



# 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**



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

A. fern

B. mosses

C. algae of ocean

D. large trees

**Answer: C**



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3. Which of the following is an essential part of photosynthesis ?

A. Oxygen

B. sunlight

C. Carbon di oxide

D. Chlorophyll

**Answer: A**



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4. A cell that lacks chloroplast does not

A. evolve  $CO_2$

B. liberate  $O_2$

C. require water

D. utilise carbohydrate

**Answer: B**



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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**



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6. First stable compound of  $C_3$  cycle is

A. glucose

B. PGAlD

C. PGA

D. fructose 1, 6 diphosphate

**Answer: C**



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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**



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8. The process of photophosphorylation was described by

A. Blackmann

B. Warburg

C. Arnon

D. Calvin

**Answer: C**



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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**



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10. Photosynthesis is most active in

A. sunlight

B. blue light

C. red light

D. green light

**Answer: B,C**



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11. The Photosynthetic unit having 250 chlorophyll molecules are called

- A. quantum
- B. quantosome
- C. oxysome
- D. photon

**Answer: B**



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12. Assimilatory power refers to

A. Production of ATP and  $\text{NADPH}_2$

B. reduction of  $\text{CO}_2$

C. splitting of  $\text{H}_2\text{O}$

D. disintegration of plastid

**Answer: A**



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13. Which one is a  $\text{C}_4$  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**



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

A. xanthophyll

B. Chl-b

C. carotene

D. anthocyanin

**Answer: C**



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**16.** An illuminated 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

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

A. 2

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**



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**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**



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**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**



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**27. Photorespiration is affected by**

A. light intensity

B. temperature

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  $15 \times 15\text{\AA}$ , *tail* –  $20\text{\AA}$

B. head  $10 \times 12\text{\AA}$ , *tail* –  $15\text{\AA}$

C. head  $20 \times 20\text{\AA}$ , *tail* –  $25\text{\AA}$

D. head  $15 \times 15\text{\AA}$ , *tail* –  $25\text{\AA}$

**Answer: D**



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

A. PS I

B. PS II

C. Cyt ' b'

D. quinone

**Answer: B**





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33. Chlorophyll 'a' is present in

- A. all photosynthetic eukaryotes as well as prokaryotes
- B. all plants except fungi
- C. all higher plants carrying out photosynthesis
- D. all  $O_2$  evolving photosynthetic organism

**Answer: D**



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**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

**Answer: C**



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**35.** Which is the evidence to show that oxygen released in photosynthesis comes from water ?

A. isotopic oxygen supplied as  $H_2O$  appears in the  $O_2$  released in photosynthesis

B. activated chloroplast in  $H_2O$  releases  $O_2$  if supplied potassium ferrocyanide or some other reducing agent

C. photosynthetic bacteria use  $H_2S$  and  $CO_2$  to make carbohydrates  $H_2O$  and sulphur

D. all of the above

**Answer: A**



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**36.** Major component of phloem sap is

A. Galactose

B. sucrose

C. Fructose

D. Starch

**Answer: B**



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37. chlorophyll , 4 - pyrrol rings are attached to Mg by their atoms

A. N

B. C

C. H

D. O

**Answer: A**



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38. Fixation & reduction of  $CO_2$  require

- A. ATP , NADPN
- B. ATP
- C. NADPH, chl , water
- D. None

**Answer: A**



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**39.** Enzymes RuBP carboxylase - oxygenase & PEP - carboxylase are activated by

A. Mg

B. Mo

C. Mn

D. Zn

**Answer: A**



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40. Chloroplast stroma of higher plant contains

A. Chlorophyll II

B. Light independent reaction enzyme

C. Ribosomes

D. None

**Answer: B**



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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**



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42. Reaction centre of PSI is

A.  $P_{680}$

B.  $P_{700}$

C.  $Chl_{715}$

D.  $Chl_{685}$

**Answer: B**



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**43.** The photosynthetic unit to trap the light energy is known as

A. mesosome

B. oxysome

C. nucleosome

D. quantosome

**Answer: D**



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44. PS - II accepts electrons from

A.  $O_2$

B.  $OH^-$

C.  $H^+$

D. Both a & c

**Answer: B**



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

- A. ATP & NADPH
- B. ATP
- C. ATP, NADPH & light
- D. None

**Answer: A**



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**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**



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47. Photoperiodism was first characterised in

A. Potato

B. Tobacco

C. Tomato

D. Cotton

**Answer: B**



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**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**



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

A. alga

B. gymnosperm

C. bryophyte

D. angiosperm

**Answer: A**



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50. Transport of food materials in higher plants take place through

A. sieve elements

B. trachieds

C. companion cells

D. transfusion

**Answer: A**



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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**



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**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

**Answer: A**



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**53.** Example of water soluble plant pigment is

A. chl - a

B. anthocyanin

C. chl-b

D. xanthophyll

**Answer: B**



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54. CAM helps the plants in

- A. secondary growth
- B. disease resistance
- C. conserving water
- D. reproduction

**Answer: C**



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

A. bryophytes

B. sciophytes

C. heliophytes

D. pteridophytes

**Answer: B**



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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**



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57. In  $C_3$  Plants , the first stable product of photosynthesis during dark reaction is

A. PGAl

B. RuBP

C. PGA

D. OAA

**Answer: C**



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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**



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59. Photolysis of water caused by

A. PS- I

B. PS-II

C. PS-I and PS-II

D. None of them

**Answer: B**



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60. CAM - pathway is observed in

A. Pineapple

B. Maize

C. Sunflower

D. sugar cane

**Answer: A**



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**61.** Thylakoids occur inside

A. Mitochondria

B. Chloroplast

C. Golgi apparatus

D. Endoplasmic reticulum

**Answer: C**



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62. Cyclic photophosphorylation links to

A. PS- I

B. PS-II

C. Dark reaction

D. Both (a) & (b)

**Answer: B**



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**63.** Chlorophyll molecules are located in the

A. thylakoid membrane

B. thylakoid lumen

C. stroma

D. inner chloroplast membrane

**Answer: A**



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

A. Organic matter

B. Oxygen

C. Carbon dioxide

D. Chlorophyll

**Answer: A**



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65. Enzymes required for phosphorylation are located in .....of Chloroplast

A. peristromium

B. Plastidome

C. stroma

D. quantosome

**Answer: D**



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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**



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**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**



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**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



**Answer: A**



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## **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**



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

A. Protoplasmic factors

B. Light

C. water

D. temperature

**Answer: B::C::D**



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

A. Zn

B. Mn

C. Cl

D. ca

**Answer: B::C::D**



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5. Name the hormones , those are stimulate the photosynthesis

A. none

B. Auxin

C. Gibberellin

D. Cytokinin

**Answer: B::C::D**



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**6. The  $C_4$  - plants are**

A. Opuntia

B. Maize

C. Sugar cane

D. Sodium

**Answer: B::C**



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7. The photosynthetic bacteria are

A. Chromatium

B. Bacillus

C. Azotobacter

D. Rhodospseudomonas

**Answer: A::D**



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8. The non-green heterotrophs plants are

A. Utricularia

B. Dodder

C. Ziziphus

D. Monotropa

**Answer: B::D**



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9. Chlorophyll-e found in

A. Tribonema

B. Vaucheria

C. Cassia

D. Chlorella

**Answer: A::B**



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**10.** The CAM- Plants are

A. Orchids

B. Pineapple

C. Opuntia

D. Artiplex

**Answer: A::B::C**



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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 .....



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3. All the pigments are located in .....  
membrane of chloroplast .



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



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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 .....



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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



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9. Cyclic photophosphorylation is found dominantly in....



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10. The distinct photosynthetic unit is called.....



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11. Synthesis of ATP using light energy in photosynthesis is.....



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12. In calvin cycle primary acceptor of  $CO_2$  is \_\_\_\_\_



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**13.** Noncyclic photophosphorylation is dominated in .....



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



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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



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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 .



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3. non\_ cyclic photophosphorylation is not dominated in green plants .



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4. An isotope of carbon ,  $^{14}\text{C}$  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.



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6. Fossil fuels are full of energy stored from photosynthesis millions of years ago.



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7. Light dependent reactions of photosynthesis occur in the stroma of chloroplast.



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



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



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**10.** Bacteria contain both PS I and II.



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## Very Short Answer Type Questions

1. What are actual sites for photosynthesis ?



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2. Expand PAR.



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3. What are accessory pigments ?



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4. Who formulated electron transport chain ?



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5. Where does photophosphorylation occurs ?



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6. Expand Rubisco.



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7. Give another appropriate name for  $C_3$  pathway.



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8. What is Kranz anatomy ?



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**9. Expand P.E.P.C.**



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**10. Which chlorophyll is known as universal photosynthetic pigment ?**



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11. Give name of central element found in chlorophyll molecule.



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12. Name two  $C_4$  plants.



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



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



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15. Give an appropriate name of coupling hypothesis.



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16. Name two CAM plants.



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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 ?



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19. Write the reaction centre of PS - I ?



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20. How many molecules of ATP and how many molecules of NADPH are spent to fix molecules of  $CO_2$  in clavin cycle ?



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**21.** What environmental conditions favour photorespiration ?



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**22.** Mention one difference in the structure of chl-a and chl -b .



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



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



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**25.** Name the primary electron acceptor of PS - I ?



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**26.** Name the primary electron acceptor of PS - II ?



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**27.** Write the electron carrier gives electron to PS-I ?



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**28.** What is regarded as assimilatory power for LIP (Light independent phase) ?



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**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 .



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32. Write one green sulphur bacterium .



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33. Which plants are called  $C_4$  plants of night ?



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**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 ?



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2. Write the chemical formulae of chlorophyll 'a' and chlorophyll 'b'.



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3. Write the contribution of Van Helmont in the process of photosynthesis.





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4. What is the magnitude and importance of photosynthesis ?



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5. Differentiate between chlorophyll 'a' and chlorophyll 'b' .



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6. Briefly explain the structure of 'b' carotene.



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7. Expand PS I, PS II, PQ, PC, RuBP , Rubisco.



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8. Photorespiration poses threat to plants yet it occurs in Angiosperm why ?



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**9.** Define carboxylation . Mention the enzyme and product of carboxylation.



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**10.** Differentiate between absorption spectrum and action spectrum.



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**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.



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



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



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



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**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 ?



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**18.** Write about Warburg's effect ?



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



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**20.** Define antenna pigments ?



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**21. Define inductive resonance ?**



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



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**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?



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



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**26.** Give an account of carboxylation stage in Calvin cycle in photosynthesis.



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**27.** Explain in brief about photosystems.





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**28.** Give the full form of NADP, RuDP, PGAl, ATP, ADP, FAD.



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**29.** What is chlorosis ? How it differs from albino plants?



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**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  $\text{NADPH}_2$  are formed during photochemical reaction?



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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.



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4. Discuss the mechanism and significance of Hatch and slack pathway in photosynthesis.



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5. What are photosystems? Which is the pigment that acts as a reaction center?



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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.



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**8.** What is Blackman's law of limiting factors?



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**9.** Calvin cycle consist of three phase. What are they? Explain the significance of each of them.



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**10.** Explain the light dependent phase or steps of photosynthesis.



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**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 schematically



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**13.** What is the purpose of proton gradient created during the process in the thylakoid.



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**14.** What is photorespiration ?



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**15.** Draw a labelled diagram of the cross section of chloroplastid as seen under



microscope.



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**16.** Explain in Brief chemiosmotic synthesis of ATP given by Peter Mitchell.



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**17.** Name the different external and internal factors of photosynthesis.



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



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**19.** Mention the name, location and functions of main pigments for photosynthesis.



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## Ncert Questions

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  $C_4$  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 ? Which

pigment do you think is more stable ?



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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 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 .



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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



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