



BIOLOGY

BOOKS - MODERN PUBLICATION

PHOTOSYNTHESIS IN HIGHER PLANTS

Exercise

1. Who first recognised the importance off chlorophyll for photosynthesis?



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2. Write the chemical formula of chlorophyll a.



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3. What does phenomenon of red drop refer to?



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4. What is the characteristic anatomical feature of C_4 plants, known as?



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5. Why chlorophyll is necessary for photosynthesis?



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6. Why is it that the dark reaction is the rate limiting step in photosynthesis?



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7. What is the advantage of having more than one type of pigment molecules in a photocentre?



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8. Why does chlorophyll appear green in reflected light and red in transmitted light?



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9. What are the functions of chloroplast? List any three.



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10. If a green plant is placed in air free of O_2 , would it live longer in light or in darkness?



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11. When do you expect an increase in the rate of photosynthesis in green, red or blue light?



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12. Trace the fate of a molecule of water after its reaches the mesophyll cells.



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13. Write two main function of carotenoid pigments.



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14. Why is the overall rate of photosynthesis higher per unit light received in flashes than continuously?



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15. Why are plants that consume more than usual 18 ATP to produce one molecule of glucose favoured in tropical region?



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16. What are the advantages of using *Chlorella* to study photosynthesis than a higher plant?



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17. For yielding one molecule of glucose the Calvin cycle turns:

- A. Two times
- B. Four times
- C. Six times

D. Eight times

Answer:



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18. Fixation of one molecule CO_2 through Calvin cycle requires:

A. 3 ATP and 3 $NADH_2$ molecules

B. 3 ATP and $NADPH_2$ molecules

C. 2 ATP and 1 $NADPH_2$ molecule

D. 1 ATP and 2 NADPH_2` molecules.

Answer:



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

A. Malic acid

B. Osaloacetic acid

C. 3-phosphoglyceric acid

D. Posphoglyceraldehyo

Answer:



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20. In chloroplasts, chlorophyll is present in:

A. Outer membrane

B. inner membrane

C. Thylakiods

D. Stroma

Answer:



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21.3 - PGA is first stable product in:

- A. Carbon reductin cycle
- B. OAA
- C. Malic acid
- D. PEP

Answer:



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22. Fat storing granules are:

- A. Elaioplasts
- B. Amyloplast
- C. Aleuroplast
- D. None of these.

Answer:



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23. The movement of electron from chlorophyll molecules to NADP occur in:

- A. Photosystem I
- B. Photophosphorylation
- C. Photosystem II
- D. Photorespiration

Answer:



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24. Calvin cycle leads to reduction of:

A. CO_2

B. O_2

C. RUBP

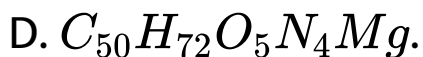
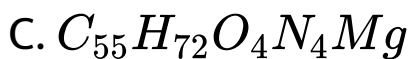
D. RUMP

Answer:



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25. The molecular formula of chlorophyll a is,



Answer:



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26. The first compound that accepts CO_2 during dark phase:

A. NADP

B. Ferredoxine

C. RuBP

D. Cytochrome

Answer:



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27. Kranz anatomy is a morphological diversity in the leaves of:

A. C_3 plants`

B. C_4 – *plants*

C. Both C_3 and C_4 - plants

D. CAM plants

Answer:



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28. The C_4 plants are photosynthesis more efficient than C_3 plants because:

A. The CO_2 efflux is not prevented

B. They have more chloroplasts

C. The CO_2 efflux is not prevented

D. CO_2 generated during photorespiration is trapped and recycled through PEP carboxylase.

Answer:



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29. Calvin k,used algae in his experiment,for tracting out the path of carbon,the algae uused were:

A. Chlorella and chlamydomonas

B. Chlorella and Scenedesmus

C. Chlorocaccum and Chlorella

D. Chloroccum and Scenedesmus

Answer:



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30. In bacteria photosynthesis:

- A. PS I is present
- B. PS II is present
- C. Both PS I and PS II are present
- D. None of these.

Answer:



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31. Which chlorophyll molecule does not have a phytol tail?

A. Chl a

B. Chl b

C. Chl c

D. Chl d

Answer:



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

- A. Malic acid
- B. Oxaloacetic acid
- C. 3-phosphoglyceric acid
- D. Phosphoric

Answer:



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33. NH_3 is released from:

A. Photorespiration

B. Dark reaction

C. CAM

D. All of these

Answer:



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34. What is common between chloroplasts, chromoplasts and leucoplasts:

- A. Presence of pigments
- B. Possession of thylakoids and grana
- C. Storage of starch, proteins and lipids
- D. Ability to multiply by a fission like process

Answer:



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35. Structurally chlorophyll a and b are different as:

A. Chl a has a methyl group and Chl b has an aldehyde group

B. Chl a has a carboxyl group and Chl b has an aldehyde group

C. Chl a has an aldehyde group and Chl b has a methyl group

D. Chl a has an ethyl group and Chl b has an aldehyde group

Answer:



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36. Which one does not occur in cyclic pyhtophosphorylation?

- A. Oxygen is not given off
- B. Water is not consumed
- C. Only photosystem - I is involved
- D. NADPH formation

Answer:



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37. In higher plants, the shape of the chloroplasts is

- A. Discoid
- B. Cup shaped
- C. Girdle shaped
- D. Reticulate

Answer:



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38. 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:



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39. Kranz anatomy is observed in:

A. C_4 plants, the bundle sheath cells:

B. Have thin walls to facilitate gaseous exchange

C. have large intercellular spaces

D. Are rich in PEP carboxylase

Answer: Have a high density of chloroplasts



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40. Kranz anatomy is observed in:

A. C_2 plants

B. C_3 plants

C. C_4 plants

D. CAM plants

Answer:



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41. Primary CO_2 acceptor of CAM plant:

A. OAA

B. PGA

C. PEP and RuBP

D. Citric acid

Answer:



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42. First stable compound in C_3 plant is:

A. PGA

B. OAA

C. RuBP

D. PEP

Answer:



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43. 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:



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44. Stroma in the chloroplasts of higher plants contain:

- A. Light independent reaction enzymes
- B. Light dependent reaction enzymes
- C. Ribosomes
- D. Chlorophyll

Answer:



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45. Mitosis occurs in:

A. Chloromatixon

B. Oscillatoria

C. Rhodospirillum

D. None of these.

Answer:



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46. The active component of photosystem -I
composed of:

A. Chlorophyll a with absorption peak at

680 nm

B. Chlorophyll a with absorption peak at

700 nm

C. Chlorophyll b with absorption peak at

680 nm

D. Chlorophyll a and h iht absorption peak
at 200 nm

Answer:



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47. In photorespiration, the cell organelles
involved are:

A. Chloroplast and mitochondrion

B. Chloroplast only

C. Chloroplast, mitochondrion and
ribosome

D. Chloroplast, mitochondrion and
peroxisome

Answer:



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48. The conversion of phosphoglyceric acid to
phosphoglyceraldehyde during
photosynthesis can be described as:

A. Oxidation

B. Hydrolysis

C. Electrolysis

D. Reduction

Answer:



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49. ATP can be formed in the photosynthesizing plant cells by:

A. Photophosphorylation

B. Oxidative phosphorylation

C. Substrate level phosphorylation

D. All of these

Answer:



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50. Energy released during movement of electrons through the photosystem in photosynthesis is used to drive protons the

membrane against concentration gradient .As
a result the protons accumulate in:

- A. Thylaikoid lumen
- B. Stroma
- C. Intrathylakoid space
- D. Stromal lamella

Answer:



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51. The first event in photosynthesis is:

- A. Photoexcitation of chlorophyll and electron emission
- B. Photolysis of water
- C. release of oxygen
- D. Synthesis of ATP

Answer:



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52. Rubisco is the most abundant enzyme in the world and present in very high concentration in chloroplasts. It is in very high concentration for photosynthesis because it:

- A. Is a very slow acting enzyme
- B. Also acts as an oxygenase
- C. Catalyses a reversible reaction
- D. Is degraded very rapidly

Answer:



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53. The enzyme sucrose synthase catalysis the synthesis of sucrose from:

A. UDPG + fructose

B. UDPF + glucose

C. UDPG+ glucose - 6 phosphate

D. UDPG+ fructose-6- phosphate

Answer:



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54. Light reaction of photosynthesis occurs inside:

A. Stroma

B. Grana

C. Endoplasmic reticulum

D. Cytoplasm

Answer:



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55. A reduction in the quantity of oxygen evolution during photosynthesis may be observed at:

A. Light having wave length more than 680

nm

B. Light having wave length less than 680

nm

C. Light having wave klength 560 nm

D. Light having wave length less than 360

nm

Answer:



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56. Plants requiring low light intensity for optimum photosynthesis is called:

- A. Heliphytes
- B. Pteridophytes
- C. Sciophytes
- D. Bryophytes

Answer:



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57. Sunken stomata are usually found in:

- A. C_3 plants
- B. CAM plants
- C. Insectivorous plants
- D. Phanerogams

Answer:



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58. In C_3 cycle for the fixation of every CO_2 molecule, the reduction and regeneration steps require:

- A. 3 ATP and 2 $NADH_2$
- B. 2 ATP and $NADPH_2$
- C. 2 ATP and 3 $NADPH_2$
- D. 3 ATP and 3 $NADPH_2$.

Answer:



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59. Which of the following is formed during photorespiration?

- A. Sugar
- B. Phosphoglycolate
- C. NADPH
- D. ATP

Answer:



60. Which of the following statement is true ?

A. In PSII the reactin centre chlorphyll a has
na absorpion peak at 700 nm ,hence is
called P 700

B. In PSI the reaction centre chlorropyll a
has an absorptin maxima at 680 nm and
is called P680

C. The splitting of water molecule is an association with PS I

D.

Answer:



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61. Fill in the blank

Photosynthesis is processed by which green plants trapenergy and convert it intoenergy of carbohydrates.



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62. Fill in the blank

RuBP carboxylase, in the presence of high concentration ofacts as oxygenase.



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63. Fill in the blank

In C_4 pathway pyruvic acid is generated in the cells and is transferred back to





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64. Fill in the blank

All the pigments are located in.....
membrans of chloroplast.



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65. Fill in the blank

The radioactive spots on chromatogram can
be located by



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66. Fill in the blank

Biochemical mechanism for photo respiration is also calledmetabolism.



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67. True or False

Chloroplast is differentiated into two structural components i.e. grana and stroma.



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68. True or False

C_3 plants are more efficient than C_4 plants due to absence of photo-respiration.



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69. True or False

Photo System II has the trap centre known as P_{680} .



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70. Write 'True' or 'False':

ATP, $NADPH_2$ and O_2 released during light phase are used in dark phase.



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71. Write 'True' or 'False':

The principle of limiting factor was proposed by Emerson.



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72. Write 'True' or 'False':

C_4 plants have a specialised type of anatomy in leaves called Kranz type.



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73. Match the terms in column A with suitable terms in column B :

Column A	Column B
(i) PS I	(a) green pigment
(ii) Heliophytes	(b) C_4
(iii) Chlorophyll	(c) P_{700}
(iv) Hatch and Slack	(d) sun loving plants
(v) Cytochromes	(e) timber
	(f) electron acceptor



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74. Note the relationship between the first two words and then fill the suitable word for fourth place:

Chlorophyll a: CH_3 ::Chlorophyll b`:.....



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75. Note the relationship between the first two words and then fill the suitable word for fourth

place:

RuBP:Ribulose 1,5 biphosphate::PGA:.....



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76. Note the relationship between the first two words and then fill the suitable word for fourth place:

PGA:3-carbon compound::RuBP:.....



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77. Note the relationship between the first two words and then fill the suitable word for fourth place:

Cyclic photophosphorylation : PS I :: Non-cyclic photosynthesis :



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78. Give reason, why?

The process of photorespiration has been considered as disadvantageous to C_3 plants.





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79. Give reason, why?

Hill reaction is not the true form of light reaction.



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80. Give reason why?

Photosynthetic pigments absorb visible part of radiation (380 nm to 760 nm).



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81. Give reason,why?

In photorespiration glycine is transported out of peroxisomes into mitochondria.



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82. Give reason,why?

C_4 plants show Kranz anatomy.



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83. Give reason,why?

Cyclic electron transport in photosynthesis is only concerned with production of ATP.



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84. Give reason,why?

Reduce form of NADP is abbreviated as NADPH



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85. Give reason, why?

Quantum requirement in photosynthesis is 8.



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86. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion:Stomata open during the day.

Reason:Stomata help in gaseous exchange.

A. A

B. B

C. C

D. D

Answer:



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87. Define Photolysis of water.



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88. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and

Reason in correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: The dark reaction in photosynthesis is called because it does not require light energy.

Reason, Dark reaction occurs more rapidly in night.

A. A

B. B

C. C

D. D

Answer:



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89. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and

Reason in correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: C_4 plants form food more rapidly more efficiently in photosynthesis than C_3 plants.

Reason: C_4 plants have a shorter CO_2 fixation cycle.

A. A

B. B

C. C

D. D

Answer:



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90. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and

Reason in correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: In C_4 plants end product of C_2 fixation is oxalo-acetic acid.

Reason: Oxalo-acetic acid is formed in bundle sheath chloroplasts.

A. A

B. B

C. C

D. D

Answer:



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91. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: Chlorophyll is soluble in ethyl ether and acetone.

Reasons: Ethyl ether and acetone are organic solvents.

A. A

B. B

C. C

D. D

Answer:



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92. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: Etiolated plants are formed due to lack of light.

Reason: In absence of light, plants show more elongation and even chlorosis to show etiolation.

A. A

B. B

C. C

D. D

Answer:



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93. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses. If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: Thylakoids are centres of CO₂ fixation of photosynthesis.

Reason: Thylakoids are grouped to form grana and have enzyme of CO₂ fixation.

A. A

B. B

C. C

D. D

Answer:



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94. The proteins are synthesized at

A. Ribosome

B. Mitochondria

C. Centrosome

D. Golgi bodies

Answer:



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95. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: C_4 photosynthetic pathway is more efficient than the C_3 pathway.

Reason: Photorespiration is suppressed in C_4 plants.

A. A

B. B

C. C

D. D

Answer:



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96. Cell Shape is mainly determined by:

A. Vacuole

B. ER

C. Microtubules

D. Cell Membrane

Answer:



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97. These questions consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

If both Assertion and Reason are true and Reason is correct explanation of Assertion.

If both assertion and Reason are true but reason is not correct explanation of Assertion.

If Assertion is true but Reason is false.

If both Assertion and Reason are false.

Assertion: Photosynthetically C_4 plants are less

efficient than C_3 plants.

Reason: The operation of C_4 pathway requires the involvement of only bundle sheath cells.

A. A

B. B

C. C

D. D

Answer:



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98. Describe structure of chlorophyll a.



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99. Define light compensation point.



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100. State blackman's law of limiting factor.



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101. Give the difference between C_3 and C_4 plants.



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102. What do you mean by Kranz anatomy ?
Give to examples.



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103. Give comparison between the following:
 C_3 and C_4 pathways



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104. Give comparison between the following:

Cyclic and non-cyclic photophosphorylation



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105. Give comparison between the following:

Anatomy of leaf in C_3 and C_4 plants



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106. Why is the colour of a leaf kept in the dark frequently yellow, or pale green?



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107. Look at leaves of the same plant on the shady side and compare it with the leaves on the sunny side or compare the potted plants kept in the sunlight with those in the shade. Which of them has leaves that are darker green ? Why?



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108. Compare the potted plants kept in the sunlight with those in the shade. Which of them has leaves that are darker green? Why?



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109. Chemiosmotic theory of ATP synthesis in the chloroplasts and mitochondrial is based on



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110. Why does rate of photosynthesis decrease at higher light intensities? What plays a protective role in such situations?



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111. When and why does photorespiration take place in plants? How does this process result in loss to the plant?



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112. Write the structure and functions of chloroplast.



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113. Give an account of carboxylation (CO_2 fixation) stage in Calvin cycle in photosynthesis



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114. Two group (A and B) of bean plants of similar size and same leaf area were placed in identical conditions .GroupA was exposed to light of wavelength of 400-450 nm and group B to light of wavelength 500-550 nm.Compare the photosynthetic rate of the two groups giving reason.



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115. Which is the princicpal form of carbohydrate translocated from leaf to the

non-photosynthetic plant organs ? Describe the translocation of photosynthates.



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116. Name the pentose phosphate that fixes CO_2 in the C_3 plants. Explain Calvin cycle in such plants.



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117. Explain urea cycle.



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118. Which light range is more effective in Photosynthesis.

A. Blue

B. Green

C. Red

D. Violet

Answer:



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119. Differentiate between photophosphorylation and phototrespiration.



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120. What is meant by photophosphorylation? Discuss the cyclic photophosphorylation with the help of schematic sketches.



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121. Describe C_4 cycle in plants. Name at least two C_4 plants.



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122. What is carbon fixation? Where does it occurs?



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123. Describe Calvin cycle.



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124. Explain the process of succession.



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125. Explain the mechanism of C_4 photosynthetic carbon cycle. Name any two plants where it occurs. Mention the difference in the structure of chloroplast in the mesophyll cells and bundle sheath cells in such plants.





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126. Explain the biosynthetic phase of photosynthesis occurring in the chloroplast?



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127. Explain the autoregulatory mechanism of GFR.



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128. Explain the mechanism of rusting.



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129. List three stages of Calvin cycle of photosynthesis .Describe the chemical steps in these stages.



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130. Differentiate

Photosystem-I and Photosystem-II



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131. Chemosynthesis bacteria obtain energy from

A. Sun

B. Infrared rays

C. Organic Substances

D. Inorganic Substances

Answer:



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Example

1. By looking at a plant externally can you tell whether a plant is C_3 or C_4 ? Why and how?



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2. By looking at which internal structure of a plant can you tell whether a plant is C_3 or C_4 ? Explain.



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3. Even though a very few cells in a C_4 plant carry out the biosynthetic - Calvin pathway, yet they are highly productive. Can you discuss why?



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4. RuBisCO is an enzyme that acts both as a carboxylase and oxygenase. Why do you think

RuBisCo carries out more carboxylation in C4 plants?



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5. Suppose there were plants that had a high concentration of Chlorophyll b, but lacked chlorophyll a, would it carry out photosynthesis? Then why do plants have chlorophyll b and other accessory pigments?



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6. Why is the colour of a leaf kept in the dark frequently yellow, or pale green?



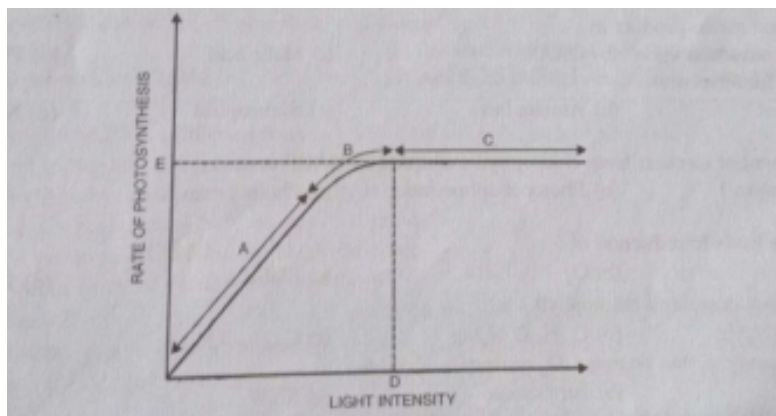
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7. Look at leaves of the same plant on the shady side and compare it with the leaves on the sunny side or compare the potted plants kept in the sunlight with those in the shade. Which of them has leaves that are darker green ? Why?



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8. Figure given below shows the effect of light on the rate of photosynthesis .Based on the graph ,answer the following questions:

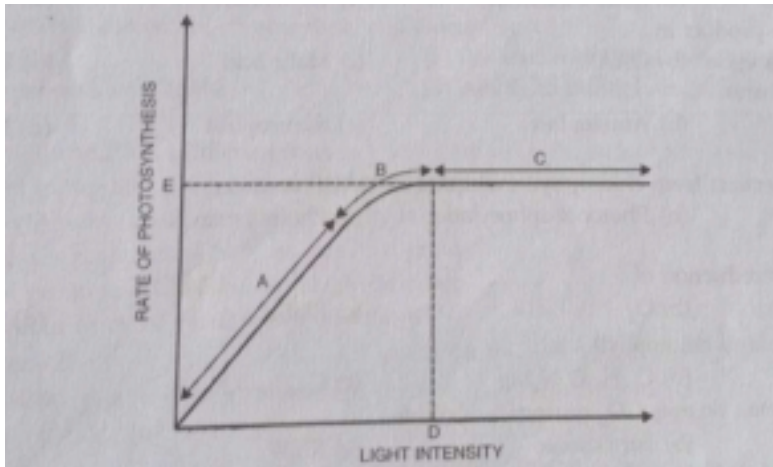


At which points (A,B or C) in the curve is light a limiting factor?



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9. Figure given below shows the effect of light on the rate of photosynthesis .Based on the graph ,answer the following questions:

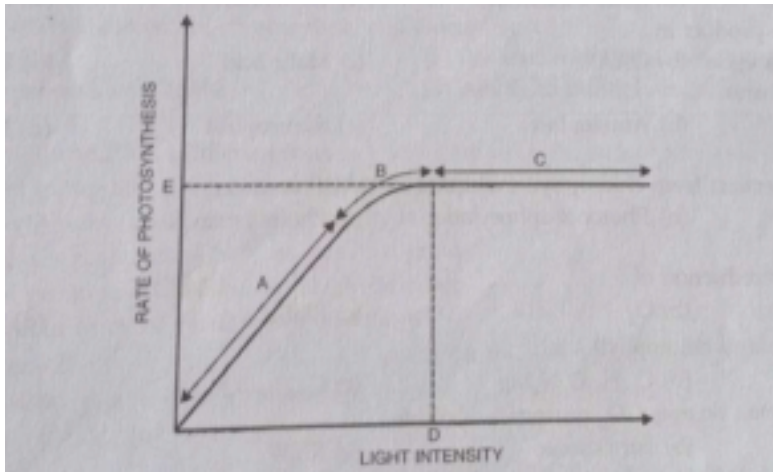


What could be the limiting factor,s in region A?



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10. Figure given below shows the effect of light on the rate of photosynthesis .Based on the graph ,answer the following questions:



What do C and D represent on the curve?



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