III. 3. Fotosíntesi

Chapter Questions

1) Organisms that can exist with light as an energy source and an inorganic form of carbon and other raw materials
A) are called photoautotrophs.
B) do not exist in nature.
C) are called heterotrophs.
D) are best classified as decomposers.
E) both C and D

Topic: Overview
Skill: Knowledge

2) Which type of organism obtains energy by metabolizing molecules produced by other organisms?
A) autotrophs
B) heterotrophs
C) decomposers
D) B and C
E) A, B, and C

Topic: Concept 10.1
Skill: Knowledge

3) The early suggestion that the oxygen (O_2) liberated from plants during photosynthesis comes from water was
A) first proposed by C.B. van Niel of Stanford University.
B) confirmed by experiments using oxygen-18 (^{18}O).
C) made following the discovery of photorespiration because of rubisco's sensitivity to oxygen.
D) A and B
E) A, B, and C

Topic: Concept 10.1
Skill: Application

4) If photosynthesizing green algae are provided with CO_2 synthesized with heavy oxygen (^{18}O), later analysis will show that all but one of the following compounds produced by the algae contain the ^{18}O label. That one exception is
A) PGA.
B) PGAL.
C) glucose.
D) RuBP.
E) O_2.

Topic: Concept 10.1
Skill: Comprehension

5) Which of the following are products of the light reactions of photosynthesis that are utilized in the Calvin cycle?
A) CO_2 and glucose
B) H_2O and O_2
C) ADP, P_i, and $NADP^+$
D) electrons and H^+
E) ATP and NADPH

Topic: Concept 10.1
Skill: Comprehension

6) What is the primary function of the light reactions of photosynthesis?
A) to produce energy-rich glucose from carbon dioxide and water
B) to produce ATP and NADPH
C) to produce NADPH used in respiration
D) to convert light energy to the chemical energy of PGAL
E) to use ATP to make glucose

Topic: Concept 10.1
Skill: Comprehension

7) What are the products of the light reactions that are subsequently used by the Calvin cycle?
A) oxygen and carbon dioxide
B) carbon dioxide and RuBP
C) water and carbon
D) electrons and photons
E) ATP and NADPH

Topic: Concept 10.1
Skill: Knowledge

8) Where does the Calvin cycle take place?
A) stroma of the chloroplast
B) thylakoid membrane
C) cytoplasm surrounding the chloroplast
D) chlorophyll molecule
E) outer membrane of the chloroplast
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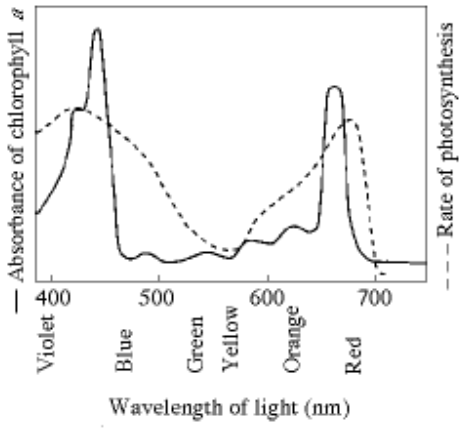
Topic: Concept 10.1
Skill: Knowledge

10) During photosynthesis, visible light has enough energy to
A) force electrons closer to the nucleus.
B) excite electrons.
C) split a water molecule into hydrogen and oxygen.
D) B and C only.
E) A, B, and C.
Answer: B
Topic: Concept 10.2
Skill: Knowledge

Use the following information to answer the questions below.

Theodor W. Engelmann illuminated a filament of algae with light that passed through a prism, thus exposing



different segments of algae to different wavelengths of light. He added aerobic bacteria and then noted in which areas the bacteria congregated. He noted that the largest groups were found in the areas illuminated by the red and blue light.

11) What did Engelmann conclude about the congregation of bacteria in the red and blue areas?
A) Bacteria released excess carbon dioxide in these areas.
B) Bacteria congregated in these areas due to an increase in the temperature of the red and blue light.
C) Bacteria congregated in these areas because these areas had the most oxygen being released.
D) Bacteria are attracted to red and blue light and thus these wavelengths are more reactive than other wavelengths.
E) Bacteria congregated in these areas due to an increase in the temperature caused by an increase in photosynthesis.

Topic: Concept 10.2
Skill: Knowledge

12) An outcome of this experiment was to help determine
A) the relationship between heterotrophic and autotrophic organisms.
B) the relationship between wavelengths of light and the rate of aerobic respiration.
C) the relationship between wavelengths of light and the amount of heat released.
D) the relationship between wavelengths of light and the oxygen released during photosynthesis.
E) the relationship between the concentration of carbon dioxide and the rate of photosynthesis.

Topic: Concept 10.2
Skill: Knowledge

13) If you ran the same experiment without passing light through a prism, what would you predict?
A) There would be no difference in results.
B) The bacteria would be relatively evenly distributed along the algal filaments.
C) The number of bacteria present would decrease due to an increase in the carbon dioxide concentration.
D) The number of bacteria present would increase due to an increase in the carbon dioxide concentration.
E) The number of bacteria would decrease due to a decrease in the temperature of the water.
Answer: B
Topic: Concept 10.2
Skill: Application

15) What wavelength of light is *most* effective in driving photosynthesis?
A) 420 mm
B) 475 mm
C) 575 mm
D) 625 mm
E) 730 mm
-

Topic: Concept 10.2
Skill: Knowledge

16) In the thylakoid membranes, what is the main role of the antenna pigment molecules?
A) split water and release oxygen to the reaction-center chlorophyll
B) harvest photons and transfer light energy to the reaction-center chlorophyll
C) synthesize ATP from ADP and P_i
D) transfer electrons to ferredoxin and then NADPH
E) concentrate photons within the stroma

Topic: Concept 10.2
Skill: Knowledge

17) The reaction-center chlorophyll of photosystem I is known as P700 because
A) there are 700 chlorophyll molecules in the center.
B) this pigment is best at absorbing light with a wavelength of 700 nm.
C) there are 700 photosystem I components to each chloroplast.
D) it absorbs 700 photons per microsecond.
E) the plastoquinone reflects light with a wavelength of 700 nm.

Topic: Concept 10.2
Skill: Application

18) All of the events listed below occur in the light reactions of photosynthesis *except*
A) oxygen is produced.
B) $NADP^+$ is reduced to NADPH.
C) carbon dioxide is incorporated into PGA.
D) ADP is phosphorylated to yield ATP.
E) light is absorbed and funneled to reaction-center chlorophyll *a*.

Topic: Concept 10.2
Skill: Knowledge

19) Which of the following statements about the light reactions of photosynthesis are true?
A) The splitting of water molecules provides a source of electrons.
B) Chlorophyll (and other pigments) absorb light energy, which excites electrons.
C) ATP is generated by photophosphorylation.
D) Only A and C are true.
E) A, B, and C are true.

Topic: Concept 10.2
Skill: Comprehension

20) Which statement regarding events in the functioning of photosystem II is *false*?
A) Light energy excites electrons in an antenna pigment in a photosynthetic unit.
B) The excitation is passed along to a molecule of P680 chlorophyll in the photosynthetic unit.
C) The P680 chlorophyll donates a pair of protons to NADPH, which is thus converted to $NADP^+$.
D) The electron vacancies in P680 are filled by electrons derived from water.
E) The splitting of water yields molecular oxygen as a by-product.

Topic: Concept 10.2
Skill: Comprehension

22) All of the following are directly associated with photosystem I *except*
A) harvesting of light energy by chlorophyll.
B) receiving electrons from plastocyanin.
C) P700 reaction-center chlorophyll.
D) extraction of hydrogen electrons from the splitting of water.
E) passing electrons to ferredoxin.

Topic: Concept 10.2
Skill: Comprehension

23) Some photosynthetic organisms contain chloroplasts that lack photosystem II, yet are able to survive. The best way to detect the lack of photosystem II in these organisms would be
A) to determine if they have thylakoids in the chloroplasts.
B) to test for liberation of O_2 in the light.
C) to test for CO_2 fixation in the dark.
D) to do experiments to generate an action spectrum.
E) to test for production of either sucrose or starch.

Topic: Concept 10.2
Skill: Application

24) What are the products of noncyclic photophosphorylation?
A) heat and fluorescence
B) ATP and P700
C) ATP and NADPH
D) ADP and NADP
E) P700 and P680

Topic: Concept 10.2
Skill: Knowledge

28) What does the chemiosmotic process in chloroplasts involve?
A) establishment of a proton gradient
B) diffusion of electrons through the thylakoid membrane
C) reduction of water to produce ATP energy
D) movement of water by osmosis into the thylakoid space from the stroma
E) formation of glucose, using carbon dioxide, NADPH, and ATP
-
Topic: Concept 10.2
Skill: Knowledge

30) In a plant cell, where are the ATP synthase complexes located?
A) thylakoid membrane
B) plasma membrane
C) inner mitochondrial membrane
D) A and C
E) A, B, and C

Topic: Concept 10.2
Skill: Comprehension

32) Which of the following statements *best* describes the relationship between photosynthesis and respiration?
A) Respiration is the reversal of the biochemical pathways of photosynthesis.
B) Photosynthesis stores energy in complex organic molecules, while respiration releases it.
C) Photosynthesis occurs only in plants and respiration occurs only in animals.
D) ATP molecules are produced in photosynthesis and used up in respiration.
E) Respiration is anabolic and photosynthesis is catabolic.

Topic: Concept 10.2
Skill: Comprehension

33) Where is the electron transport chain found in plant cells?
A) thylakoid membranes of chloroplasts
B) stroma of chloroplasts
C) inner membrane of mitochondria
D) matrix of mitochondria
E) cytoplasm
-
Topic: Concept 10.2
Skill: Knowledge

34) Of the following, what do both mitochondria and chloroplasts have in common?
A) thylakoid membranes
B) chemiosmosis
C) ATP synthase
D) B and C only
E) A, B, and C

Topic: Concept 10.2
Skill: Knowledge

Refer to the choices to answer the following questions. Each choice may be used once, more than once, or not at all. Indicate whether the following events occur during

A. photosynthesis
B. respiration
C. both photosynthesis and respiration
D. neither photosynthesis nor respiration

35) synthesis of ATP by the chemiosmotic mechanism

Topic: Concept 10.2
Skill: Comprehension

36) reduction of oxygen which forms water

Topic: Concept 10.2
Skill: Comprehension

37) reduction of $NADP^+$
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Topic: Concept 10.2

Skill: Knowledge
38) the splitting of carbon dioxide to form oxygen gas and carbon compounds

Topic: Concept 10.2
Skill: Knowledge

39) generation of proton gradients across membranes

Topic: Concept 10.2
Skill: Comprehension

40) Which of the following statements best represents the relationships between the light reactions and the Calvin cycle?
A) The light reactions provide ATP and NADPH to the Calvin cycle, and the cycle returns ADP, P_i, and $NADP^+$ to the light reactions.
B) The light reactions provide ATP and NADPH to the carbon fixation step of the Calvin cycle, and the cycle provides water and electrons to the light reactions.
C) The light reactions supply the Calvin cycle with CO_2 to produce sugars, and the Calvin cycle supplies the light reactions with sugars to produce ATP.
D) The light reactions provide the Calvin cycle with oxygen for electron flow, and the Calvin cycle provides the light reactions with water to split.
E) There is no relationship between the light reactions and the Calvin cycle.
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Topic: Concept 10.3
Skill: Comprehension

41) Where do the enzymatic reactions of the Calvin cycle take place?
A) stroma of the chloroplast
B) thylakoid membranes
C) outer membrane of the chloroplast
D) electron transport chain
E) thylakoid space
-
Topic: Concept 10.3
Skill: Knowledge

42) What is the primary function of the Calvin cycle?
A) use ATP to release carbon dioxide
B) use NADPH to release carbon dioxide
C) split water and release oxygen
D) transport RuBP out of the chloroplast
E) synthesize simple sugars from carbon dioxide

Topic: Concept 10.3
Skill: Comprehension

43) Which of the following is (are) required in the Calvin cycle?
A) CO_2
B) ATP
C) RuBP
D) A and B only
E) A, B, and C

Topic: Concept 10.3
Skill: Knowledge

44) Which statement is *false?*
A) Thylakoid membranes contain the photosynthetic pigments.
B) The O_2 released during photosynthesis comes from water.
C) RuBP is produced during cyclic electron flow in the light reactions of photosynthesis.
D) The light reactions of photosynthesis provide the energy for the Calvin cycle.
E) When chlorophyll is reduced, it gains electrons.

Topic: Concept 10.3
Skill: Comprehension

45) One carbon dioxide molecule reacts in each "turn" of the Calvin cycle. How many turns of the cycle are required for the synthesis of one glucose molecule?
A) 1
B) 2
C) 3
D) 6
E)12
Topic: Concept 10.3
Skill: Knowledge

46) All of the following statements are correct regarding the Calvin cycle *except:*
A) The energy source utilized is the ATP and NADPH obtained through the light reaction.
B) These reactions begin soon after sundown and end before sunrise.
C) The 5-carbon sugar RuBP is constantly being regenerated.
D) One of the end products is glyceraldehyde phosphate.
E) Rubisco attaches carbon dioxide to ribulose bisphosphate.

Topic: Concept 10.3
Skill: Comprehension

For the following questions, compare the light reactions with the Calvin cycle of photosynthesis in plants. Use the following key:

A. light reactions alone
B. the Calvin cycle alone
C. both the light reactions and the Calvin cycle
D. neither the light reactions nor the Calvin cycle
E. occurs in the chloroplast but is not part of photosynthesis

47) produces molecular oxygen (O_2)
-
Topic: Concept 10.2
Skill: Knowledge

48) requires ATP

Topic: Concept 10.3
Skill: Knowledge

49) produces NADH

Topic: Concept 10.3
Skill: Knowledge

50) produces NADPH

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Topic: Concept 10.2
Skill: Knowledge

51) produces three-carbon sugars

Topic: Concept 10.3
Skill: Knowledge

52) inactive in the dark

Topic: Concept 10.3
Skill: Knowledge

53) requires CO_2

Topic: Concept 10.3
Skill: Knowledge

54) requires glucose

Topic: Concept 10.3
Skill: Knowledge

55) Which of the following is (are) true of the enzyme ribulose bisphosphate carboxylase?
A) It participates in the Calvin cycle.
B) It catalyzes a phosphorylation reaction.
C) It has an affinity for both O_2 and CO_2.
D) A and C are true.
E) A, B, and C are true.

Topic: Concept 10.4
Skill: Comprehension

56) What are the substrates (normal reactants) for the enzyme RuBP carboxylase?
A) CO_2 and O_2
B) CO_2 and glucose
C) ATP and NADPH
D) triose-P, glucose, and CO_2
E) CO_2 and ATP
-
Topic: Concept 10.4
Skill: Application

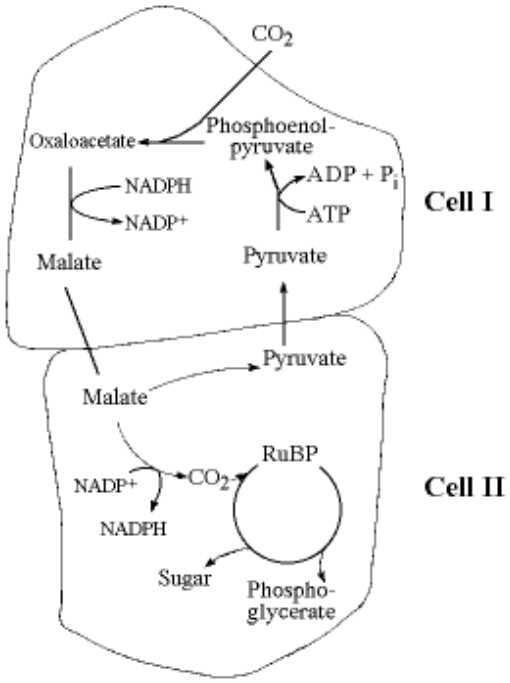

Figure 10.2

57) Which of the following statements is *true* concerning Figure 10.2?
A) It represents cell processes involved in C_4 photosynthesis.
B) It represents the type of cell structures found in CAM plants.
C) It represents an adaptation that minimizes photorespiration.
D) A and C are true.
E) A, B, and C are true.

Topic: Concept 10.4
Skill: Knowledge

58) Referring to Figure 10.2, oxygen would inhibit the CO_2 fixation reactions in
A) cell I only.
B) cell II only.
C) neither cell I nor cell II.
D) both cell I and cell II.
E) cell I during the night and cell II during the day.

Topic: Concept 10.4
Skill: Comprehension

59) In which cell would you expect photorespiration?
A) Cell I
B) Cell II
C) Cell I at night
D) Cell II at night
E) neither Cell I nor Cell II

Topic: Concept 10.4
Skill: Comprehension

60) In an experiment studying photosynthesis performed during the day, you provide a plant with radioactive carbon (^{14}C) dioxide as a metabolic tracer. The ^{14}C is incorporated first into oxaloacetate. The plant is best characterized as a
A) C_4 plant.
B) C_3 plant.
C) CAM plant.
D) heterotroph.
E) chemoautotroph.
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Topic: Concept 10.4
Skill: Application

61) Why are C_4 plants able to photosynthesize with no apparent photorespiration?
A) They do not participate in the Calvin cycle.
B) They use PEP carboxylase to initially fix CO_2.
C) They are adapted to cold, wet climates.
D) They conserve water more efficiently.
E) They exclude oxygen from their tissues.

Topic: Concept 10.4
Skill: Comprehension

62) CAM plants keep stomata closed in daytime, thus reducing loss of water. They can do this because they
A) fix CO_2 into organic acids during the night.
B) fix CO_2 into sugars in the bundle-sheath cells.
C) fix CO_2 into pyruvate in the mesophyll cells.
D) use the enzyme phosphofructokinase, which outcompetes rubisco for CO_2.
E) use photosystems I and II at night.
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Topic: Concept 10.4
Skill: Knowledge

64) Photorespiration lowers the efficiency of photosynthesis by preventing the formation of
A) carbon dioxide molecules.
B) 3-phosphoglycerate molecules
C) ATP molecules.
D) ribulose bisphosphate molecules.
E) RuBP carboxylase molecules.

Topic: Concept 10.4
Skill: Knowledge

65) Plants that fix CO_2 into organic acids at night when the stomata are open and carry out the Calvin cycle during the day when the stomata are closed are called
A) C_3 plants.
B) C_4 plants.
C) CAM plants.
D) B and C only.
E) A, B, and C

Topic: Concept 10.4
Skill: Knowledge

Respostes

1A 2D 3A 4E 5E 6B 7E 8A 10B 11C	12D 13B 15A 16B 17B 18C 19E 20C 22A 23B	33a 34D 35C 36B 37A 38D 39C 40A 41A 42A	43E 44C 45D 46B 47A 48B 49D 50A 51B 52C	53B 54D 55D 56A 57D 58B 59B 60ª 61B 62A	64B 65C