

Name _____ Period _____

Chapter 5: The Working Cell***Guided Reading Activities*****Big Idea: Membrane Structure and Function**

Answer the following questions as you read Modules 5.1–5.9:

1. Every cell has a(n) _____ that allows it to maintain a cellular environment that is separate from the environment in which it is found.

2. Which of the following best describes the structure of a plasma membrane?
 - a. Proteins sandwiched between two layers of phospholipids
 - b. Proteins embedded in two layers of phospholipids
 - c. A layer of protein on top of a layer of phospholipids
 - d. Phospholipids sandwiched between two layers of protein

3. Biologists have described a cell's plasma membrane as being a fluid mosaic. Briefly explain why this is an accurate description. Use the figure on page 78 to help with this.

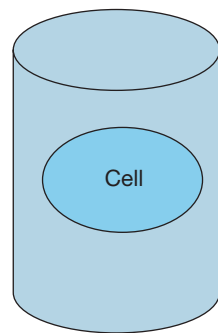
4. True or false: The fact that all cells have a plasma membrane supports the evolutionary linkage of all life. If false, make it a correct statement.

5. Match the following terms with their description: passive transport, diffusion, concentration gradient, and osmosis.
 - a. Diffusion of water across a selectively permeable membrane: _____
 - b. Movement across a cell membrane that requires no work from the cell: _____

- c. Movement of a substance from high to low concentration: _____
- d. When there exists a difference in the amount of a substance across a distance: _____
6. Complete the table that compares diffusion, osmosis, and facilitated diffusion.

	Diffusion	Osmosis	Facilitated diffusion
Is energy required from the cell?			
Description			

7. What feature does diffusion, osmosis, and facilitated diffusion all share?
8. A cell is placed into a beaker containing a 4% sucrose solution. The cell contains a 1% sucrose solution. Use an arrow to illustrate the direction in which water will diffuse in the figure below. Assume that the cell's membrane is not permeable to the sucrose.

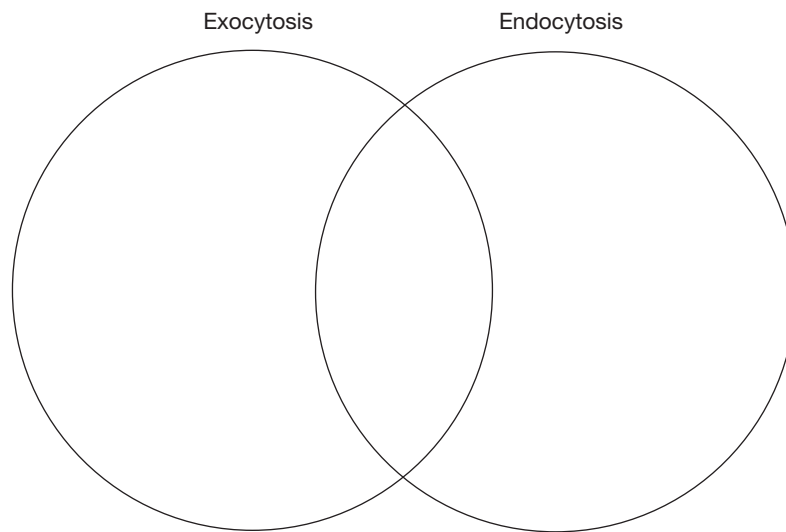


9. Complete the table that compares terms associated with tonicity.

	Isotonic solution	Hypotonic solution	Hypertonic solution
Each term refers to . . .			
Effect on a plant cell if placed in a(n) . . .			
Effect on an animal cell if placed in a(n) . . .			

10. Nonpolar is to diffusion as _____ is to facilitated diffusion.
11. Which of the following statements regarding transport across a plasma membrane is false?
- Passive transport requires an input of energy from the cell.
 - Osmosis is the diffusion of water across a selectively permeable membrane.
 - Substances always travel down their concentration gradient in passive transport.
 - Facilitated diffusion requires a specific transport protein found in the membrane.
12. True or false: Aquaporins form the specific protein channel through which water diffuses. If false, make it a correct statement.
13. Dr. Agre's research into aquaporins hinged on two key observations. List both observations.
14. In contrast to passive transport, active transport pumps a substance _____ its gradient.

15. You are sailing on Lake Superior from Copper Harbor, Michigan, to Isle Royale National Park. A sudden storm causes your sailboat to spring a leak. You immediately grab a bucket and begin bailing water out of the boat. Briefly explain how your predicament could be used as an analogy to help explain both active and passive transport.
16. Use the Venn diagram to compare exocytosis with endocytosis.



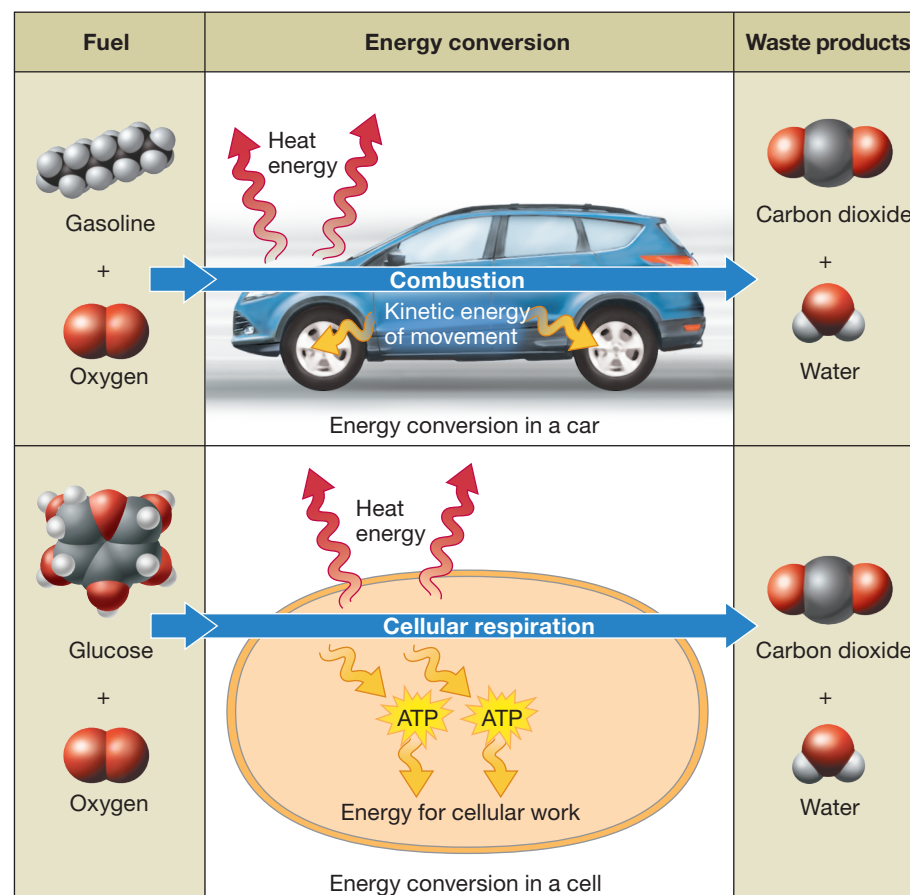
Big Idea: Energy and the Cell

Answer the following questions as you read Modules 5.10–5.12:

1. Complete the table that compares kinetic with potential energy.

	Kinetic energy	Potential energy
Description		
Example		

2. The food we eat contains chemical energy. Is it possible for a candy bar to have potential energy for two different reasons at the same time? Briefly explain your answer.
3. Energy is never created or destroyed. What happened to the energy that was stored in your gas tank after your lawnmower comes to a stop as a result of running out of gas?
- The energy was lost.
 - Entropy decreased in the universe.
 - It was converted to heat.
 - The lawnmower gained energy.
4. Which portion of the Figure 5.10 on page 84 of your textbook illustrates the second law of thermodynamics?



5. Match the following terms with their correct description: exergonic reaction, endergonic reaction, metabolism, metabolic pathway.
 - a. The sum of all chemical reactions in an organism: _____
 - b. A series of reactions that either build or break down a molecule: _____
 - c. A reaction that gives off energy: _____
 - d. A reaction that requires an input of energy: _____

6. A chemical reaction is determined to be endergonic. If you were trying to get that reaction to occur using an additional and separate reaction, what would you do?

7. The phosphorylation of ADP creates _____.

8. A cell pumps certain ions against their concentration gradient to maintain those gradients. What type of cellular work is this considered?

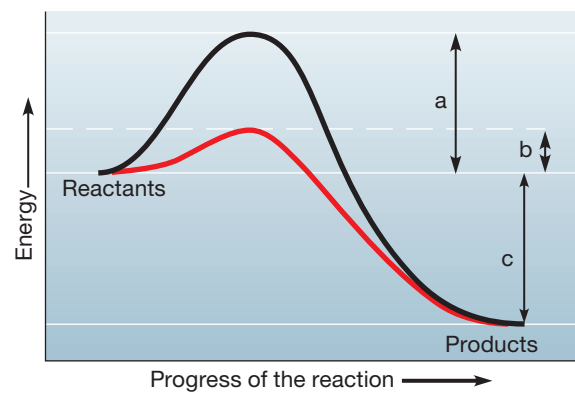
9. Anything that inhibits ATP synthesis in a cell would most likely
 - a. force the cell to use ADP as an energy source.
 - b. result in the death of the cell.
 - c. make the cell start using lipids as energy.
 - d. cause the cell to stop doing mechanical work but not transport work.

Big Idea: How Enzymes Function

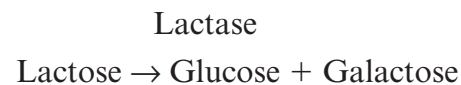
Answer the following questions as you read Modules 5.13–5.16:

1. The energy needed to initiate a chemical reaction is the _____.
 - a. activation energy
 - b. substrate energy
 - c. active site
 - d. inhibition site

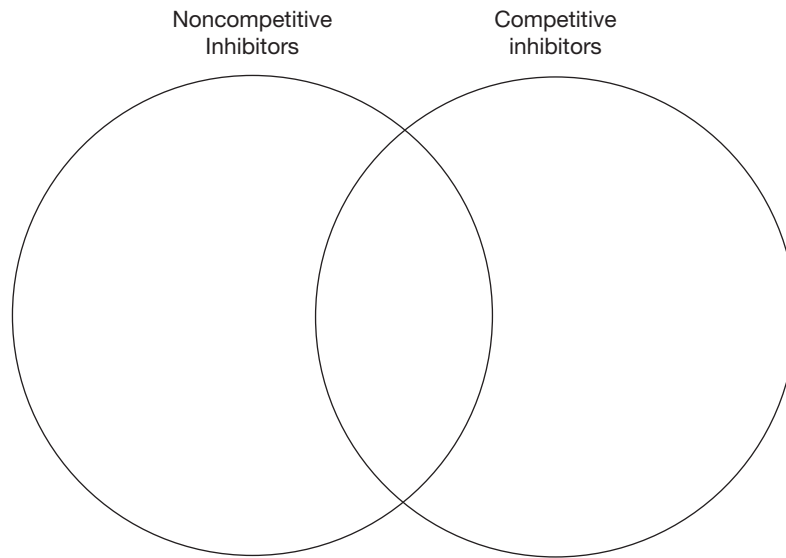
2. In pole vaulting, the higher the bar is placed, the more difficult it is to clear it. Explain why this is a good analogy to help students understand enzymes and activation energy.
3. The graph on page 87 in your textbook illustrates the difference between a chemical reaction with and without an enzyme. Could the reaction represented by the black line still occur without the enzyme? Briefly explain your answer.



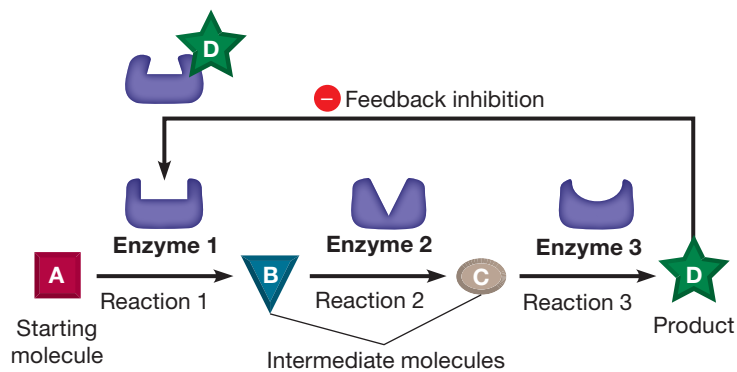
4. The relationship between an enzyme's active site and its substrate is most like which of the following?
- A comb and hair
 - A car and a driver
 - A scarf and a hand
 - A key and a lock
5. In the following reaction, circle the enzyme.



- Sucrase is the enzyme that breaks down sucrose into glucose and fructose. Will sucrose also catalyze the breakdown of the disaccharide maltose? Briefly explain your answer.
- Complete the Venn diagram comparing inhibitors.



- Use Figure 5.15B on page 89 of your textbook to answer this question. Assume that a toxin is introduced to the cell that binds to and removes substance C from the pool of molecules participating in the reaction. Briefly explain what would happen to the amount of substance B.



9. Penicillin is a drug that affects bacterial cells and not human cells. How is this possible?

CONNECTING THE BIG IDEAS

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

Aquaporins are membrane proteins that span the entire membrane (transmembrane proteins). An aquaporin protein must be able to interact with polar regions that are both extracellular and intracellular as well as polar water molecules moving through its core. Additionally, it must be able to interact with the nonpolar phospholipid tails. How is it possible that this protein (Hint: A collection of amino acids) can meet all of these requirements?