

- 1) Where does the Calvin cycle take place?
  - A) stroma of the chloroplast
  - B) thylakoid membrane
  - C) cytoplasm surrounding the chloroplast
  - D) interior of the thylakoid (thylakoid space)
  - E) outer membrane of the chloroplast
- 2) When oxygen is released as a result of photosynthesis, it is a direct by-product of
  - A) splitting water molecules.
  - B) chemiosmosis.
  - C) the electron transfer system of photosystem I.
  - D) the electron transfer system of photosystem II.
- 3) What does the chemiosmotic process in chloroplasts involve?
  - A) establishment of a proton gradient across the thylakoid membrane
  - 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
- 4) Where are the molecules of the electron transport chain found in plant cells?
  - A) thylakoid membranes of chloroplasts
  - B) stroma of chloroplasts
  - C) outer membrane of mitochondria
  - D) matrix of mitochondria
  - E) cytoplasm
- 5) The reactions that produce molecular oxygen ( $O_2$ ) take place in
  - A) the 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) the chloroplast, but are not part of photosynthesis.
- 6) 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
- 7) 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.

- 8) All of the events listed below occur in the light reactions of photosynthesis *except*
- A) oxygen is produced.
  - B)  $\text{NADP}^+$  is reduced to NADPH.
  - C) carbon fixation.
  - D) ADP is phosphorylated to yield ATP.
- 9) All of the following are directly associated with photosystem I *except*
- A) harvesting of light energy by chlorophyll.
  - B) P700 reaction-center chlorophyll.
  - C) extraction of hydrogen electrons from the splitting of water.
  - D) passing electrons to ferredoxin.
- 10) Which of the following is (are) required in the Calvin cycle?
- A)  $\text{CO}_2$
  - B) ATP
  - C) RuBP
  - D) A and B only
  - E) A, B, and C
- 11) 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