



Nombre y Apellidos

FOTOSÍNTESIS

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

2) If photosynthesizing green algae are provided with CO₂ synthesized with heavy oxygen (¹⁸O), later analysis will show that all but one of the following compounds produced by the algae contain the ¹⁸O label. That one exception is

- A) PGA.
- B) PGAL.
- C) glucose.
- D) RuBP.
- E) O₂.

3) 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

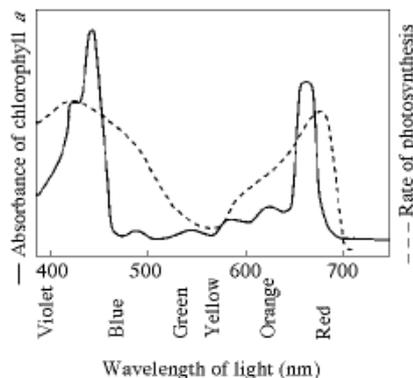


Figure 10.1

4) Figure 10.1 shows the absorption spectrum for chlorophyll *a* and the action spectrum for photosynthesis. Why are they different?

- A) Green and yellow wavelengths inhibit the absorption of red and blue wavelengths.
- B) Bright sunlight destroys photosynthetic pigments.
- C) Oxygen given off during photosynthesis interferes with the absorption of light.
- D) Other pigments absorb light in addition to chlorophyll *a*.
- E) Aerobic bacteria take up oxygen which changes the measurement of the rate of photosynthesis.

- 5) Taking Figure 10.1 into account, what wavelength of light is *most* effective in driving photosynthesis?
- A) 420 nm
 - B) 475 nm
 - C) 575 nm
 - D) 625 nm
 - E) 730 nm
- 6) 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
- 7) A plant has a unique photosynthetic pigment. The leaves of this plant appear to be reddish yellow. What wavelengths of visible light are *not* being absorbed by this pigment?
- A) red and yellow
 - B) blue and violet
 - C) green and yellow
 - D) blue, green, and red
 - E) green, blue, and violet
- 8) 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
- 9) 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.
- 10) 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*.
- 11) 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.

12) All of the following are directly associated with photosystem II *except*

- A) extraction of hydrogen electrons from the splitting of water.
- B) release of oxygen.
- C) harvesting of light energy by chlorophyll.
- D) NADP⁺ reductase.
- E) P680 reaction-center chlorophyll.

13) 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.

14) 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 O₂ in the light.
- C) to test for CO₂ fixation in the dark.
- D) to do experiments to generate an action spectrum.
- E) to test for production of either sucrose or starch.

15) 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

16) What does cyclic electron flow in the chloroplast produce?

- A) ATP
- B) NADPH
- C) glucose
- D) A and B
- E) A, B, and C

17) 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

18) 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

- 19) In mitochondria, chemiosmosis translocates protons from the matrix into the intermembrane space, whereas in chloroplasts, chemiosmosis translocates protons from
- A) the stroma to the photosystem II.
 - B) the matrix to the stroma.
 - C) the stroma to the thylakoid space.
 - D) the intermembrane space to the matrix.
 - E) ATP synthase to NADP⁺ reductase.
- 20) 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.
- 21) 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) A and C only
- 22) 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

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
- 23) synthesis of ATP by the chemiosmotic mechanism
- 24) reduction of oxygen which forms water
- 25) reduction of NADP⁺
- 26) the splitting of carbon dioxide to form oxygen gas and carbon compounds
- 27) generation of proton gradients across membranes
- 28) 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 CO₂ 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.

29) 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

30) Which of the following is (are) required in the Calvin cycle?

- A) CO₂
- B) ATP
- C) RuBP
- D) A and B only
- E) A, B, and C

31) Which statement is *false*?

- A) Thylakoid membranes contain the photosynthetic pigments.
- B) The O₂ 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.

32) 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

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

33) produces molecular oxygen (O₂)

34) requires ATP

35) produces NADH

36) produces NADPH

37) produces three-carbon sugars

38) requires CO₂

39) requires glucose

40) Which of the following is (are) true of the enzyme ribulose biphosphate carboxylase?

- A) It participates in the Calvin cycle.
- B) It catalyzes a phosphorylation reaction.
- C) It has an affinity for both O₂ and CO₂.
- D) A and C are true.
- E) A, B, and C are true.

41) What are the substrates (normal reactants) for the enzyme RuBP carboxylase?

- A) CO₂ and O₂
- B) CO₂ and glucose
- C) ATP and NADPH
- D) triose-P, glucose, and CO₂
- E) CO₂ and ATP

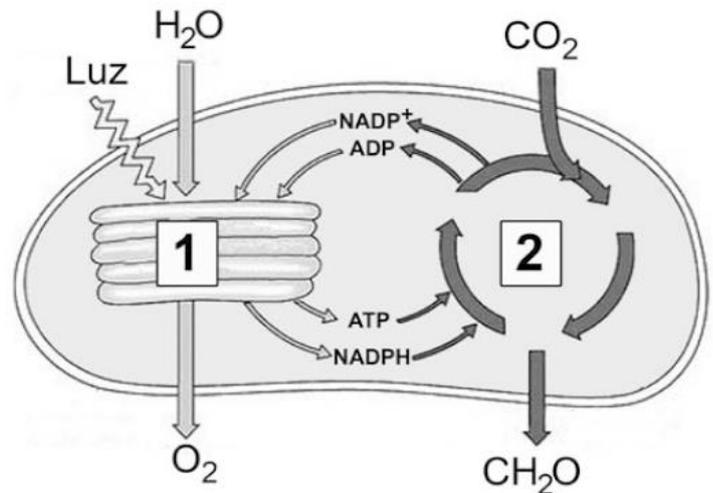
42) After 3-PGA is phosphorylated, it is reduced by

- A) NADP⁺.
- B) ADP.
- C) CO₂.
- D) NADPH.
- E) ATP.

45. En relación con la imagen adjunta, conteste las siguientes cuestiones:

a).- ¿Qué proceso representa la imagen? [0,1]. ¿En qué orgánulo se lleva a cabo? [0,1]. ¿En qué tipo de células? [0,1]. ¿Qué estructura es la señalada con el número 1? [0,1]. ¿Qué proceso ocurre en dicha estructura? [0,1]. ¿Qué papel tiene la luz en dicho proceso? [0,5].

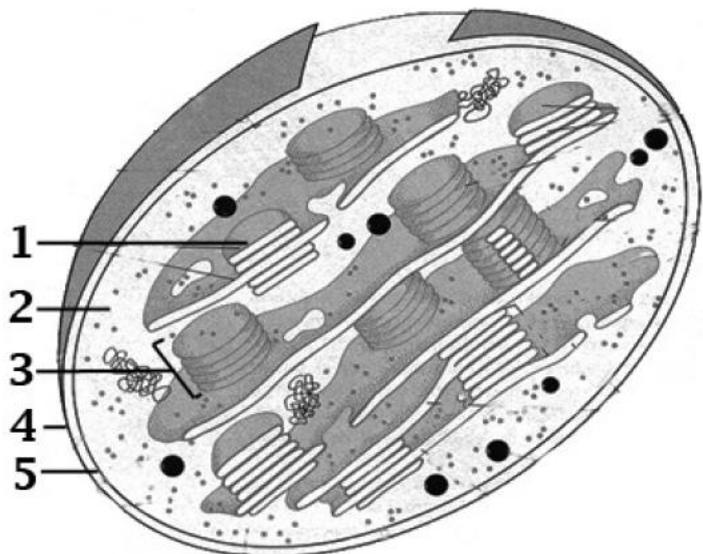
b).- ¿Qué proceso es el señalado con el número 2? [0,2]. ¿Qué ocurre de forma global en dicho proceso? [0,5]. ¿En qué compartimento del orgánulo tiene lugar? [0,1]. Escriba la ecuación general de lo que sucede de manera conjunta en este orgánulo [0,2].



46. A la vista de la imagen, conteste las siguientes cuestiones:

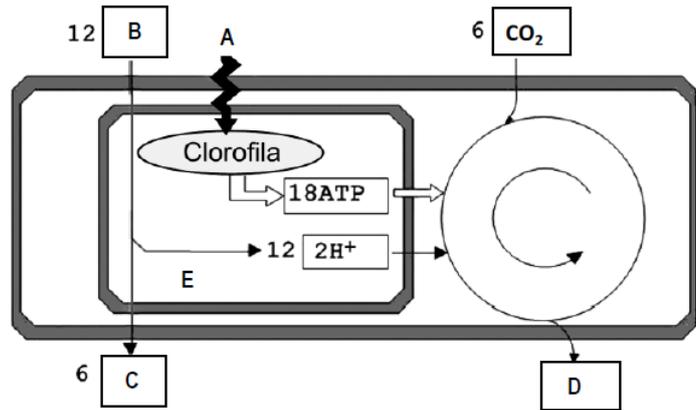
a).- ¿Qué orgánulo representa la imagen? [0,1]. Indique dos características de la imagen que le permitan su identificación [0,2]. Nombre las partes numeradas [0,5]. ¿En qué tipo de células se encuentra? [0,2].

b).- ¿Cuál es la función del orgánulo representado? [0,1]. De dicha función explique qué reacciones tienen lugar en la estructura marcada con el número 1 [0,4]. Indique dos semejanzas de este orgánulo con las bacterias [0,2]. ¿Qué razón puede explicar estas semejanzas? [0,3].



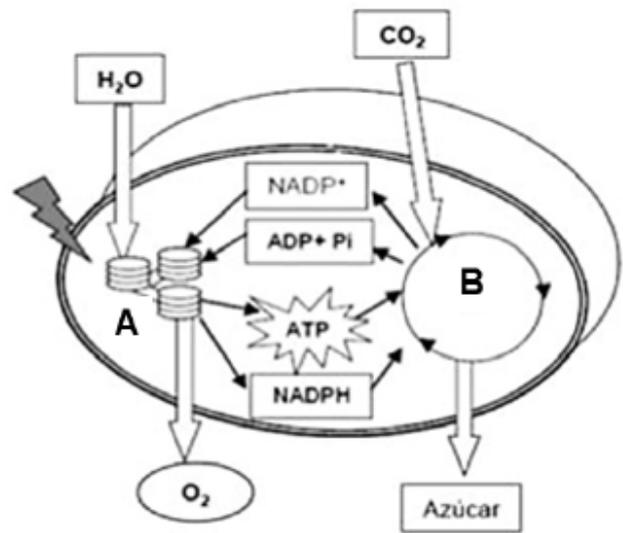
47. A la vista de la imagen, que muestra un proceso celular, conteste las siguientes cuestiones:

- a).- ¿De qué proceso se trata? [0,2]. ¿En qué orgánulo tiene lugar? [0,2]. Indique qué representan las letras: A, B, C y D [0,4]. Nombre el ciclo representado por el círculo [0,2].
- b).- Explique los acontecimientos que suceden en el compartimento señalado con la letra E [1].



48. El esquema adjunto representa un proceso esencial en la biosfera.

- a).- Identifique de qué proceso se trata [0,1] y cite el tipo de seres vivos que lo llevan a cabo [0,2]. Indique la denominación de las dos fases del proceso (señaladas como A y B) [0,2] y cite la localización donde se realizan [0,2]. ¿Se trata de un proceso anabólico o catabólico? Razone la respuesta [0,3].
- b).- Indique tres diferencias entre las fases A y B [0,6]. Señale dos aspectos que revelen la importancia biológica del proceso [0,4].



49. Explique las reacciones dependientes de luz de la fotosíntesis.

50. Explique las reacciones independientes de luz de la fotosíntesis.