



## BIOLOGY

## BOOKS - SANTRA BIOLOGY (BENGALI ENGLISH)

## PHOTOSYNTHESIS

**Exercise A Multiple Choice Questions Mcq** 

1. The role of chlorophyll in photosynthesis is

A. absorption of water

B. absorption of  $CO_2$ 

C. absorption of light and photolysis of

water

D. absorption of light

Answer: C

**2.** More than nine tenth of all the photosynthesis is carried

A. fern

B. mosses

C. algae of ocean

D. large trees

Answer: C

3. Which of the following is an essential part

of photosynthesis ?

A. Oxygen

B. sunlight

C. Carbon di oxide

D. Chlorophyll

Answer: A

4. A cell that lacks chloroplast does not

A. evolve  $CO_2$ 

B. liberate  $O_2$ 

C. require water

D. utilise carbohydrate

Answer: B

5. The red drop is due to the disruption of

photochemical activity of

A. PS I

B. PS II

C. PS I and II

D. carotenoid

**Answer: B** 

**6.** First stable compound of  $C_3$  cycle is

A. glucose

B. PGAld

C. PGA

D. fructose 1, 6 diphosphate

Answer: C

7. Emerson defined red drop as decline in quantum yield of photosynthesis at wavelength

A. 460 nm

B. 670 nm

C. 680 nm

D. more than 560 nm

Answer: C

8. The process of photophosphorylation was

described by

A. Blackmann

B. Warburg

C. Arnon

D. Calvin

Answer: C

9. Who gave chemical composition of

chlorophyll, carotenes and xanthophyll?

A. Park and Begging

B. Meyers and French

C. Willstatter and Stoll

D. Govindjee

Answer: A

10. Photosynthesis is most active in

A. sunlight

B. blue light

C. red light

D. green light

Answer: B,C

**11.** The Photosynthetic unit having 250

chlorophyll molecules are called

A. quantum

B. quantosome

C. oxysome

D. photon

Answer: B

12. Assimilatory power refers to

A. Production of ATP and  $NADPH_2$ 

B. reduction of  $CO_2$ 

C. splitting of  $H_2O$ 

D. disintegration of plastid

Answer: A



#### **13.** Which one is a $C_4$ plant ?

A. papaya

B. pea

C. potato

D. maize

Answer: D

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**14.** The law of limiting factors for photosynthesis was enunciated by

A. R.Hill

- B. Calvin
- C. Krebs
- D. Blackmann

#### Answer: D



15.  $C_{40}H_{56}$  is the

A. xanthophyll

B. Chl-b

C. carotene

D. anthocyanin

Answer: C

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**16.** An alluminated plant is provided with  $0.03\% CO_2$ . The plant will

#### A. die

B. just survive

C. show normal photosynthesis

D. have reduced respiration

Answer: A

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17. The substrate for photorespiration is

A. glycolic acid

 $\mathsf{B.}\,H_2O_2$ 

C. serine

D. phosphoglyceric acid

Answer: A

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**18.** Quanta required for assimilation of one molecule of  $CO_2, O_2$  liberation of

photosynthesis are

B. 6

C. 8

D. 10

Answer: C

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**19.**  $C_4$  plants differ from  $C_3$  plants in :

A. substrate which accepts  $CO_2$ 

B. first product

C. number of ATP molecule consumed

D. all of the above

Answer: C

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**20.** A non chlorophyllous water soluble pigment in association of PSII of blue green algae is

A.  $\beta$  carotene

B. zeaxanthin

C. anthocyanin

D. phycocyanin

Answer: D

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21. Kranz anatomy found in

A. flower

B. roots

C. stem

D. leaves

Answer: D



**22.** ATP formation during photosynthesis is termed as

A. phosphorylation

B. photophosphorylation

C. oxidative phosphorylation

D. none of these

#### Answer: C

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**23.** In blue green algae photosystem II contains an important pigment concerned with photolysis of water . It is called

A. carotene

B. chlorophyll b

C. cytochrome

D. phycocyanin

Answer: C

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24. Trap centre of radiant energy in PSI is

A. carotene

B. xanthophyll

C.  $P_{700}$ 

D.  $P_{800}$ 

#### Answer: C



#### 25. RuBisCO (RuBP -carboxylase oxygenase) a

protein which comprises

A. 5% of total chloroplast portion

B. 11% of total chloroplast portion

C. 16% of total chloroplast portion

D. 20% of total chloroplast portion

Answer: C

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**26.** In  $C_4$  plants initial  $CO_2$  fixation takes place

in the chloroplast of

A. guard cells

B. spongy mesophyll

C. palisade tissue

D. bundle sheath

#### Answer: B,D



#### 27. Photorespiration is affected by

A. light intensity

B. temperature

 $\mathsf{C}. CO_2$  and  $O_2$ 

D. all of these

#### Answer: D

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### **28.** Photosynthetic evolution of oxygen

requires

A. co-enzyme

B. Fe enzyme

C. Mn enzyme

#### D. Zn enzyme

#### Answer: C

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#### 29. which of the following wavelength is active

#### in view of photosynthesis ?

A. 400-500nm

B. 400 -700 nm

C. 200 - 450 nm

D. 510-600 nm

Answer: B

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# **30.** Which one is needed for both photosynthesis and respiration ?

A. sunlight

B. chlorophyll

C. glucose

D. cytochrome

#### Answer: D

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#### 31. The presumed size of chlorophyll is

A. head  $15 imes15 ext{Å}, tail-20 ext{\AA}$ 

B. head  $10 imes 12 ext{Å}, tail - 15 ext{\AA}$ 

C. head 20 imes 20Å, tail-25Å

D. head  $15 imes15 ext{Å}, tail-25 ext{\AA}$ 

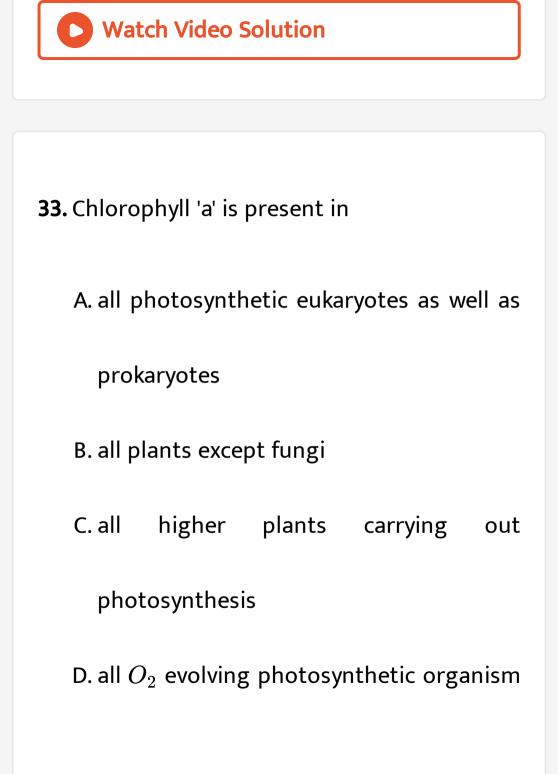




#### 32. Photolysis of water is associated with

- A. PS I
- B. PS II
- C. Cyt ' b'
- D. quinone

Answer: B



#### Answer: D



**34.** Warburg effect is decreased rate of photosynthesis at

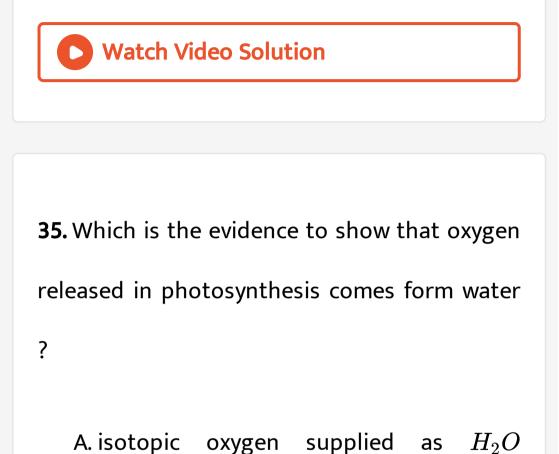
A. low concentration of  $CO_2$ 

B. high concentration of  $CO_2$ 

C. high concentration of  $O_2$ 

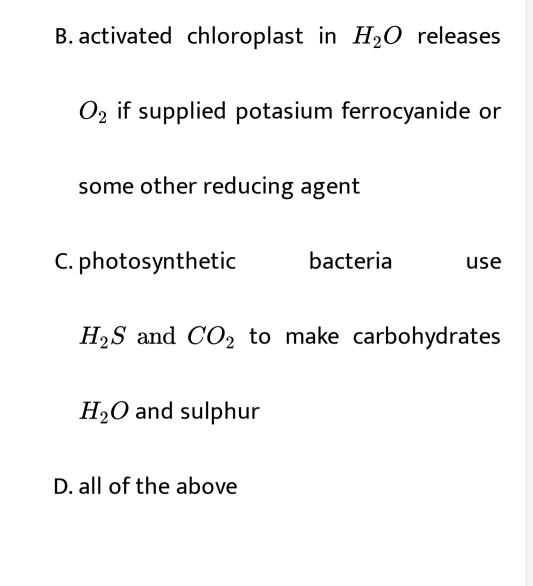
D. none





appears in the  $O_2$  released in

photosynthesis



Answer: A

36. Major component of phloem sap is

A. Galactose

B. sucrose

C. Fructose

D. Starch

**Answer: B** 



**37.** chlorophyll , 4 - pyrrol rings are attached to

Mg by their atoms

A. N

B.C

С. Н

D. 0

Answer: A

### **38.** Fixation & reduction of $CO_2$ require

A. ATP , NADPN

B. ATP

C. NADPH, chl , water

D. None

Answer: A

**39.** Enzymes RuBP carboxylase - oxygenase &

PEP - carboxylase are activated by

A. Mg

B. Mo

C. Mn

D. Zn

**Answer: A** 

40. Chloroplast stoma of higher plant contains

A. Chlorophyll II

B. Light independent reaction enzyme

C. Ribosomes

D. None

Answer: B

**41.** Which of the following is the  $CO_2$  acceptor used by  $C_3$  - plants for the activities of food production ?

A. RUBP

B. PGA

C. PEP

D. OAA

Answer: A



42. Reaction centre of PSI is

A.  $P_{680}$ 

B.  $P_{700}$ 

 $\mathsf{C.} Chl_{715}$ 

D.  $Chl_{685}$ 

Answer: B



43. The photosynthetic unit to trap the light

energy is known as

A. mesosome

B. oxysome

C. nucleosome

D. quantosome

#### Answer: D

44. PS - II accepts electrons from

## A. $O_2$

## $\mathsf{B.}\,OH^{\,-}$

C.  $H^+$ 

D. Both a & c

#### **Answer: B**



**45.** The fixation & reduction of  $CO_2$  occurs in

presence of

A. ATP & NADPH

B. ATP

C. ATP, NADPH & light

D. None

Answer: A

46. Manganese is required in

A. Photolysis of water during

photosynthesis

B. Chlorophyll synthesis

C. Nucleic acid synthesis

D. Plant cell wall formation

Answer: A

47. Photoperiodism was first characterised in

A. Potato

B. Tobacco

C. Tomato

D. Cotton

Answer: B



**48.** The energy releasing metabolic process in which substrate is oxidized without an internal electron acceptor is called

A. Photorespiration

**B.** Fermentation

C. Glycolysis

D. Aerobic respiration

Answer: A

**49.** PGA as the first  $CO_2$  fixation product was

discovered in photosynthesis of

A. alga

B. gymnosperm

C. bryophyte

D. angiosperm

Answer: A

50. Transport of food materials in higher

plants take place through

A. sieve elements

B. trachieds

C. companion cells

D. transfusion

Answer: A

**51.** In Kranz anatomy , the bundle sheath cells have ,

A. thin walls , no inter cellular spaces & several chloroplasts

B. thick walls, many intercellular spaces &

few chloroplasts

C. thick walls, many intercellular spaces &

no chloroplasts

D. None

#### Answer: A



**52.** Which of the following organelles are associated with photorespiration ?

A. Chloroplast , peroxisome , mitochondria

B. mitochondria, ER , carotenoids

C. ribosomes, carotenoids, mitochondria

D. carotenoids, chloroplast , peroxisome





## 53. Example of water soluble plant pigment is

- A. chl a
- B. anthocyanin
- C. chl-b
- D. xanthophyll

Answer: B



54. CAM helps the pants in

A. secondary growth

B. disease resistance

C. conserving water

D. reproduction

Answer: C

**55.** Plants requiring low light intensity for optimum photosynthesis is called

A. bryophytes

B. sciophytes

C. heliophytes

D. pteridophytes

Answer: B

56. A process that makes important difference

between the  $C_3\&C_4$  plant is

A. glycolysis

B. transpiration

C. photosynthesis

D. photorespiration

Answer: D

57. In  $C_3$  Plants , the first stable product of

photosynthesis during dark reaction is

A. PGAld

B. RuBP

C. PGA

D. OAA

Answer: C



**58.** In  $C_4$  - plants the  $CO_2$  occurs in

A. guard cells

B. spongy cells

C. palisade cells

D. bundle sheath cells

Answer: D

59. Photolysis of water caused by

A. PS- I

B. PS-II

C. PS-I and PS-II

D. None of them

Answer: B

60. CAM - pathway is observed in

A. Pineapple

B. Maize

C. Sunflower

D. sugar cane

Answer: A

61. Thylakoids occur inside

A. Mitochondria

B. Chloroplast

C. Golgi apparatus

D. Endoplasmic reticulum

Answer: C

62. Cyclic photophosphorylation links to

A. PS- I

B. PS-II

C. Dark reaction

D. Both (a) & (b)

**Answer: B** 

63. Chlorophyll molecules are located in the

A. thylakoid membrane

B. thylakoid lumen

C. stroma

D. inner chloroplast membreane

Answer: A

**64.** Gross primary productivity is the rate of production of ...... During photosynthesis

A. Organic matter

B. Oxygen

C. Carbon dioxide

D. Chlorophyll

Answer: A

65. Enzymes required for phosphorylation are

located in .....of Chloroplast

A. peristromium

B. Plastidome

C. stroma

D. quantosome

Answer: D

**66.**  $C_4$  pathway is advantageous over  $C_3$  - pathway in plants as it

A. Occurs in relatively low  $CO_2$ 

concentration

B. Uses more amount of water

C. Occurs in relatively  $O_2$  concentration

D. Is less efficient in energy utilization

Answer: A

**67.** Emerson's enhancement effect and Red drop have been instrumental in the discovery of

A. Two photosystems operating simultaneously B. Photophosphorylation and cyclic electron transport C. oxidative phosphorylation D. phosphorylation and non cyclic electron

transport

Answer: A

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68. Kranz type of leaf anatomy is observed in

A.  $C_3$  plants

B.  $C_4$  plants

C.  $C_3$  and  $C_4$  plants

D. Hydrolytic plants

Answer: B

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**69.** With reference to factors affecting the rate of photosynthesis which of the following statement is not correct ?

A. Increasing atmospheric  $CO_2$  concentration up to 0.05% can enhance

 $CO_2$  fixation rate B.  $C_3$  plants respond to higher temperatures with enhanced photosynthesis while  $C_4$  plants have much lower temperature optimum C. Tomato is a greenhouse crop which can be grown in  $CO_2$  enriched atmosphere for higher yield D. Light saturation for  $CO_2$  fixation at 10% of full sunlight

#### Answer: B



# **70.** Phosphoenol pyruvate (PEP) is the primary $CO_2$ acceptor in

- A.  $C_4$  plants
- B.  $C_2$  plants
- C.  $C_3$  and  $C_4$  plants
- D.  $C_3$  plants





#### **Exercise B Choose More Than One Options**

**1.** Name the animals where photosynthesis takes place

A. Amoeba

B. Plasmodium

C. Euglena

D. Chrysamoeba

Answer: C::D

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2. Chlorophyll - e found in

A. Vaucheria (Zoospores)

B. Rhodopseudomonas

C. Green bacteria

D. Tribonema

#### Answer: A::D



## **3.** The external environmental factors of photosynthesis are

A. Protoplasmic factors

B. Light

C. water

D. temperature

#### Answer: B::C::D



# **4.** Name the mineral elements , are factors of photosynthesis are

A. Zn

B. Mn

C. Cl

D. ca

#### Answer: B::C::D



**5.** Name the hormones , those are stimulate the photosynthesis

A. none

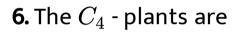
B. Auxin

C. Gibberellin

D. Cytokinin

#### Answer: B::C::D





A. Opuntia

B. Maize

C. Sugar cane

D. Sodium

Answer: B::C



- 7. The photosynthetic bacteria are
  - A. Chromatium
  - B. Bacillus
  - C. Azotobacter
  - D. Rhodopseudomonas

Answer: A::D



8. The non -green heterotrophs plants are

A. Utricularia

B. Dodder

C. Ziziphus

D. Monotropa

Answer: B::D

9. Chlorophyll-e found in

A. Tribonema

B. Vaucheria

C. Cassia

D. Chlorella

Answer: A::B



10. The CAM- Plants are

A. Orchids

B. Pineapple

C. Opuntia

D. Artiplex

Answer: A::B::C



Exercise C Fill In The Blanks

**1.** Biochemical mechanism for

photorespiration is called.....metabolism.

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**2.** In  $C_4$  Pathway pyruvic acid is generated in

the cells and is transferred back to .....

**3.** All the pigments are located in ......
membrane of chloroplast . **Watch Video Solution**

**4.** Photosynthesis is processed by which green plants trap ...... energy and convent it into

•••••

5. RuBP carboxylase. In the presence of high

concentration of ..... act as oxygenase.

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6. The radioactive spots of chromatogram can

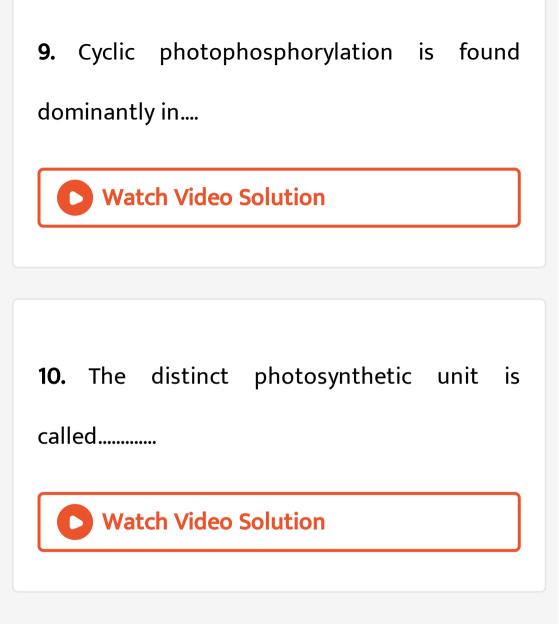
be located by .....

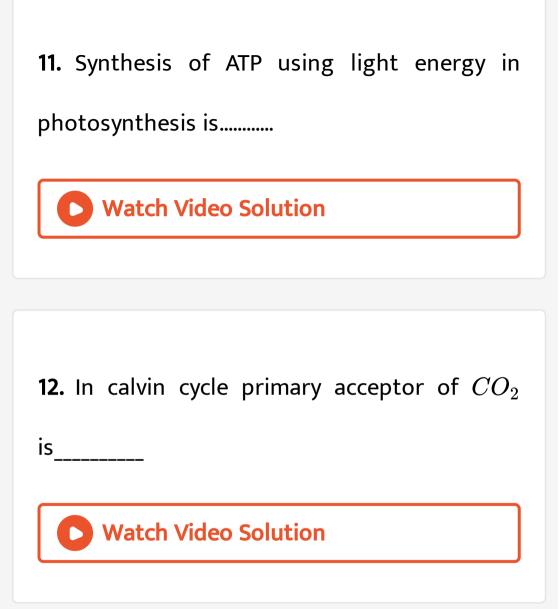
7. A long hydrocarbon chain that forms the tail

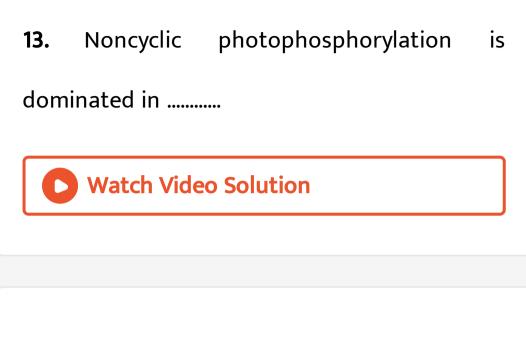
of chlorophyll molecule is known as.....

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**8.** ..... is the number of glycine molecules required to release one molecule of carbon-dioxide in photorespiration







**14.** Light dependent uptake of oxygen and release of carbon dioxide is .....

15. Manufactured food in leaves is

translocated through .....

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**Exercise D True Or False Statement Questions** 

1. The ultimate electron donor in

photosynthesis is water

2. Photorespiration is the process by which light is used to release the stored energy in carbohydrate molecules to perform all work in plant cells .

**O** Watch Video Solution

3. non\_ cyclic photophosphorylation is not

dominated in green plants .

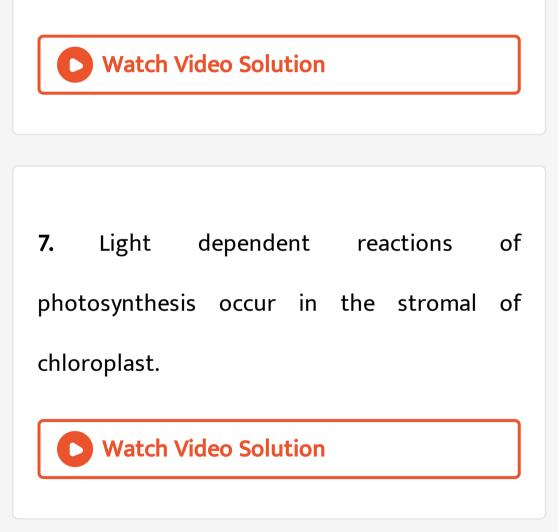
**4.** An isotope of carbon ,  $.^{14} C$  is quite useful in tracing the various step of the dark reaction of photosynthesis.

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**5.** The intermittent light experiment proves the presence of a chemical reaction is photosynthesis.

6. Fossil fuels are full of energy stored from

photosynthesis millions of years ago.



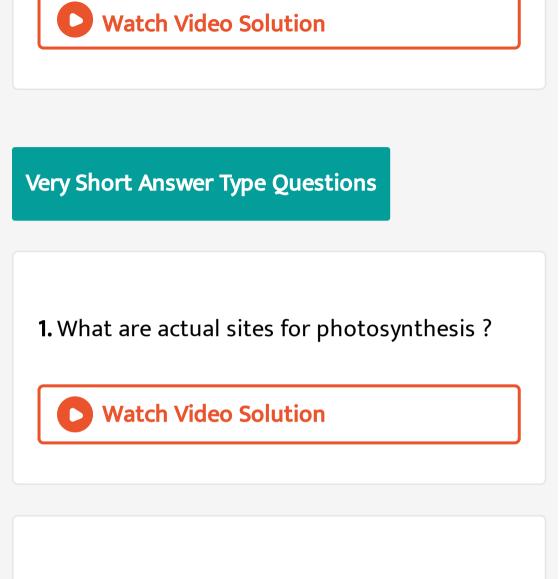
**8.** Reduction of  $CO_2$  occurs in light but the production of assimilatory powers is dark dependent.



## **9.** 75% of carbon is lost in $C_2$ Pathway.

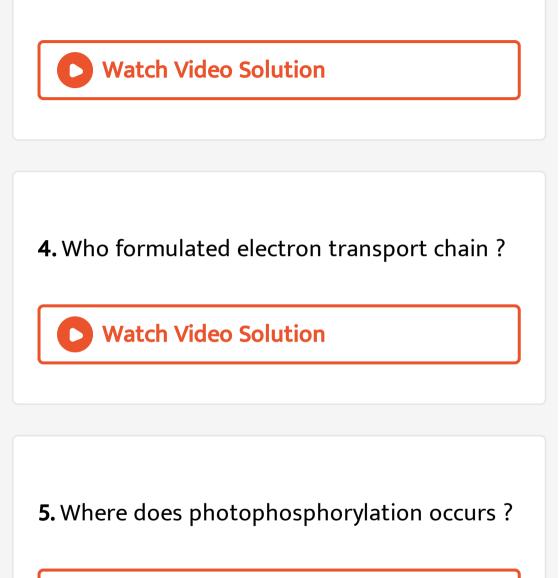


10. Bacteria contain both PS I and II.

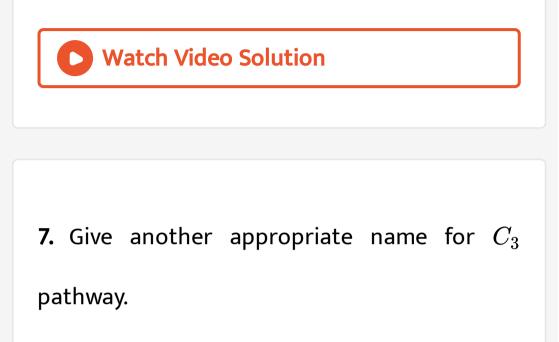


2. Expand PAR.

3. What are accessory pigments?

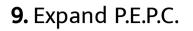








8. What is Kranz anatomy?





10. Which chlorophyll is known as universal

photosynthetic pigment?

11. Give name of central element found in chlorophyll molecule. Watch Video Solution **12.** Name two  $C_4$  plants. Watch Video Solution

**13.** Write one anatomical feature of  $C_4$  plant.

**14.** What is the first stable product of  $C_4$  cycle.



**15.** Give an appropriate name of coupling hypothesis.



**16.** Name two CAM plants.



**17.** Write the percentage of radiant energy that falls upon the leaf surface is utilized for photosynthesis ?

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**18.** Where are chromatophores seen ?

**19.** Write the reaction centre of PS - I ?



20. How many molecules of ATP and how many

molecules of NADPH are spent to fix molecules

of  $CO_2$  in clavin cycle ?

21. What environmental conditions favour photorespiration ?
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**22.** Mention one difference in the structure of chl-a and chl -b .

**23.** Which form of carbon is absorbed by the hydrophytes through their general body surface.



### 24. Write the reaction centre of PS - II ?



25. Name the primary electron acceptor of PS -

1?



## 26. Name the primary electron acceptor of PS -

II ?



27. Write the electron carrier gives electron to

PS-I?



28. What is regarded as assimilatory power for

LIP (Light independent phase) ?



29. Write the oxidising and reducing agents in

photosynthesis?

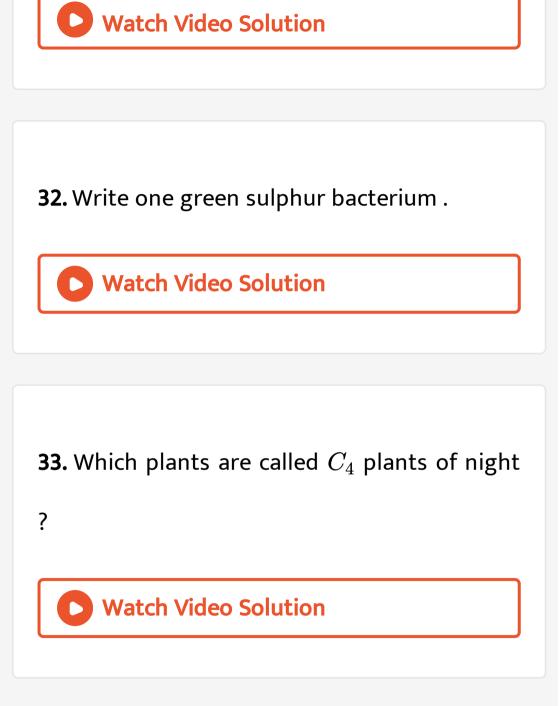
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30. How many turns of Calvin cycle produce

one molecule of hexose ?

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31. Write two chemosynthetic bacteria .



**34.** Write the  $CO_2$  acceptor in the mesophyll

cells of a  $C_4$  plant.

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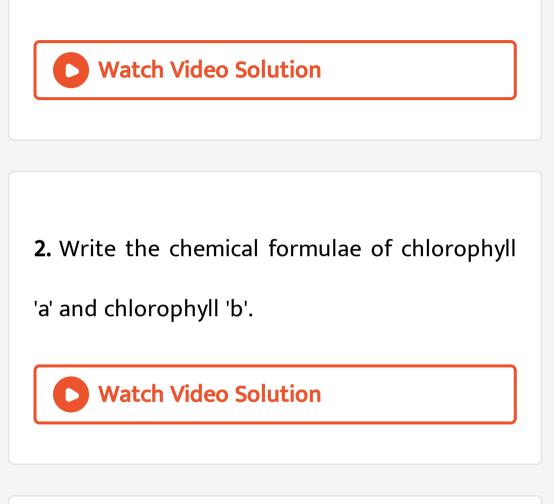
**35.** Where is PS- II and PS -I located in a

chloroplast ?

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Short Answer Type Questions

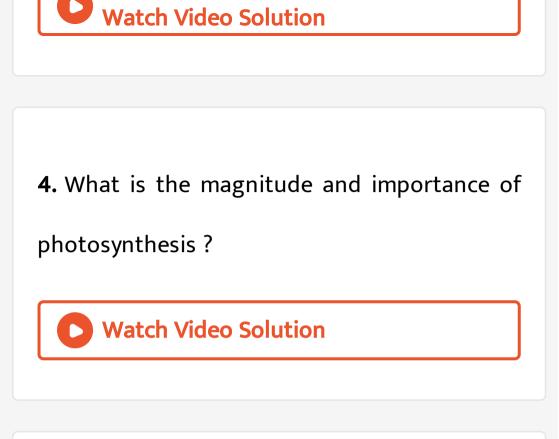
**1.** What are phycobillin ?



3. Write the contribution of Van Helmont in

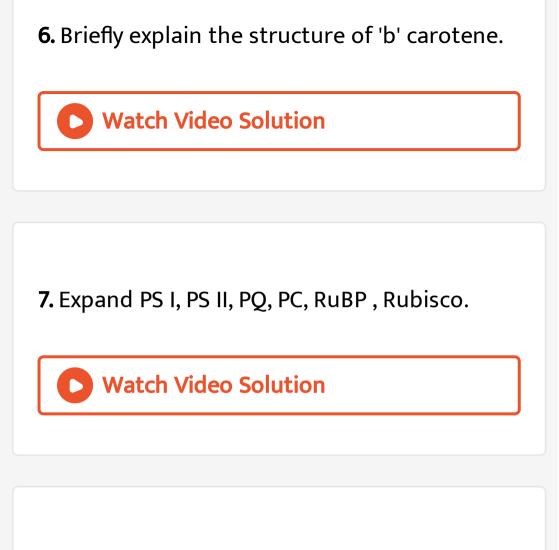
the process of photosynthesis.





**5.** Differenciate between chlorophyll 'a' and chlorophyll 'b' .





8. Photorespiration posses threat to plants yet

it occurs in Angiosperm why?

9. Define carboxylation . Mention the enzyme

and product of carboxylation.

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10. Differentiate between absorption spectrum

and action spectrum.

**11.** Suppose all external factors necessary for photosynthesis are available at optimum level , but temperature is as low as  $20^{\circ}C$  , how will

it effect the rate of photosynthesis.



## **12.** What do you understand by $Q_{10}$ law ?



13. Give two examples of photosynthetic bacteria.
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**14.** Give two examples of chemosynthetic bacteria.



15. What are the end products of (i) dark phase

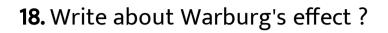
and (ii) light phase ?

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## **16.** Define photooxidation ?

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**17.** Define glycolic acid cycle ?





**19.** Write two functions of carotenoids.

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20. Define antenna pigments ?

## **21.** Define inductive resonance ?

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**22.** State the difference between respiration and photorespiration.

23. What is the advantages to having more

than one pigment molecules in photocenter?

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24. How are photorespiratory losses overcome

by  $C_4$  Plants?

**25.** Give three advantages of  $C_4$  cycle over  $C_3$ 

cycle



26. Give an account of carboxylation stage in

Calvin cycle in photosynthesis.



27. Explain in brief about photosystems.



**28.** Give the full from of NADP, RuDP, PGAld, ATP, ADP, FAD.

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29. What is chlorosis ? How it differs from

albino plants?

30. What do you mean by hill reaction and

Blackman's reaction ?

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**31.** Photosynthesis dose not occur in roots justify.

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Long Answer Type Questions

1. Describe in detail how ATP and  $NADPH_2$ 

are formed during photochemical reaction?



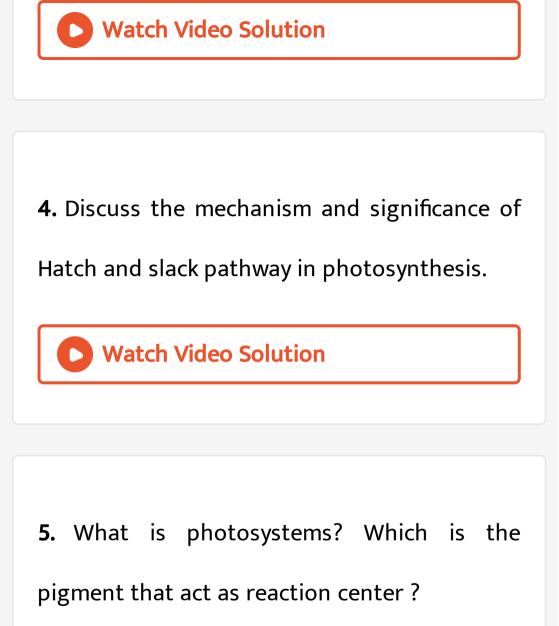
**2.** Where dose carboxylation takes place in  $C_3$ 

plants ? Explain the process.

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3. Define CAM. Explain the process briefly with

a help of a diagram.



**6.** What are the steps that are common to  $C_3$  and  $C_4$  plants.

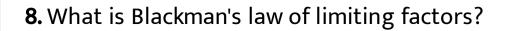
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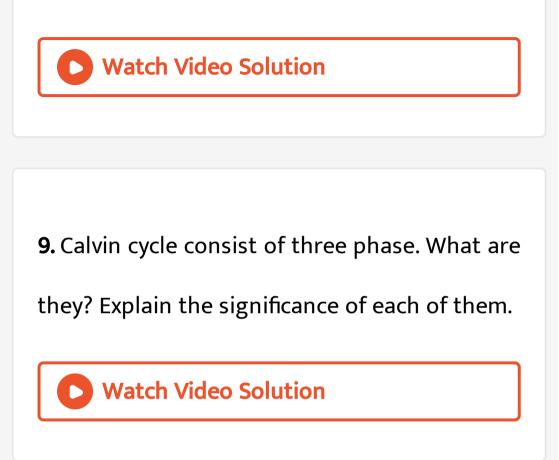
7. Distinguish between:

(a) Absorption spectrum and action spectrum.

(b) Cyclic photophosphorylation and Non

cyclic photophosphorylation.





10. Explain the light dependent phase or steps

of photosynthesis.

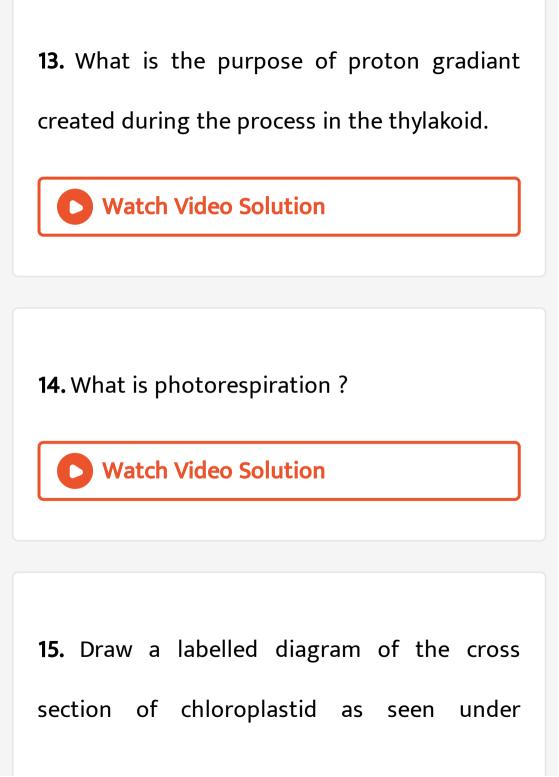
11. Explain the redox process process occurring

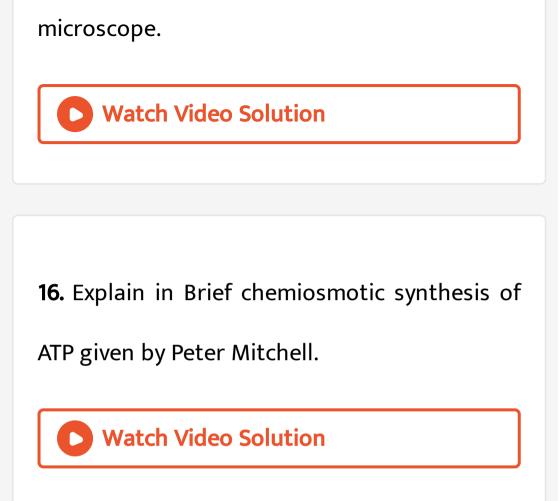
in photosynthesis to generate ATP and NADPH.

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12. Where does Calvin cycle take place? Explain

schematicaly





17. Name the different external and internal

factors of photosynthesis.



**18.** How solar energy is trapped by chloroplasts?

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19. Mention the name, location and functions

of man pigment s for photosynthesis.

**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  $C_3 ext{or}$   $C_4$ 

? Explain .

**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  $C_4$  plants ?



**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 ? Which

pigment do you think is more stable ?



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 ?



8. Figure shows the effect of light on the rate of photosynthesis. Based on the graph, answer the following questions. (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? (b) What could be the limiting factor /s in

region A?

(c) What do C and D represent the following .



**9.** Give comparison between the following:

(a)  $C_3$  and  $C_4$  pathways

(b) Cyclic and non-cyclic photophosphorylation

(c) Anatomy of leaf in  $C_3$  and  $C_4$  plants