



BIOLOGY

BOOKS - KUMAR PRAKASHAN KENDRA BIOLOGY (GUJRATI ENGLISH)

PHOTOSYNTHESIS IN HIGHER PLANTS

Section A Exam Oriented Questions Answers From Drpan

1. Why are green plants necessary for living organisms ?



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2. Explain the experiment of two leaves for formation of starch.



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3. Describe the experiment of Priestley.



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4. Explain the experiment of Jan Ingenhousz.



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5. Explain the experiment of Julius von Sachs.



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6. Explain the experiment of T. W. Engelmann (1843 - 1909)



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7. How middle of 19th century is an important reference to photosynthesis ?



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8. Give contribution of Cornelius van Niel ?



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9. Where does photosynthesis take place ? Explain.



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10. Explain the structure of chloroplast.



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11. How many pigments take part in photosynthesis ?



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12. Explain the role of pigments in photosynthesis.



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13. What is reaction centre ?



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14. Explain Light harvesting complexes ?



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15. Explain construction of LHC with diagram.



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16. Explain : Electron Transport



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17. Describe Z scheme of light reaction



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18. Explain splitting of water



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19. Describe photolysis of water.



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20. Explain : Non - cyclic Photophosphorylation.



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21. Explain cyclic photophosphorylation.



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22. Describe Chemiosmotic Hypothesis.



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23. Explain : Where aer ATP and NADPH used ? Write introduction of biosynthetic process.



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24. Explain the information about discovery of C_3 and C_4 pathway.



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25. Explain : Who is primary acceptor of CO_2 ?



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26. Describe Calvin cycle. OR C_3 pathway.



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27. Describe C_4 pathway.



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28. Explain : Where is Hatch-Slack pathway seen ?



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29. Describe photorespiration.



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30. Mention important matters for C_4 plants.



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31. Give difference between $C_3 - C - (4)$ plants.



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32. Explain factors affecting photosynthesis.



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Section B Difference Scientific Reasons Give Difference 2 Marks

1. Grana and Stroma



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2. PS - I and PS - II



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3. Light reaction (Light phase) Dark reaction (Biosynthetic phase)



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4. Mesophyll cells and Bundle sheath cells



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5. Green plants form basis of life of earth



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6. Photosynthesis is a complex metabolic process.



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7. The productivity of C_4 is more than C_3 .



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8. It is necessary that Calvin cycle runs for six times.



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9. Photorespiration does not take place in C_4 plants.





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Section C Definition Explanation Terms Location Function Full Name
Definitions Explanation 1 Mark

1. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL
NAME

Photosynthesis :



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2. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL
NAME

Light reaction :



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3. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

Dark reaction :



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4. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

Photophosphorylation :



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5. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

Photorespiration :



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6. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

Bundle sheath :



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7. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

kranz Tissue :



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8. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

Photo - oxidation :



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9. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

Chloroplast :



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10. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

Cells of Bundle sheath :



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11. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

Thylakoid :



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12. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

Stoma :



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13. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

LHC



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14. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

PS



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15. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL
NAME

NADP



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16. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL
NAME

ATP



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17. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL
NAME

PGA



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18. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

OAA



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19. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

RuBisCO



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20. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

KOH



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21. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

PS-I



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22. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

PS-II



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23. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL NAME

RuBP



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24. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

PGAL



View Text Solution

25. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

PEP



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26. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL

NAME

PEPcase



View Text Solution

27. DEFINITION / EXPLANATION - TERMS / LOCATION - FUNCTION / FULL
NAME

nm



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Section D Textual Exercise

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. 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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5. Why is the colour of a leaf kept in the dark frequently yellow, or pale green? Which pigment do you think is more stable?

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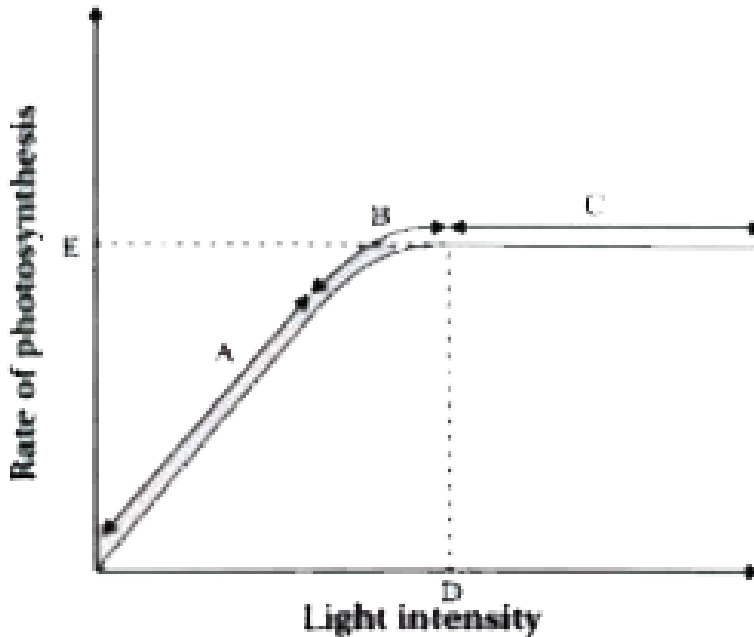
6. Look at leaves of the same plant on the shady side and compare it with the leaves on the sunny side or compare the potted plants kept in the

sunlight with those in the shade. Which of them has leave that are darker green ? Why ?



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7. Figure shows the effect of light on the rate of photosynthesis, Based on the graph, answer the following question :



- (a) At which point/s (A,B or C) in the curve is light a limiting factor ?
- (b) What could be the limiting factor/s in region A ?
- (c) What do C and D represent on the curve ?



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8. Give comparison between the following :

(a) C_3 and C_4 pathways



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9. Give comparison between the following :

Cyclic and Non-cyclic photophosphorylation



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10. Give comparison between the following :

Anatomy of leaf in C_3 and C_4 plants



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1. Which metal ion is a constituent of chlorophyll ?

- A. Iron
- B. Copper
- C. Magnesium
- D. Zinc

Answer: A



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2. Which pigment acts directly to convert light energy to chemical energy ?

- A. Chlorophyll - a
- B. Chlorophyll-b
- C. Xanthophyll

D. Carotenoid

Answer: A::C



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3. Which light range is most effective in photosynthesis ?

A. Blue

B. Green

C. Red

D. Violet

Answer: D



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4. Chemosynthesis bacteria obtain energy from

- A. sun
- B. infrared rays
- C. organic substances
- D. inorganic chemicals

Answer: inorganic chemicals



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5. Energy required for ATP synthesis in Ps - II comes from

- A. Proton gradient
- B. electron gradient
- C. reduction of glucose
- D. oxidant of glucose

Answer: A::D



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6. During light reaction in photosynthesis the following are found

- A. ATP and sugar
- B. Hydrogen, O_2 and sugar
- C. ATP hydrogen donor and O_2
- D. ATP, hydrogen and O_2 donor

Answer: A::B::D



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7. Dark reaction in photosynthesis is called so bacuse

- A. it can occur in dark also
- B. it does not depend on light energy
- C. it cannot occur during day light

D. it occurs more rapidly at night

Answer: D



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8. PEP is primary CO_2 acceptor in

A. C_4 plants

B. C_3 plants

C. C_2 plants

D. both C_3 and C_4 plants

Answer: A::C::D



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9. Splitting of water is associated with

- A. photosystem I
- B. lumen of the thylakoid
- C. both photosystem I and II
- D. inner surface of thylakoid membrane

Answer: A::B::C::D



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10. The correct sequence of flow of electrons in the light reaction is

- A. PS - II, plastoquinone, cytochromes, PS - I, ferredoxin
- B. PS - I, plastoquinone, cytochromes, PS-II, ferredoxin
- C. PS-I, ferredoxin, PS-II
- D. PS-I, plastoquinone, cytochromes, PS - II, ferredoxin

Answer: PS-II, plastoquinone, cytochromes, PS-I, ferredoxin



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11. The enzyme that is not found in a C_3 plant is

- A. RuBP carboxylase
- B. PEP carboxylase
- C. NADP reductase
- D. ATP synthase

Answer: A::B::C



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12. The reaction that is responsible for the primary fixation of CO_2 is catalysed by

- A. RuBP carboxylase
- B. PEP carboxylase
- C. RuBP carboxylase and PEP carboxylase

D. PGA synthase

Answer: RUBP carboxylase and PEP carboxylase



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13. When CO_2 is added to PEP, the first stable product synthesised is

A. pyruvate

B. glyceraldehyde - 3 - phosphate

C. phosphoglycerate

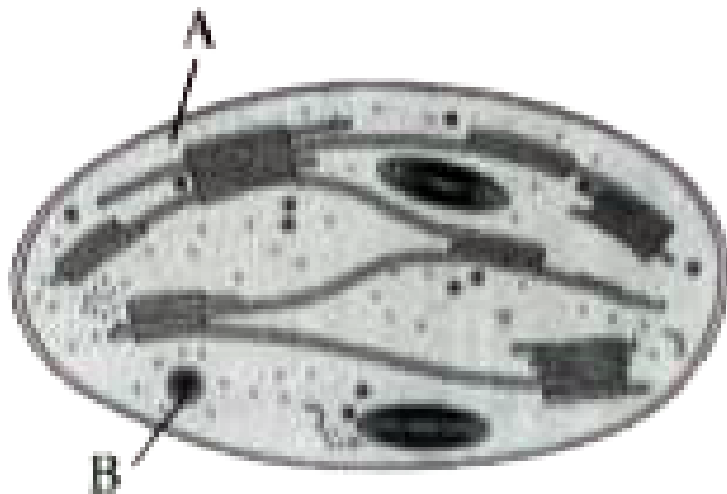
D. oxaloacetate

Answer: oxaloacetate



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1. Examine the figure :



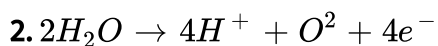
(a) Is this structure present in animal cell or plant cell ?

(b) Can these be passed on to the progeny ? How?

(c) Name the metabolic processes taking place in the marked (A) and (B).



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Based on the above equation, answer the following question

Where does this reaction take place in plants ?

(b) What is the significations of this reaction ?



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3. Cyanobacteria and some other photosynthetic bacteria don't have chloroplasts. How do they conduct photosynthesis ?



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4. (a) NADP reductase enzyme is located on

(B) Breakdown of proton gradient leads to release of



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5. Can girdling experiments be done in monocots ? If yes, How ? If no, why not ?



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6.

$3CO_2 + 9ATP + 6NADPH + \text{water} \rightarrow \text{glyceral - dehyde 3 - phosphate}$

pi. Analyse the above reaction and answer the following questions :

How many molecules of ATP and NADPH are required to fix one molecule of CO_2 ?

Where in the chloroplast does this process occur ?



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7. Does moonlight support photosynthesis ? Find out.



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8. Some of these terms/chemicals are associated with the C_4 cycle.

Explain.

Hatch slack pathway

Calvin cycle

(c) PEP carboxylase

(d) Bundle sheath cells



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9. Where is NADP reductase enzyme located in the chloroplast ? What is the role is this enzyme in proton gradient development ?



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10. ATPase enzyme consists of two parts. What are those parts ? How are they arranged in the thylakoid membrane ? Conformational change occur in which part of the enzyme ?



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11. Which products formed during the light reaction of photosynthesis are used to drive the dark reaction ?

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12. What is the basis for designating C_3 and C_4 pathways of photosynthesis ?

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Section E Solutio Of Ncert Exemplar Short Answer Type Question

1. Succulents are known their stomata closed during the day to chek transpiration . How do they meet their photosynthetic CO_2 requirements ?

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2. Chlorophyll 'a' is the primary pigment for the ligh reaction. What are accessory pigments ? What is their role is photosynthesis ?

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 [View Text Solution](#)

3. Do reactions of photosynthesis called, as 'Dark Reaction' need light ? Explain.

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4. How are photosynthesis and respiration related to each other ?

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5. If a green plant is kept in dark with proper ventilation, can this plant carry out photosynthesis ? Can anything be given as supplement to maintain its growth or survival ?

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6. Photosynthetic organisms occur at different depths in the ocean. Do they receive qualitatively and quantitatively the same light ? How do they adapt to carry out photosynthesis under these conditions ?



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7. In tropical rain forests, the canopy is thick and shorter plants growing below it, receive filtered light. How are they able to carry out photosynthesis ?



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8. What conditions enable RuBisCO to function as an oxygenase ? Explain the ensuing process.



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9. Why does the rate of photosynthesis decreases at higher temperatures ?



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10. Explain how during light reaction of photosynthesis, ATP synthesis is a chemiosmotic phenomenon.



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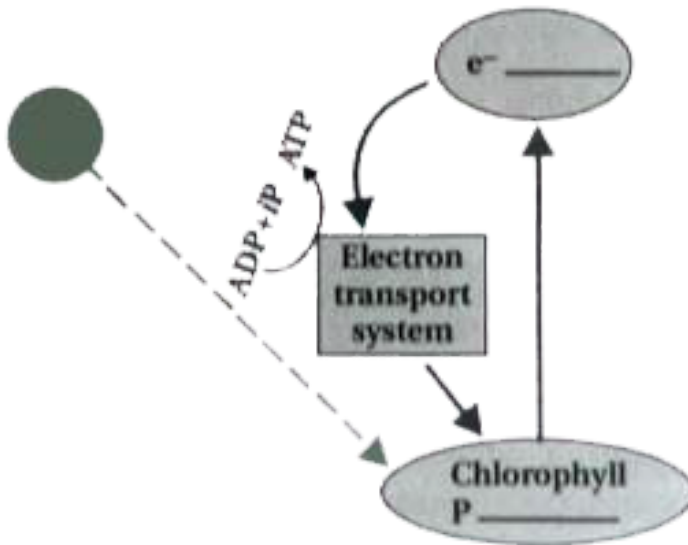
11. Find out how Melvin Calvin worked out the complete biosynthetic pathway for synthesis of sugar.



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12. Six turns of Calvin cycle are required to generate one mole of glucose. Explain.

13. Complete the flow chart for cyclic photophosphorylation of the photosystem - I.



14. In what kind of plant do you come across 'Kanz' anatomy ? To which conditions are those plants better adapted ? How are these plants better adapted than the plants, which lack this anatomy?

15. A process is occurring throughout the day, in 'X' organism. Cells are participating in this process. During the process ATP, CO_2 and water are evolved. It is not a light dependent process.

(a) Name the process.

(b) It is a catabolic or an anabolic process ?

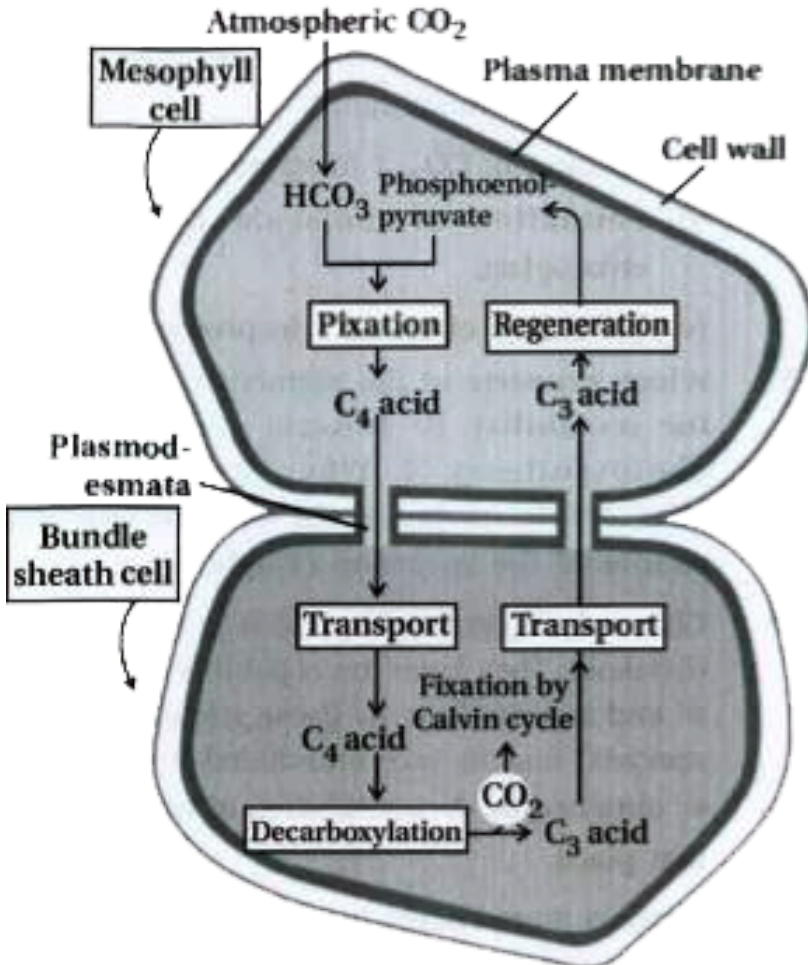
What could be the raw material to this process ?

16. Toatoes, carrots and chilles ar used in colour due to the presnece of one pigment. Name the pigment. Is it a photosynthetic pigment ?

17. Why do we belive choroplast and mitochondria to be semi - autonomous organelle ?



18. Observe the diagram and answer the following.



(a) Which group of plants exhibit these two types of cells?

(a) Which group of plants exhibit these two type of cells ?

(b) What is first product of C_4 cycle ?

(c) Which enzyme is there in bundle sheath cells and mesophyll cells ?



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19. A cyclic process is occurring in C_3 plant, which is light dependent and needs O_2 . This process doesn't produce energy rather it consumes energy.

(a) Can you name the given process ?

(b) Is it essential for survival ?

(c) What are the end products of this process ?

(d) Where does it occur ?



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20. Suppose Euphorbia and Mazie are grown in the tropical area.

(a) Which one of them do you think will be able to survive under such conditions ?

(b) Which one of them is more efficient in terms of photosynthetic

activity ?

(c) What difference do you think are there in their leaf anatomy ?



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Section E Solution Of Ncert Exemplar Long Answer Type Questions

1. Is it correct to say that photosynthesis occurs only in leaves of a plant?

Besides leaves, what are the other parts that may be capable of carrying out photosynthesis ? Justify.



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2. The entire process of photosynthesis consists of a number of reactions.

Where in the cell do each of these take place ?

(a) *Synthesis of ATP & NADPH* (b) *Photo → lysis of water* (c)

CO_2

(d) Synthesis of sugar molecule

Synthesis of starch



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3. Which property of the pigment is responsible for its ability to initiate the process of photosynthesis ? Why is the rate of photosynthesis higher in the red and blue regions of the spectrum of light ?



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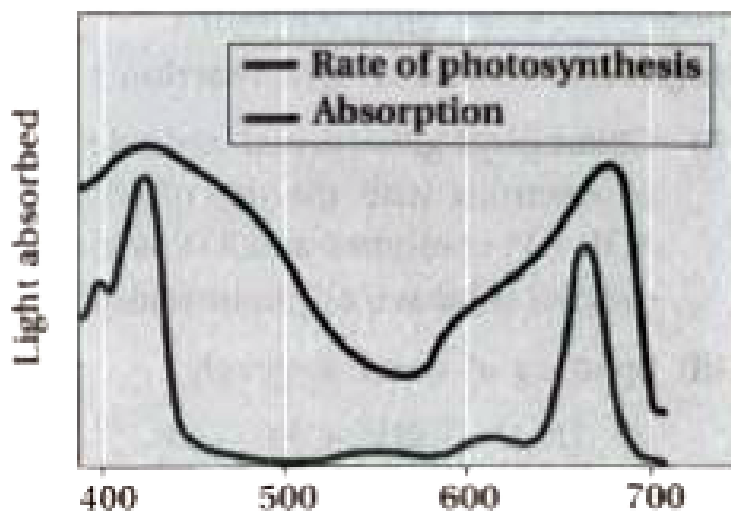
4. What can we conclude from the statement that the action and absorption spectrum of photosynthesis overlap ? At which wavelength do they show peaks ?



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5. Under what conditions are C_4 plants superior to C_3 ?

6. In the figure given below, the black line (upper) indicates action spectrum for photosynthesis and the lighter line (lower) indicates the absorption spectrum of chlorophyll - a, answer the followings :



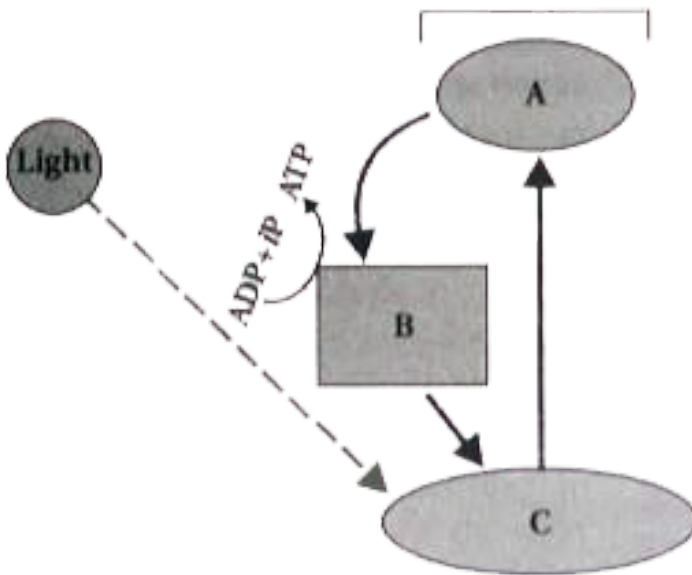
(a) What does the action spectrum indicate ? How can we plot an action spectrum ? Explain with an example.

(b) How can we derive an absorption spectrum reaction of photosynthesis, why do the action spectrum and absorption spectrum not overlap ?

7. What are the important events and end products of the light reaction ?

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8. In the diagram shown below label A,B,C. What type of photosynthesis is possible in this ?



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9. Why is the RuBisCO enzyme more appropriately called RUBP Carboxylase-Oxygenase and what important role does it play in photosynthesis ?



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10. What special anatomical features are displayed by leaves of C_4 plants ? How do they provide advantage over the structure of C_3 plants ?



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11. Name the two important enzymes of C_3 and C_4 pathway, respectively ? What important role do they play in fixing CO_2 ?



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12. Why is RuBisCO enzyme the most abundant enzyme in the world ?



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13. Why does not photorespiration take place in C_4 plants ?



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Question From Module Important Mcq For Neet

1. Where does maximum photosynthesis occurs ?

- A. Red light
- B. Green light
- C. Blue light
- D. Yellow light

Answer: D



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2. Plants show sunken stomata.

- A. C_3 plants
- B. CAM plant
- C. Insectivores
- D. All of above

Answer: A::C



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3. In photosynthetic plants, synthesis of ATP is due to process.

- A. photophosphorylation
- B. Oxidative phosphorylation
- C. Phosphorylation at substance level
- D. All of the above

Answer: A



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Multiple Choice Questions Mcqs

1. Who revealed the essential role of air in the growth of green plants ?

A. Jan Ingenhousz

B. Joseph Priestley

C. Hill

D. Julius von Sachs

Answer: B



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2. Is a bright or blue green in the chromatogram

A. Chlorophyll a

B. Chlorophyll b

C. Xanthophyll

D. Carotenoids

Answer: A



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3. The chief pigment associated with photosynthesis

A. Chlorophyll-a

B. Chlorophyll-b

C. Carotenodies

D. Xanthophyll

Answer: A



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4. When all the carries are placed in a sequence on a redox potential scale

A. A scheme

B. Z seheme

C. M scheme

D. L sheme

Answer: B



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5. Biosynthetic pathway is also called as

A. Calvin cycle

B. Kreb's cycle

C. TGA cycle

D. Photorespiration

Answer: A



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6. In C_4 plant calvin cycle takes place in

A. Mesophyll

B. Bundle sheath

C. Both (A) and (B)

D. None of these

Answer: B



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7. Major limiting factor for photosynthesis is

A. Light

B. CO_2

C. Temperature

D. Water

Answer: B



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8. Light saturation occurs at which percentage of full sunlight

A. 1

B. 0.1

C. 0.5

D. 0.2

Answer: B



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9. No synthesis of ATP of NADPH takes place in

- A. Photorespiration
- B. Photosynthesis
- C. Chlorophyll-b
- D. Both (A) and (C)

Answer: A



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10. Kranz anatomy is present in

- A. Maize
- B. Sorghum
- C. Both (A) and (B)

D. None of these

Answer: A::C



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11. Chemosmosis requires

A. Membrane

B. Protonn pump

C. Proton gradient

D. All of these

Answer: D



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12. The most crucial step of calvin cycle is

A. Carboxylation

B. Reduction

C. Regeneration

D. All of these

Answer: A



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13. Which are 'in' the calvin cycle ?

A. 18 ADP

B. 12 NADP

C. Six O_2

D. Six CO_2

Answer: D



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14. The most abundant enzyme in world

- A. RuBiCO
- B. PEPcase
- C. Deaminase
- D. Carbonase

Answer: A



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15. Photo respiration is absent in

- A. Maize
- B. Sorghum
- C. C_4 plants

D. All of these

Answer: D



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16. Bacteria used by Engelmann accumulated mainly in the region of

A. Blue

B. Red

C. Both (A) and (B)

D. CO_2

Answer: A::C



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17. Which one is donor in photosynthesis ?

A. O_2

B. H_2O not utilized

C. CO_2

D. $C_{16}H_{12}O_6$

Answer: B



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18. First action spectrum was described by

A. T.W Engelman

B. Julius Von Sach

C. Van Niel

D. Priestly

Answer: A



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19. The reaction which is not light dependent

- A. Light
- B. Dark
- C. Both (A) and (B)
- D. None of these

Answer: B



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20. Which regions in VIBGYOR show low rate of photosynthesis ?

- A. Green light
- B. Blue
- C. Red

D. Orange

Answer: A



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Assertion Reasoning Type Questions

1. A : C_4 plants photosynthesis is more efficient than C_3 plants.

R : C_4 plants have a shorter CO_2 fixation cycle.

A. A and R both are correct and R is correct explanation of A.

B. A and R are correct but R is not explanation of A.

C. A is correct and R is false.

D. A and R are false

Answer: A



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2. A : Action spectrum of photosynthesis compares well with absorption spectrum of chlorophyll.

R : Chlorophyll is the only pigment which can absorb and convert light energy into chemical energy.

A. A and R both are correct and R is correct explanation of A.

B. A and R are correct but R is not explanation of A.

C. A is correct and R is false.

D. A and R are false

Answer: B



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3. A : The absorption spectrum of chlorophyll 'a' shows close correlation with its action spectrum.

R : Chlorophyll 'a' is present in both pigment system I and II.

A. A and R both are correct and R is correct explanation of A.

B. A and R are correct but R is not explanation of A.

C. A is correct and R is false.

D. A and R are false

Answer: A



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4. A: C_4 plants are better adapted in tropicall and desert areas.

R: C_4 plants can perform a high rate of photosynthesis even when stomata are nearly closed.

A. A and R both are correct and R is correct explanation of A.

B. A and R are correct but R is not explanation of A.

C. A is correct and R is false.

D. A and R are false

Answer: A



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5. A : Lysosomes helps in process of photorespiration .

R : Lysosomes have basic enzymes

A. A and R both are correct and R is correct explanation of A.

B. A and R are correct but R is not explanation of A.

C. A is correct and R is false.

D. A and R are false

Answer: D



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6. A : Dark reaction occurs at night in stroma of chloroplast

R : All the enzymes responsible of CO_2 fixation remain inactive in

presence of light.

- A. A and R both are correct and R is correct explanation of A.
- B. A and R are correct but R is not explanation of A.
- C. A is correct and R is false.
- D. A and R are false

Answer: D



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Analogy Type Questions

1. Chlorophyll a : Blue green :: chlorophyll b :



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2. In PSI the reaction centre chlorophyll a has : absorption peak at 700 nm
: : PS-II :



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3. Basis of photoyynthesis : CO_2 and H_2O : : phosporylation :



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4. C_3 : PGA : : C_4 :



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5. C_4 plant saturation for CO_2 : $360 \mu/L^{-1}$: : C_3 :



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6. Green plants H_2O is hydrogen donor : : purple and green sulphur bacteria :



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True Or False

1. Ingen hourz showed that sunlight is essential for plant process.



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2. Ingen hourz showed that only green part of plant could release O_2 .



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3. Biosynthetic phase includes light absorption water splitting etc.



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4. H_2O is hydrogen donor in purple and green sulphur bacteria.



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5. O_2 released during photosynthesis comes from water.



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6. NADP reductase enzyme is located on the stroma side of membrane.



[View Text Solution](#)

7. Along with NADPH produced by the movement of electron, the ATP will be used after some time in biosynthetic reaction.



[View Text Solution](#)

8. As electrons move through the photosystems, protons does not not move across the membrane.



[View Text Solution](#)

9. F_1 protudes on the outer surface of thylakoid membranc on the side that faces stroma.



[View Text Solution](#)

10. The dark phase is dependent on the products of light reaction.



[View Text Solution](#)

Pick Up The Correct Option

1. The bundle sheath is rich in RUBISCO but contains / lacks PEPcase





[View Text Solution](#)

2. RUBISCO is most abundant / least enzyme in the world.



[View Text Solution](#)

3. Particularly large cells / small around vascular bundles of C_4 pathway are called as bundle sheath cells.



[View Text Solution](#)

4. C_4 plants show response to low / high light intensity as they lack photorespiration.



[View Text Solution](#)

5. For every / two molecules of CO_2 entering calvin the cycle, 3 molecules of ATP and 2 of NADPH are required.



[View Text Solution](#)

6. The plants adapted to dry tropical regions have C_3 / C_4 pathway.



[View Text Solution](#)

7. The first stable product is PGA / OA A in C_3 plants .



[View Text Solution](#)

Fill In Blanks

1. Carboxylation is if CO_2 into stable organic intermediate.



[View Text Solution](#)

2. NADP reductase enzyme is located on the side of membrane.



[View Text Solution](#)

3. The first product of C_3 plant is



[View Text Solution](#)

4. The first product of C_4 plant is



[View Text Solution](#)

5. Water stress causes the stomata, Hence CO_2 availability.



[View Text Solution](#)

6. C_4 plants respond to Temperature and show higher rate of photosynthesis.



[View Text Solution](#)

7. C_4 plants have a mechanism which concentration of CO_2 at enzyme site.

 [View Text Solution](#)

8.of Bundle sheath helps in identifying C_4 plants.

 [View Text Solution](#)

9. The fixation of six molecules of CO_2 and 6 turns of the cycle are required for removal of Molecule of glucose from the pathway.

 [View Text Solution](#)

10. Each photosystem has all the pigment except forming a light harvesting system called antennae.



View Text Solution