Study Guide 3.5: Active Transport, Endocytosis and Exocytosis

KEY CONCEPT
Cells use energy to transport materials that cannot diffuse across a membrane.

VOCABULARY

<table>
<thead>
<tr>
<th>active transport</th>
<th>phagocytosis</th>
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<tbody>
<tr>
<td>endocytosis</td>
<td>exocytosis</td>
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MAIN IDEA: Proteins can transport materials against a concentration gradient.

1. How is active transport different than simple diffusion and facilitated diffusion?
   ____________________________________________________________

2. How is active transport similar to facilitated diffusion?
   ____________________________________________________________

3. List two characteristics that almost all transport proteins share.
   ____________________________________________________________
   ____________________________________________________________

4. List the key distinguishing feature of active transport proteins.
   ____________________________________________________________

5. Refer to Figure 5.1 to draw a picture in the box below to represent active transport.

   outside                                      inside

6. Most active transport proteins use energy from the breakdown of __________.
**MAIN IDEA:** Endocytosis and exocytosis transport materials across the membrane in vesicles.

7. A cell may transport a substance in _________ if the substance is too large to cross the membrane.

8. During endocytosis, the vesicle membrane fuses with a lysosome, and the membrane and its contents are broken down by __________.

Complete the Y diagram below to compare and contrast the processes of endocytosis and exocytosis. Under the heading “endocytosis,” list the characteristics of endocytosis. Under the heading “exocytosis,” list the characteristics of exocytosis. At the bottom of the Y, write the characteristics that both processes have in common. Then lightly cross out those characteristics at the top of the Y.

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**Vocabulary Check**

9. What term means “cell eating” and describes a type of endocytosis?

10. The prefix *exo-* means “out of,” and the prefix *endo-* means “taking in.” How do these meanings relate to the meaning of exocytosis and endocytosis?

11. What process drives molecules across a membrane against a concentration gradient?
Reinforcement 3.5: Active Transport, Endocytosis and Exocytosis

**KEY CONCEPT** Cells use energy to transport materials that cannot diffuse across the membrane

Cells use active transport to obtain materials they need that they could not get by means of diffusion or facilitated diffusion. **Active transport** is the movement of a substance against its concentration gradient by the use of transport proteins embedded in the cell membrane and chemical energy. The transport proteins used in active transport are often called pumps. Most often, the chemical energy that is used comes from breakdown of a molecule called ATP. A cell may use this energy directly or indirectly.

- The sodium-potassium pump directly uses energy from the breakdown of ATP to pump two potassium ions into a cell for every three sodium ions it removes from the cell.
- The proton pump indirectly uses energy from the breakdown of ATP to remove hydrogen ions (protons) from a cell. This action creates a charge gradient, which is a form of stored energy. This charge gradient can then be used to drive other pumps to transport molecules such as sucrose.

Some molecules are too large to be transported through proteins. These molecules can be moved in vesicles, so they never actually have to cross the membrane. The movement of these vesicles also requires energy from a cell.

- **Endocytosis** is the process of taking liquids or large molecules into a cell by engulfing them in a vesicle. During endocytosis, the cell membrane makes a pocket around the material to be brought in. The pocket pinches together around the material and breaks off, forming a vesicle, inside the cell. This vesicle then joins with a lysosome, which breaks down the contents if needed and recycles the vesicle. **Phagocytosis** is a type of endocytosis and means “cell eating.”

- **Exocytosis** is the process of releasing materials from a cell by fusion of a vesicle with the cell membrane. In this process, a vesicle forms around select materials. The vesicle is moved to the cell surface, and it fuses with the cell membrane, releasing the contents. Exocytosis plays an important role in releasing hormones and digestive enzymes and in transmitting nerve impulses.

1. In what ways are active transport, endocytosis, and exocytosis similar?

   ___________________________________________________

2. In what ways does active transport differ from endocytosis and exocytosis?

   ___________________________________________________

   ___________________________________________________

3. List one function that exocytosis carries out in the human body.

   ___________________________________________________
Section Quiz 3.5: Active Transport, Endocytosis and Exocytosis

Choose the letter of the best answer.

____ 1. Unlike passive transport, active transport requires
   a. concentration gradients.
   b. diffusion.
   c. energy from the cell.
   d. vesicles.

____ 2. Which process uses proteins to move molecules against a concentration gradient?
   a. active transport
   b. passive transport
   c. endocytosis
   d. phagocytosis

____ 3. Cells use active transport proteins to
   a. obtain molecules they need.
   b. break down molecules.
   c. engulf large particles.
   d. detect the charge of molecules.

____ 4. A membrane-bound sac used to transport substances into and out of cells is a
   a. pump.
   b. macrophage.
   c. lysosome.
   d. vesicle.

____ 5. Which process is used to release insulin from pancreatic cells into the bloodstream?
   a. exocytosis
   b. endocytosis
   c. active transport
   d. passive transport