR cycle

C. Hill's reaction

D. Bioluminiscence

Answer: A

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37. PEP case and RuBisCo in C_4 plants are present respectively in

A. Cytoplasm and thylakoids

B. Stroma and Cytoplasm

C. Stroma and thylakoids

D. mesophyll and bundle sheath cells

Answer: D

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38. Identify the incorrect match.

A. Regeneration of PEP- Mesophyll cells

B. RuBP oxygenase - Chloroplast

C. Photorespiration loss - cytoplasm of CO_2

D. Decarboxlation in - Bundle sheath cell C_4 pathway

Answer: C

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39. Law of limiting factor was given in

A. 1950

B. 1905

C. 1920

D. 1915

Answer: B

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40. Which one of the following is not a limiting factor for photosynthesis

A. Chlorophyll

B. Light

C. Carbon dioxide

D. Temperature.

Answer: B

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41. Plants like sugarcane show high productivity and high efficiency of CO_2 fixation, because of

A. Absence of photorespiration

B. EMP pathway

C. Calvin cycle

D. TCA cycle

Answer: A

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42. The CO_2 concetration at which C_4 plants show saturation is about

A. 360 ppm

B. 380 ppm

C. 450 ppm

D. 500 ppm

Answer: A

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43. Linear relationship exists between incident light and rate of CO_2 fixation at/in.

A. High light intensity

B. Low light intensity

C. Dense forests

D. More than one option is correct

Answer: D

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44. Choose the correct sequence of steps involved in C_4 cycle.

A. CO_2 fixation $\rightarrow$ Regeneration $\rightarrow$ Transport

B. CO_2 fixation $\rightarrow$ Recorboxylation $\rightarrow$ Decarboxylation

C. Transport $\rightarrow$ Regeneration $\rightarrow$ CO_2 fixation

D. CO_2 fixation $\rightarrow$ Transport $\rightarrow$ Decarboxylation

Answer: D

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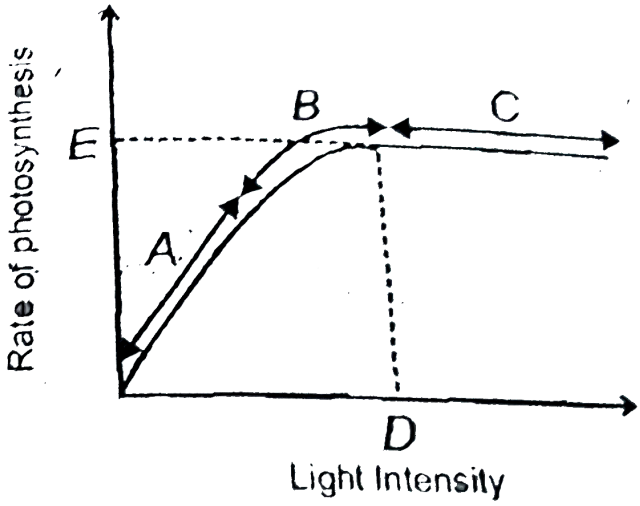
45. Choose the correct labeliling for given figure



A. D-Saturation point, E - Maximum photosynthesis

B. A -Achieved at high light intensity

C. D-10% of total sunlight , E - Conmoensation point

D. A-light saturation at 10% of total sunlight

Answer: A

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Assignment Section B

1. The bulk fixation of carbon through photosynthesis takes place in

A. Crop plants

B. Tropical rain forests

C. Ocean

D. Both (1) & (2)

Answer: C

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2. Essentiality of light in photosynthesis can be demonstrated by

A. Moll's half leaf experiment

B. Ganong screen

C. Inverted funnel experiment

D. KOH solution

Answer: A

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3. Choose the correct statement

A. Chlorophyll-a is soluble in petroleum ether and shows maximum absorption peak at 453 nm and 642 nm

B. In chlorophyll-b , CH_3 replaces -CHO at 3-C of chlorophyll-a

C. For biosynthesis of chorophyll , raw materials required are succiny . Co-A and glycine

D.

Answer: D

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4. If a photosynthesizing plant release oxygen containing more than normal amount of 180, it is concluded that the plant has been supplied with

A. $C_6H_{12}O_6$ containing. ^{18}O

B. H_2O containing . ^{18}O

C. CO_2 containing . ^{18}O

D. Oxygen in the form of ozone

Answer: B

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5. The first step in photosynthesis is the

A. Exciation of chlorophyll by light

B. lonsiation of water

C. ATP synthesis

D. Production of assimilartory power

Answer: A

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6. Electric charge separation or quantum conversion occurs at

A. Antenna molecules

B. Thylakiod membrane

C. Reaction centre

D. Stroma

Answer: C

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7. Mineals involved in photooxidation of water are

A. Mn, Cl, Ca

B. Mg, Fe, Mn

C. Mn, Fe, Ca

D. N,P,K

Answer: A

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8. Z-scheme in thylakoid membrane is concerned with

A. Reduction of NAD^+

B. Reduction of CO_2

C. Electron transfer

D. All of these

Answer: C

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9. The absorption of radiant energy causes

A. Reduction of chlorophyll

B. Oxidation of chlorophyll

C. Absorption of CO_2

D. Oxidation of CO_2

Answer: B

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10. Cyclic photophosphorylation releases

A. ATP and NADPH_2

B. ATP , $NADPH_2$ and oxygen

C. ATP only

D. $NADPH_2$ only

Answer: C

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11. In non-cyclic photophosphorylation

A. ATP is systhesised only

B. Last electron acceptor is ferredoxin

C. NADP reductase activity reqires H^+ from stroma

D. There is involvement of PS-I only

Answer: C

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12. Select the correct match

Column-I	Column-II
a. OEC	(i) primary e^- acceptor
b. NADP reductase	(ii) Photolysis of H_2O
c. Succinyl CoA	(iii) Outer surface of thylakoid membrane
d. phaeophytin	(iv) Chlorophyll synthesis

A. a(ii), b(iii) , c(iv), d(i)

B. a(ii), b (iii),c (i) , d(iv)

C. a(iii), b(i), c(ii) , d(iv)

D. a(i), b(ii), c(iii) , d(iv)

Answer: A

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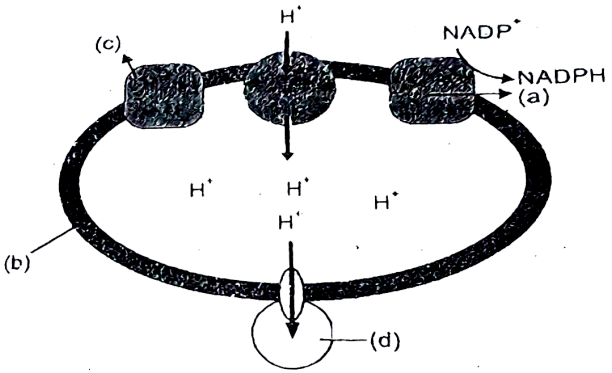
13. Examine the figure given below an select the right optionn giving all the four parts (a,b,c,d) correctiy idenified.



Options	(a)	(b)	(c)	(d)
(1)	Photosystem-II	Thylakoid membrane	Photosystem-I	ATP synthetase
(2)	Photosystem-I	Thylakoid membrane	Photosystem-II	F_1
(3)	Photosystem-I	Inner chloroplast membrane	Photosystem-II	F_o
(4)	Photosystem-II	Thylakoid membrane	Cytochrome b & f	F_1

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14. Which is not ture regarding cyclic electron transfer system (ETP) in thtylakoid membrane of higher plants ?

A. Operates at low light intensity

B. Only PSI is involved

C. Act as a back up for ATP synthesis

D. External electron donor is required

Answer: D

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15. ATP synthesis in chloroplast and mithochondria is due to proton gradient across the membrane. Select corrct statement w.r.t formation in chloroplast

(a) Proton accumulates in lumen of thylakiod

(b) Splitting of water occures on inner side of membrane

(c) proton redutase is located on stroma side of chloroplast

(d) NADP reductase is located on stroma side of membrane

A. Only (a) and (b) are correct

B. only (b) and © are correct

C. only (c) and (d) are correct

D. (a), (b) and (d) are correct

Answer: D

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16. C_3 cycle (reductive pentose phosphate cycle) is basically a

A. CO_2 reduction cycle

B. CO_2 oxdising cycle

C. photochemical reaction

D. Both (2) & (3)

Answer: A

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17. To reduce $1CO_2$ molecules in C_3 cycle , assimilatory power needed is

A. 3ATO, 2NADPH $+H^+$

B. 2ATP , 3NADPH $+H^+$

C. 5ATP, 2NADPH $+H^+$

D. 6.5 ATP, 2NADPH $+H^+$

Answer: A

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18. CO_2 acceptor and carboxylating enzyme in C3 plants are , respectively,

A. PEP, PEPCo

B. RuBP, RuBisco

C. OAA,RuBisco

D. 3 PGA, RuBisco

Answer: B

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19. Which technique has helped in inverstigation of calvin cycle ?

A. Radiocative isotope techniqe

B. Inverted funnel experiment

C. Half leaf experiment

D. flash light experimental technique

Answer: A

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20. Select the correct option for photosynthesis in C_3- plants.

A. Bifunctonal nature of PEP case enzyme

B. Regeneration of each RuBP requires 6 ATP

C. First stable product of Calvin cycle undergoes phosphoylation dark reaction

D. Optimum temperture is $30 - 40^\circ C$

Answer: C

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21. In photorespiration , release of $CO2$ occurs in

A. Mitochondria

B. Chloroplast

C. Peroxisomes

D. Glycoxisome

Answer: A

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22. Photorespiration occurs in

A. During day time

B. In C_3 plants

C. In co-operation with Chloroplasts , peroxisomes and mitochondira

D. All of these

Answer: D

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23. During photorespiration , phosphorylation as well as oxdiation occurs in

A. Centrosame

B. Peroxisome

C. mitochondria

D. Chloroplast

Answer: D

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24. Sorghum and sugarcane plants show saturation at about

A. 50% of full sunlight

B. 10% of full sunlight

C. 360 ppm of CO_2

D. 500 ppm of CO_2

Answer: C

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25. CO_2 concentrating steps are found in

A. Rice

B. sugarcane

C. Wheat

D. Tomato

Answer: B

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26. Kranz antomy is concerned with

A. Having peripheal reticulum in chloroplast of bundle sheath

B. Presence of distinct bundle sheath surrounded by concentric ring of mesopyhll cells

C. Dimorphic chloroplast

D. Large vacuole in mesophyll cells

Answer: B

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27. In C_4 plants , mesophyll cells and bundle sheath cells are specialized to perform, respectively,

A. Light reaction and dark reaction

B. Dark reaction and dark reaction

C. Light reaction and photorespiration

D. Photorespiration and dark reaction

Answer: A

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28. Agranal chloroplasts are found in the

A. Mesophyll of pea leaves

B. Bundle sheath of mango leaves

C. Mesophyll of maize leaves

D. Bundle sheath of sugarcane leaves

Answer: D

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29. Find the odd one (w.r.t double carboxylation).

A. Zea mays

B. sugarcane

C. Pisum sativum

D. Sorghum

Answer: C

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30. Photosynthesis of maize palnt differ from wheat plant in

A. Number of ATP reqired per CO_2 fixation

B. Having spatial soparation in both carboxylations

C. Having PEP case activity

D. All of these

Answer: D

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31. In C_4 plants, the bundle sheath cells

A. Have thin walls to facilitate gaseous exchange

B. Have large intercellular spaces

C. Are rich in PEP Carboxylase

D. Have a high density of chloroplasts

Answer: D

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32. C_4 plants are less efficient at low temperature due to

A. Low O_2 affinity of PEPcase

B. Cold sensitivity of PEP synthetase enzyme

C. Reduced rate of decarboxyaltion of organic acids

D. High energy requirement for CO_2 fixation

Answer: B

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33. C_4 plants can tolerate saline conditions due to

A. Occurrence of organic acids

B. Absence of photorespiration

C. Presence of PEP synthetase enzyme

D. Presence of PEP carboxylase enzyme

Answer: A

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34. Which group of plants are not beefitted by CO_2 fertilisation effect ?

A. Plants requiring 3 ATP per CO_2 fixation

B. Plants with Kranz anatomy

C. Plants having high rate of photorespiration

D. Plants having single carboxylation

Answer: B

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Assignment Section C

1. Identify the reaction for which the C_4 plants require some extra ATP molecules in comparison to C_3 plants

A. Conversion of PEP to OAA

B. Conversion of Pyruvate to PEP

C. Conversion of Malate to Oxaloacetate

D. Conversion of PEP to Malate

Answer: B

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2. PEP is primary CO_2 acceptor in

A. C_3 Plants

B. C_4 plants

C. C_2 plants

D. C_3 and C_4 plants

Answer: B

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3. With reference to factors affecting the rate of photosynthesis, which of the following statements is not correct ?

A. Light saturation for CO_2 fixation occurs at 10% of full sunlight

B. Incrasing atmospheric CO_2 concentration upto 0.05% can enhance CO_2 fixation rate

C. C_3 plants responds to higher temperatures with enhanced photosythesis while C_4 plants have much lower temperature optimum

D. Tomato is a greenhouse crop which can be grown in CO_2 enriched atmosphere for higer yield .

Answer: C

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4. The process which makes major difference between C_3 and C_4 plants is

A. Glycolysis

B. Calvin cycle

C. Photorespiration

D. Respiration

Answer: C

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5. A plant in your garden avoids photorespiratory losses, has improved water use efficiency shows high rates of

photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the followubg physiological groups would you assign this plant

A. Nitrogen fixer

B. C_3

C. C_4

D. CAM

Answer: C

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6. Emerson's enhancement effect and red drop have been instrumental in the discovery of

A. Oxidative phosphorylation

B. Photophosphorylation operating simultaneously

C. Photosystems operating simultaneously

D. Photosphorylation and cyclic electron transport

Answer: C

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7. In a chloroplast the highest number of protons are found in

A. Antennae complex

B. Stroma

C. Lumen of thylakoids

D. Inter membrane space

Answer: C

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8. The oxygen evolved during photosynthesis comes from water molecules . Which one of the following pairs of elemnets is involved in this reaction ?

A. Magnesium and chlorine

B. Managanese and Chlorine

C. manganese and potassium

D. Mangnesion and Molybdenum

Answer: B

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9. Anoxygenic photosynthesis is characteristic of

A. Rhodospirillum

B. Spirogyra

C. Chlamydomones

D. Ulva

Answer: A

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10. A process that makes important difference between C_3 and C_4 plants is

A. Photosythesis

B. Phtorespiration

C. Transpiration

D. Glycolysis

Answer: B

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11. The correct sequence of cell organelles during photorespiration is

A. Chloroplast - mitochonle- peroxisome

B. Chloroplast - vacuole - peroxisome

C. Chloroplast - Golgbodies - mitochondria

D. Chloroplast - Rought endoplasmic reticulum- Dictyosomes

Answer: A

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12. In kranz anatomy, the bundle sheath cells have

A. Thin walls, no intercellular spaces and several chloroplasts

B. Thick walls, many intercellular spaces and few chloroplasts

C. Thin walls, many intercellular spaces and no chloroplasts

D. Thick walls, no intercellular spaces and large number of chloroplasts

Answer: D

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13. CAM helps the plants in

A. Reproduction

B. Conserving water

C. secondary growth

D. Disease resistance

Answer: B

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14. PGA as the first CO_2 fixation product was discovered in photosynthesis of

A. Alga

B. Bryophyte

C. Gymnosperm

D. Angiosperm

Answer: A

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15. C_4 plants are more efficient in photosynthesis than C_3 plants due to

A. Lower rate of phtorespiration

B. Higher leaf area

C. Presence of larger number of chloroplasts in the leaf cells

D. Presence of thin cuticle

Answer: C

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16. Read the following four statement A,B,C and D and select the right opition having both correct statements.

statements

(a) Z scheme of light raction takes place in presence of PS I only .

(B) Omly PS I is functional in cyclic photosporylation

(c) Cyclic photophosphorylation results into synthesis of ATP and $NADPH_2$

(D) Stroma lamllae lack PSII as welll as NADP

A. B and D

B. A and B

C. B and C

D. C and D

Answer: A

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17. Kranz anatomy is one of the characteristics of the leaves of

A. potato

B. wheat

C. sugarcane

D. Mustand

Answer: C

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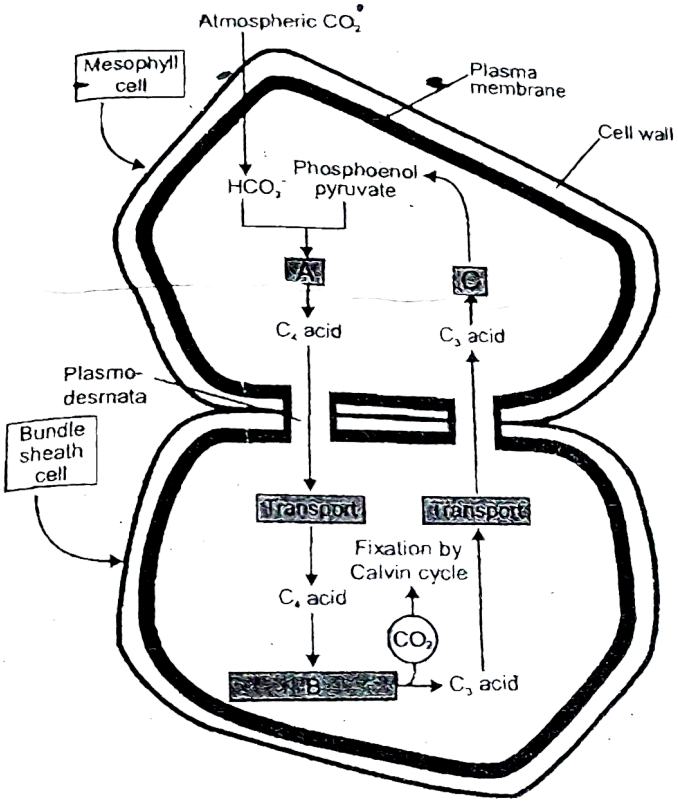
18. Study the pathway given below :



in which of the following options words for all the three blanks , A, B and C are indicated ?

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19. Oxygenic photosynthesis occurs in

A. Oscillatoria

B. Rhodospirillum

C. Chlorobium

D. Chromatium

Answer: A

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20. Cyclic photophosphorylation results in the formation of :

A. ATP and NADPH

B. ATP, NADPH and O_2

C. ATP

D. NADPH

Answer: C

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21. Stroma in the chloroplasts of higher plant cantains

A. Light - dependent reaction enzymes

B. Ribosomes

C. Chlorophyll

D. Light -independent reaction enzymes

Answer: B

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22. The C_4 plants are photosynthetically more efficient than C_4 plants beacause.

A. They have more chloroplasts

B. The CO_2 compensation point is more

C. CO_2 generated during photorespiration trapped and recycled through PEP carboxylase

D. The CO_2 efflux is not prevented

Answer: A

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23. In the leaves of C_4 plants, malic acid formation during CO_2 fixation occurs in the cells of

A. Guard cells

B. Epidermal cells

C. Mesophyll cells

D. Bundle sheath

Answer: C

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24. Electrons from exicted chlorophyll molecule of photosystem II are accepted fist by

A. Ferredoxin

B. Cytochrome -b

C. Cytochrome -f

D. Quinone

Answer: D

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25. The first acceptor of electrons from an excited chlorophyll molecule of phtosystem II is

A. Quinone

B. cytochrome

C. Iron-sulphur protein

D. Ferredoxin

Answer: A

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26. In the leaves of C_4 plants, malic acid formation during CO_2 fixation occurs in the cells of

A. Epidermis

B. Mesophyll

C. Bundle sheath

D. Phloem

Answer: B

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27. In photosystem-I the first electron acceptor is

A. Ferredoxin

B. Cytochrome

C. Plastocyanin

D. An iron - sulphur protein

Answer: D

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

A. Stroma of chloroplasts and mitochondria

B. Stroma of chloroplasts and peroxisomes

C. Grana of chloroplasts and peroxisomes

D. Stroma and chloroplasts

Answer: B

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29. Photosynthesis in C_4 plants is relatively less limited by atmospheric CO_2 levels because

A. Four carbon acids are the primary intial CO_2 fixation products

B. The primary fixation of CO_2 is meadiated sheath carboxylase

C. Effective pumping of CO_2 into budle sheath cells

D. RuBisCO in C_4 plants has higher affinity for CO_2

Answer: B

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30. As compared to a C_3 plant, how many additional molecules of ATP are needed for net production of one molecule hexose sugar by C_4 plants

A. 2

B. 6

C. 0

D. 12

Answer: D

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31. Photosynthetically active radiation (PAR) represents the following range of wavelength

A. 400-700 nm

B. 450-950 nm

C. 340-450 nm

D. 500- 600 nm

Answer: A

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32. Chorophyll '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: C

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33. 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: C

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34. During light reaction of photosynthesis, which of the following phenomena is observed during cyclic and non-cyclic photophosphorylation ?

A. Release of O_2

B. Formation of ATP

C. Formation of NADPH

D. Involvement of PS I & PS II pigment systems

Answer: B

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35. $NADPH_2$ is generated through

A. Photosystem II

B. Anaerobic respiration

C. Glycolysis

D. Photosytem I

Answer: D

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36. The first step for inition of photosynthesis will be

A. Photolysis of water

B. Excitement of chlorophyll molecules due to absorpition of light

C. ATP formation

D. Glucose formation

Answer: B

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37. Which pigment system inactivated in red drop : -

A. PS -I and PS-II

B. PS -I

C. PS - II

D. None of these

Answer: C

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

A. ADP

B. ATP

C. RuDP

D. Chlorophyll

Answer: B

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39. Which of the following absorb light energy for photosynthesis : -

A. Chlorophyll

B. Water molecule

C. O_2

D. RuBP

Answer: A

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40. How many electrons, protons and photons are involved in the lysis of water to evolve one molecule of oxygen ?

A. $4e^-$, $4H^+$ and 4 photons

B. $4e^-$, $4H^+$ and 8 photons

C. $2e^-$, $2H^+$ and 8 photons

D. $2e^-$ and $2H^+$ and 4 photons

Answer: B

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41. The primary acceptor , during CO_2 fixation in C_3 plants , is

A. Phosphoenolphyruvate (PEP)

B. Ribulose , 1 , 5- diposphate (RuDP)

C. Phosphoglyceric acid (PGA)

D. Ribulose monophosphate (RMP)

Answer: B

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42. How many Calvin cycle form one hexose molecule

A. 8

B. 9

C. 4

D. 6

Answer: D

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43. For assimilation of one CO_2 moleucles, the energy requried in form of ATP & $NADPH_2$

A. 2ATP and 2 $NADPH_2$

B. 5 ATP and $3NADPH_2$

C. 3 ATP and $2NADPH_2$

D. 18 ATP and $2NADPH_2$

Answer: C

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44. Which one of the following requesents photohosphorylation ?

A. $ADP + AMP \xrightarrow{\text{Light energy}} ATP$

B. ADP + Inorganic $PO_4 \xrightarrow{\text{Light energy}} ATP$

C. ADP + Inorganic $PO_4 \rightarrow$ ATP

D. AMP + inorganic $PO_4 \xrightarrow{\text{Light energy}}$ ATP

Answer: B

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45. In C_3 plants, the first stable product of photosynthesis during dark reaction is

A. Malic acid

B. Oxaloacetic acid

C. 3- phosglyceric acid

D. Phosphoglyceraldehyde

Answer: C

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46. Bundle sheath cells

A. Are rich in RuBisCO

B. Are rich in PEP carboxlase

C. Lack RubisCO

D. Lack both RuBisCO

Answer: A

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47. Which one of the following organisms is correctly matched with its three characteristics

A. Pea : C_3 pathway, Endospermic seed, vexilary aestivation

B. Tomato: Twisted aestivation , Axile palcentation berry

C. Onion : Bulb , Imbricate aestivation , Axile placetation

D. Maize : C_3 pathway, closed vascular bundles , scutellum

Answer: D

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48. Presence of bundle sheath is a characteristic of

A. Xerophytic plants

B. Members of the grass family

C. C_4 plants

D. C_3 plants

Answer: C

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49. In C_4 plants, the bundle sheath cells

A. Have thin walls to facilitate gaseous exchange

B. Have large intercellular spaces

C. Are rich in PEP Carboxylase

D. Have a high density of chloroplasts

Answer: D

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50. The CO_2 fixation during C_4 pathway occurs in the chloroplast of

A. Guard cells

B. Bundle sheath of mango leaves

C. Mesophyll cells

D. Spongy parechyma

Answer: C

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51. In C_4 plants, CO_2 fixation is done by

A. Sclerenchyma

B. Chlorenchyma and hypodermis

C. Mesophyll cells

D. Guard cells

Answer: C

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52. In C_4 plants CO_2 combines with

A. Phosphoenol pyruvate

B. Phosphoglyceraldehyde

C. Phosphoglyceric acid

D. Ribulose monophosphate

Answer: A

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53. which is the fist CO_2 acceptor enzyme in C_4 plants ?

A. RuDP carboxylase

B. Phosphoric acid

C. RUBISCO

D. PEP carboxylase \

Answer: D

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54. Which pair is wrong

A. C_3 _ maize

B. C_4 _ kranz anatomy

C. Calvin cycle -PGA

D. Hatch and Slack cycle - OAA

Answer: A

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55. In sugarcane plant $\hat{}$ $(14)CO_2$ is fixed in malic acid, in which the enzyme that fixes CO_2 is

A. Ribulose biphosphate carboxylase

B. Phosphoenol pyruvice acid carboxylase

C. Ribuloser phosehate kinase

D. Fructose phosphatase

Answer: B

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56. Which one of the following is wrong in relation to photoespiration ?

A. Ist oxidation in chloroplast

B. It occurs in day time only

C. It is a characteristic of C_4 plants

D. It is a characteristic of C_3 plants

Answer: C

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57. The principle of limiting factors was proposed by:-

A. Leibig

B. Hactch and slack

C. Blackmann

D. Arnon

Answer: C

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58. Maximum absorption of light occures in the region (PAR) of

A. 1000-1200 nm

B. 1500-2000 nm

C. 400-700 nm

D. 700-900 nm

Answer: C

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59. the rate of photosynthesis is higher in

A. Very high light

B. Continuous light

C. Red light

D. Green light

Answer: C

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60. Plants adapted to low light intensity have

A. Large photosynthetic unit size than the sun plants

B. Higher rate of CO_2 fixation than the sun plants

C. More extended root system

D. Leaves modified to spines

Answer: A

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Assignment Section D

1. Assertion :In C_4 plants, the chloroplasts of bundle sheath cells are granal.

Reason: PS II is mostly found in the appressed part of granum.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: D

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2. Assertion : Dark reactions of photosynthesis are temperauture -controlled processes.

Reason : Most of the reactions are enzymatic in nature.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: A

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3. Assertion : Dark acidification of cytoplasm occurs in CAM plants.

Reaon : Orgnaic acids are decarboxylated during night.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: C

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4. A : Assimilatory power in photosynthesis is generated in ETS occuring in thylakoid membrane.

R: They are needed for CO_2 reduction and RuBP regeneration.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: B

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5. A : Light hahrvesting complexes (LHC) on thyrakoid membrane broaden the range of light absorption.

R: They transfer e^- to reaction centre.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: C

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6. A: For every CO_2 molecule entering C_3 j cycle , three molecules of ATP and two NADPH are required .

R: Cyclic photophosphorylation takes place to meet the difference in number of ATP.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: B

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7. A : Carotenoids protect plant from excessive heat and prevent photoxidation of chlorophyll.

R : Carotenodis enable a wider range of wavelength of incoming light to be utilised for photosynthesis.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: B

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8. A : Biosynthetic phase of phtosynthesis depend directly on presence of light .

R: Both ATP and NADPH are not essential for assimilation of CO_2 to carbohydrates.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: D

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9. A : most of the photosyntheis takes place in the blue and red region of spectum.

R : Action spectrum shows the amount of energy of different wavelength of light absorbed by pigments.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: C

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10. A : Tropical plants are more efficient in CO_2 untilization.

R : C_4 plants ensure that RuBisCO functions as carboxylase minimising oxygenase acitivity.

A. If both Assertion % Reson ar true and the reason is the correct explanation of the asserition the mark (1)

B. If both Assertion % Reason are true but the reason, is not the correct explanation of the assertion ,then mark (2)

C. If Assetion is true statement but Reason is false , The mark (3)

D. If both Assertion and Reason are false statements, the mark (4)

Answer: B

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