Critical Thinking

1. Why are catabolic and anabolic reactions referred to as coupled reactions?

2. Explain how competitive and noncompetitive enzyme inhibitors work.

3. How does the ultimate fate of electrons liberated differ in cyclic and noncyclic photophosphorylation?

4. What are the key features of the pentose phosphate pathway?

ANSWERS

Matching

I. 1. a 2. f 3. e 4. c 5. d 6. h 7. g 8. i
II. 1. f 2. e 3. e 4. c 5. b 6. a
III. 1. c 2. f 3. c 4. e 5. a 6. b
IV. 1. a 2. c
V. 1. a 2. d 3. e 4. b
VI. 1. a 2. e 3. c 4. b

Fill in the Blanks

1. saprophyte 2. saturated 3. noncompetitive 4. competitive 5. substrate-level 6. oxygen 7. 38 8. 2 9. deamination 10. decarboxylation 11. substrate 12. pantothenic 13. metabolic 14. glycolysis 15. CoA 16. nucleotides

Label the Art

a. Pyruvic acid b. NADH c. CO_2 d. Acetyl CoA e. NADH f. CO_2 g. NADH h. CO_2
i. ATP j. $FADH_2$ k. NADH

Critical Thinking

1. Catabolic and anabolic reactions are referred to as coupled reactions because catabolic reactions furnish the energy necessary to drive anabolic reactions.

2. Competitive enzyme inhibitors bind to and fill the active site of an enzyme. They compete with the substrate for the active site of the enzyme. The inhibitor does not undergo any reaction to form a product. This binding may or may not be reversible.

   Noncompetitive inhibitors interact with some other part of the enzyme, a process that is referred to as allosteric inhibition. The binding of enzyme and inhibitor results in a change in the active site of the enzyme. This prevents binding of the substrate so the reaction cannot occur.

3. In cyclic photophosphorylation, the electrons liberated from chlorophyll pass through the electron transport chain and eventually return to the chlorophyll.

   In noncyclic photophosphorylation, electrons released from chlorophyll pass through the electron transport chain to the electron acceptor, $NADP^+$. Electrons are replaced in chlorophyll from the splitting of water.

4. Provides a means for the breakdown of pentose sugars.

   Produces intermediates that are precursors in the synthesis of nucleic acids, some amino acids, glucose from CO_2 in photosynthesis.

   The process is an important producer of the coenzyme NADPH from $NADP^+$.