

Name _____ Period _____

Chapter 6: How Cells Harvest Chemical Energy

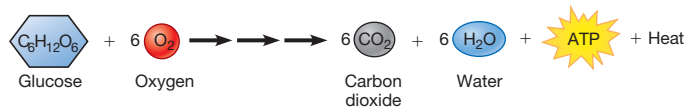
Guided Reading Activities

Big Idea: Cellular Respiration: Aerobic Harvesting of Energy

Answer the following questions as you read Modules 6.1–6.5:

1. Plants create which of the following as a result of photosynthesis?
 - a. O_2
 - b. CO_2
 - c. H_2O
 - d. Solar energy
2. _____ is always lost during photosynthesis and cellular respiration.
3. Students frequently have the misconception that plant cells don't perform cellular respiration. Briefly explain the basis of this misconception.
4. True or false: Blood traveling from your leg muscles to the lungs would be low in oxygen. If false, make it a correct statement.
5. In what way are photosynthesis and cellular respiration linked on a molecular level?

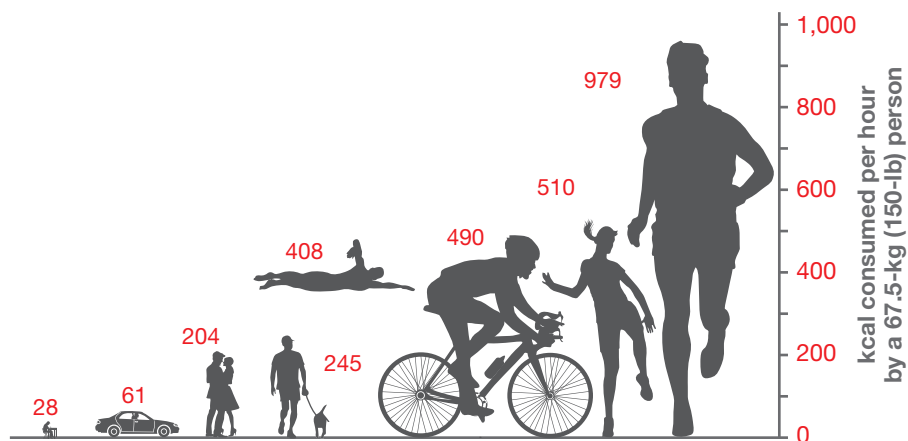
6. Any substance that inhibits the transportation of oxygen from the lungs affects _____.
- photosynthesis
 - cellular respiration
 - chloroplasts
 - none of the above
7. The overall chemical equation for cellular respiration is: $C_6H_{12}O_6 + 6O_2 \rightarrow \rightarrow \rightarrow CO_2 + 6H_2O$. Briefly explain why the equation has multiple arrows. Refer to Figure 6.3 on page 95 of your textbook.



8. CO_2 is a gaseous by-product of cellular respiration that you exhale with each breath. Briefly explain where the CO_2 comes from.
9. Fill in the following table regarding the inputs and outputs of cellular respiration.

Inputs	Outputs

10. You are taking a road trip from Chicago to Denver. The trip is going to take roughly 15 hours. At the start of your trip, you get a 96-oz Mega Gulp from 11-seven of Mountain Mist. This beverage will have roughly 1,360 kcal. How long into your trip will you have burned the calories from this drink? Refer to Figure 6.4 in your textbook on page 95.



11. The formation of NaCl (table salt) involves an atom of Na giving an electron to an atom of Cl.
- This would be considered a redox reaction.
 - Na got oxidized.
 - Cl got reduced.
 - All of the above are true statements regarding the formation of NaCl.
12. Briefly explain why a teeter-totter is a good analogy for describing how reductions are always linked to oxidations.

13. True or false: The transfer of H atoms from glucose to oxygen is not representative of redox reactions. If false, make it a correct statement.

Big Idea: Stages of Cellular Respiration

Answer the following questions as you read Modules 6.6–6.11:

- Which of the following is the correct order of the main stages of cellular respiration?
 - Citric acid cycle, glycolysis, oxidative phosphorylation
 - Glycolysis, citric acid cycle, oxidative phosphorylation
 - Citric acid cycle, oxidative phosphorylation, glycolysis
 - Oxidative phosphorylation, glycolysis, citric acid cycle
- Match the following stages of cellular respiration with the correct characteristics. Some stages may have more than one characteristic or share characteristics. For glycolysis, put A; for citric acid cycle, put B; and for oxidative phosphorylation, put C.

Occurs in the cytosol: _____

Occurs in the mitochondria: _____

Involves the splitting of glucose: _____

Produces molecules of NADH: _____

Produces ATP: _____

Produces CO₂: _____

FADH₂ shuttles electrons to the electron transport chain: _____

Occurs in a plant cell: _____

Occurs in an animal cell: _____

Uses the potential energy of a H⁺ gradient: _____

Produces molecules of FADH₂: _____

Substrate-level phosphorylation occurs: _____

3. _____ uses the energy found within a proton gradient to drive the synthesis of ATP.
4. True or false: A substance that makes the inner mitochondrial membrane leaky to H^+ (H^+ would be able to leak across the membrane at points other than ATP synthase) would increase ATP production in mitochondria. If false, make it a correct statement.
5. The driving force behind oxidative phosphorylation is _____.
 - a. oxygen
 - b. carbon dioxide
 - c. NADH
 - d. H_2O
6. True or false: Brown fat contains mitochondria. If false, make it a correct statement.
7. What initial observation led scientists to hypothesize that brown fat may be activated by cold temperatures?
8. How many ATP would be produced during the citric acid cycle from two glucose molecules?

Big Idea: Fermentation: Anaerobic Harvesting of Energy

Answer the following questions as you read Modules 6.12–6.13:

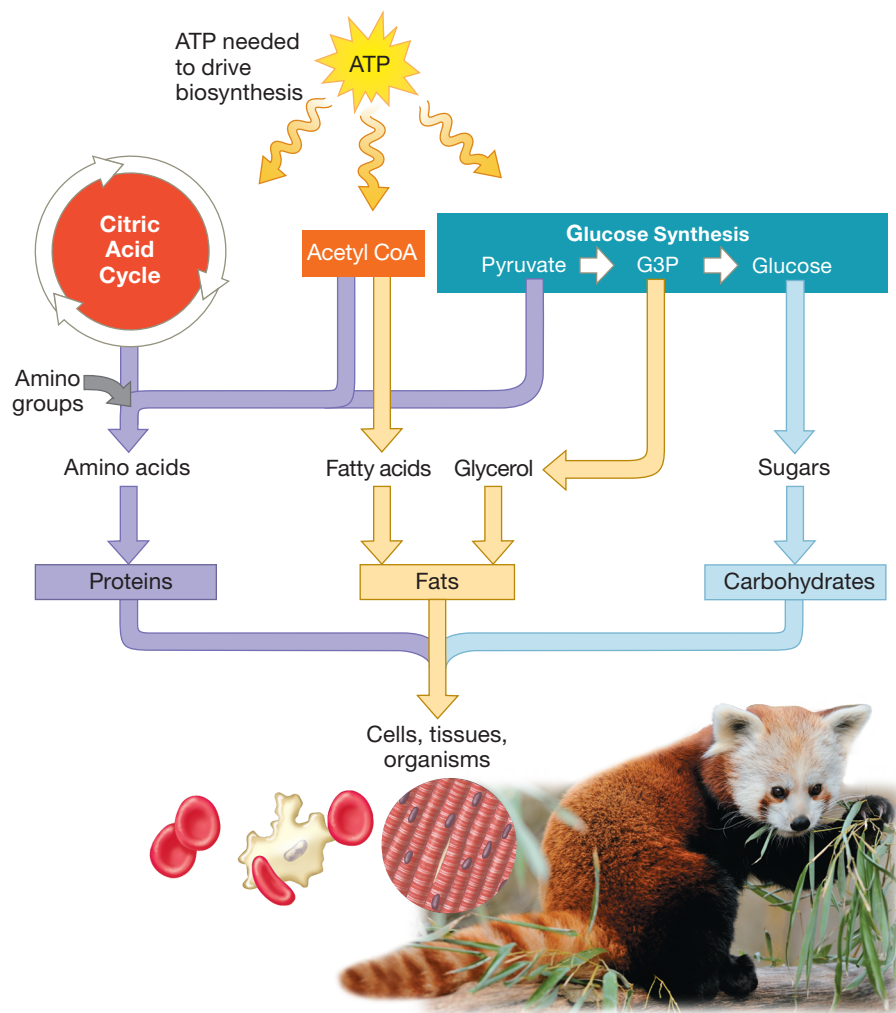
1. _____ generates fewer molecules of ATP because it contributes its electrons further along the electron transport chain.

2. The only portion of cellular respiration that is cyclic is _____.
 - a. glycolysis
 - b. the electron transport chain
 - c. the citric acid cycle
 - d. the oxidation of pyruvate
3. In lactic acid fermentation, _____ becomes the target of reduction by NADH.
 - a. pyruvate
 - b. lactate
 - c. glucose
 - d. ATP
4. Fermentation is essentially glycolysis because glycolysis does not require _____ to function.
5. If you opened a wine vat, would the yeast inside continue to perform alcoholic fermentation? Briefly explain your answer with some details about what would happen.
6. List two sources of evidence that indicate glycolysis is extremely old.

Big Idea: Connections between Metabolic Pathways

Answer the following questions as you read Modules 6.14–6.15:

1. What must proteins be broken down into before they can be burned as energy? Refer to Figure 6.15 on page 107 in your textbook.



2. Fats are hydrophobic and carbohydrates are hydrophilic. Use this information to explain why humans store the majority of their excess energy as fat and not carbohydrates.

3. True or false: Glycolysis and the citric acid cycle both function as metabolic interchanges where the products of their chemical reactions can also be used for biosynthesis. If false, make it a correct statement.
4. A buildup of _____ initiates the inhibition of an enzyme that functions early in glycolysis.
 - a. ADP
 - b. ATP
 - c. glycerol
 - d. amino acids

CONNECTING THE BIG IDEAS

Use your knowledge of the information contained within this chapter's "Big Ideas" to answer this question.

A drug is administered to a person that causes the inner mitochondrial plasma membrane to become permeable to H^+ . What effect will this have on oxidative phosphorylation? Are there possible repercussions for the other stages of cellular respiration?