Chapter 9

Put line under your answer! There is only one correct answer in the multiple choice questions

1. **During the light reactions of photosynthesis**
   a) carbon dioxide is combined with certain organic compounds in the plant, producing glucose
   b) the hydrogen removed from water molecules is combined with carbon dioxide, forming glucose
   c) water molecules are split, through the energy of light, into hydrogen and water
   d) water molecules are split, through the energy of light, into hydrogen ions, electrons, and oxygen
   e) carbon dioxide is combined with rubisco in the plant, producing PGA (GA3P)
2. **The oxygen liberated by green plants during photosynthesis comes from**
   a) water molecules
   b) the breakdown of food in living cells
   c) ATP
   d) the glucose formed during the dark reaction
   e) carbon dioxide
3. **A pigment that makes it possible for photosynthesis to take place over a broader spectrum of light than would otherwise be possible is called a/an**
   a) photosynthetic unit
   b) photorespiration pigment
   c) accessory pigment
   d) photon
   e) photosystem
4. **Roughly how much of the water absorbed by plants is used in photosynthesis?**
   a) less than 1%
   b) between 1% and 5%
   c) between 5% and 10%
   d) between 10% and 20%
   e) more than 20%

5. **Which of the following is an energy-releasing process that may occur in high light intensities?**
   a) CAM photosynthesis
   b) C_4 photosynthesis
   c) C_3 photosynthesis
   d) Phosphorescence
   e) photorespiration
6. **Which of the following is synthesized during light reactions?**
   a) glucose
   b) CO_2
   c) RuBP
   d) $NADPH,H^+$
   e) PGAL
7. **Which of the following pigments make it possible for photosynthesis to take place over a broader spectrum of light than is possible with chlorophyll a alone?**
   a) phycobilins
   b) carotenoids
   c) chlorophyll b
   d) chlorophyll c
   e) all of these answers are correct
8. **The most abundant chlorophyll pigment usually present in plants is**
   a) chlorophyll a
   b) chlorophyll b
   c) chlorophyll c
   d) chlorophyll d
   e) chlorophyll e
9. **During the light reactions of photosynthesis**
   a) CO_2 is combined with a 5-carbon sugar
   b) CO_2 is given off
   c) ATP & $NADPH,H^+$ molecules are generated
   d) 6-carbon sugars are stored
   e) H_2O molecules are produced
10. **Which of the following are contained in each photosynthetic unit of photosystem I?**
   a) one P700 molecule

b) small amount of chlorophyll b
c) carotenoid pigment
d) 200 or more molecules of chlorophyll a
e) all of these answers are correct

11. **Photosystem pigments that function in gathering and passing light to reaction-center molecules are called**
a) reaction-center pigments
b) phosphorescence pigments
c) antenna pigments
d) carotene pigments
e) 700 pigments

12. **The splitting of water molecules on the inside of thylakoid membrane during photosynthesis is called**
a) photophosphorylation
b) photolysis
c) chemiosmosis
d) uncoupling
e) plastocyanization

13. **The Calvin cycle is also called the**
a) 3-carbon pathway
b) 4-carbon pathway
c) 5-carbon pathway
d) 6-carbon pathway
e) 7-carbon pathway

14. **Plants that produced oxaloacetic acid instead of PGA during the dark reactions of photosynthesis are called**
a) ferredoxin plants
b) oxalis plants
c) CAM plants
d) C_4 plants
e) C_3 plants

15. **Which of the following is / are found in C_4 plants?**
a) large chloroplasts with numerous starch grains
b) high concentration of PEP carboxylase in mesophyll cells
c) higher optimum temperatures for photosynthesis than C_3 plants
d) small chloroplasts with well-developed grana
e) all of these answers are correct

16. **CAM photosynthesis occurs mostly in**

a) aquatic plants
b) arctic plants
c) temperate forest plants
d) tropical rain forest plants
e) cacti and succulents

17. **Which of the following is NOT a form of metabolism?**

A. respiration
B. photosynthesis
C. diffusion
D. digestion
E. assimilation

18. **Which of the following metabolic activities of plants produces sugars?**

A. photosynthesis
B. assimilation
C. digestion
D. respiration
E. None of these answers are correct.

19. **Which of the following is NOT an attribute of all living rganisms?**

A. metabolism
B. photosynthesis
C. reproduction
D. response to stimuli
E. adaptation to the environment

20. **The pigments that are important in photosynthesis are located in:**

a. the matrix
b. the stroma
c. the cytoplasm
d. photosystems I and II
e. the outer membranes of the chloroplast

21. **Which is formed during non-cyclic photophosphorylation but not during cyclic photophosphorylation?**

a. ATP
b. oxygen
c. water

d. NADPH
e. both (b) + (d)

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Put (True) or (False) with each following sentences.

22. The light most extensively used in photosynthesis consists of wavelengths in the green range ( ).

23. RuBP is a 5-carbon sugar that is continually being formed while photosynthesis is occurring ( ).

24. The carbohydrate produced through photosynthesis is converted to other substances through the process of assimilation ( ).

25. A photosynthetic unit consists of a molecule of chlorophyll a and a molecule of chlorophyll b ( ).

26. Light is believed to travel in individual "packets" called photons ( ).

27. Resins, gums, oils, and other substances may be manufactured during the process of assimilation ( ).

28. CAM photosynthesis is best known in tropical plants ( ).

29. Rubisco is the enzyme that fixes carbon dioxide in the Calvin cycle.

30._____ The Calvin cycle must turn six times and fix six carbon dioxide molecules to yield one net glucose

31._____ The Calvin cycle occurs in the light.

32._____ The Calvin cycle occurs in the dark.

33._____ The Calvin cycle requires ATP and NADPH that are supplied from the Z-scheme.

34._____ There is one reduction reaction in the Calvin cycle

35._____ ATP is required in one step in the Calvin Cycle

36._____ Carbon is fixed in the Calvin cycle

37._____ The first stable product of carbon fixation is a three-carbon compound (PGA)

38._____ Rubisco attaches carbon dioxide to a five carbon sugar (Ribulose bis phosphate)

39._____ Rubisco is a substrate specific enzyme

40._____ For every carbon fixed, it requires one ATP and one NADPH

41._____ The product of carbon fixation in C3 plants is PGA

42.

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Matching: Write in meddle column the number for the best answer.

1. Anabolism	5	containing chlorophylls and accessory pigments.
2. Catabolism	4	are chlorophyll b and carotenoids (antenna pigments).
3. Photosynthesis	3	is an anabolic process that combines carbon dioxide and water in the presence of light with the aid of chlorophyll; oxygen is a by-product.
4. accessory pigments	2	breaking down compounds into simpler compounds molecules or atoms (respiration).
5. Photosynthetic units	1	building reactions (photosynthesis, Citric acid cycle).
6. Bundle sheaths	10	are used in the carbon-fixing reactions that convert CO_2 to sugars.
7. Light reactions	9	reduce NADP to NADPH and form ATP.
8. Chlorophyll a	8	a reaction-center molecule in photosystem I & II and functions in capturing light energy.
9. In noncyclic electron flow	7	occur in thylakoid membranes of chloroplasts, water molecules are split, and oxygen gas is released, NADPH and ATP.
10. The ATP and NADPH	6	Has large chloroplasts, which contain rubisco.
11. Photorespiration	15	4-carbon oxaloacetic acid is initially produced instead of 3- carbon PGA.
12.cyclic photophosphorylation	14	which takes place in the stroma of chloroplasts.
13. Rubisco	13	catalyzes formation of the 3-carbon compound 3PGA - C3 plants (3-carbon pathway).
14. Calvin cycle	12	produced ATP from ADP.
15. C4 plants	11	requires cooperation among chloroplasts,

		peroxisomes, and mitochondria
16. In C3 plants	20	enables C3 plants to undergo a process called Photorespiration.
17. Small chloroplasts	19	fix CO_2 through the Calvin cycle in C3 plants.
18.CAM photosynthesis	18	occurs in cacti and succulent plants.
19. The carboxylase activity of rubisco	17	contain higher concentrations of PEP carboxylase in the leaf mesophyll.
20. The oxygenase activity of rubisco	16	quantum yield of photosynthesis decreases as temperatures increase.
21. The products of photorespiration	24	when additional carbon dioxide is available, photosynthetic rates undergo up to a 30% increase in light intensity.
22. Higher light intensities and / or temperatures	23	involves the destruction ("bleaching") of chlorophyll by light.
23. Photooxidation	22	may accelerate photorespiration.
24. In C4 plants	21	are the 2-carbon phosphoglycolic acid - No ATP is produced.

Comparison Matching Question: Match each of the following with the appropriate response

a. C3 plant b. C4 plant c. CAM plant d.C3 & C4 plants
e. C3 & CAM plants f. C4 & CAM plants g. all (C3, C4, CAM)
h. none (C3, C4, CAM)

_____ tobacco is an example
_____ maize is an example
_____ Cacti and bromeliad are examples
_____ have the enzyme rubisco
_____ have the enzyme PEP carboxylase
_____ have a well developed bundle sheath
_____ produce PGA
_____ PGA is the first product of carbon fixation
_____ OAA is the first product of carbon fixation
_____ fixes carbon dioxide during the daytime
_____ fixes carbon dioxide at night
_____ leaves exhibit Kranz anatomy
_____ open stomata during the day