

Passive and Active Transport

Diffusion is a form of passive transport. It does not require cells to use energy to move materials from an area of high concentration to an area of low concentration. In diffusion, materials move with the concentration gradient. Active transport requires cells to use energy to move materials. In this process, materials are often moved against a concentration gradient (from low to high). The mechanism of active transport is not completely understood. The following model represents one possible explanation of how active transport occurs.

Molecules of substance A are shown on either side of a cell membrane in Figure 1. The concentration of A is greater inside the cell than outside.

Figure 1:

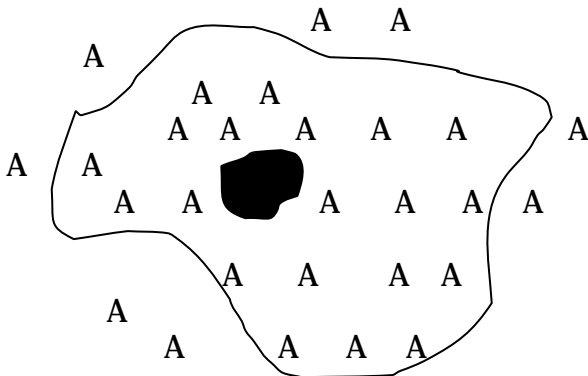
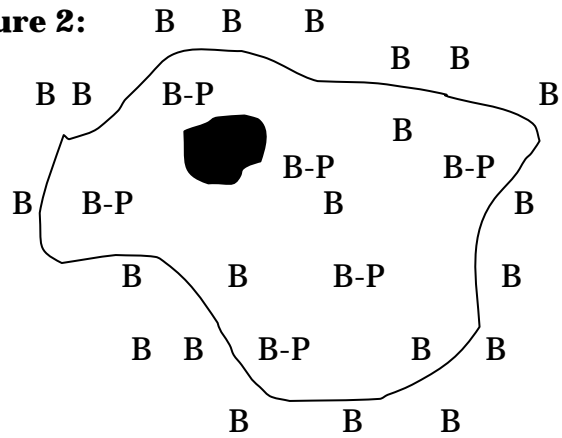


Figure 2:



1. If substance A can diffuse across the cell membrane, what would happen to the concentration of A inside and outside the cell? _____

Examine Figure 2. When substance B enters the cell, it is bound to a protein molecule. The combination of B and the protein (P) cannot pass through the cell membrane. It is too large. Only molecules of substance B that are not bound to the protein can pass back through the cell.

2. Compare the concentrations of unbound B inside and outside the cell. _____

3. If only substance B can diffuse through the cell membrane, what will happen to the unbound B outside the cell? Draw a diagram to help illustrate your answer. _____

Draw your diagram here:

Body cells use active transport to move sodium ions (Na^+) and potassium ions (K^+) across the cell membrane. Living cells pump sodium out of the cytoplasm into the area surrounding the cells. At the same time, cells pump potassium from outside the cell into the cytoplasm. This system is called the **sodium-potassium pump**. These ions are pumped against the concentration gradient and the cell uses energy to do this.

4. Add sodium and potassium ions to Figure 3 to show that active transport is at work. (Remember to show a concentration gradient by drawing more ions for each element on one side of the membrane than the other.)

5. Suppose that the active transport of sodium and potassium stopped. Illustrate what would happen by completing the diagram in Figure 4.

Figure 3:

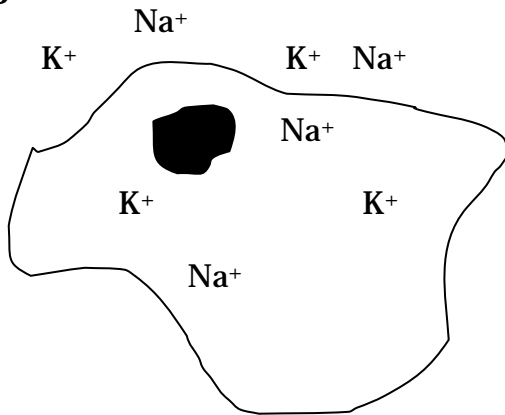
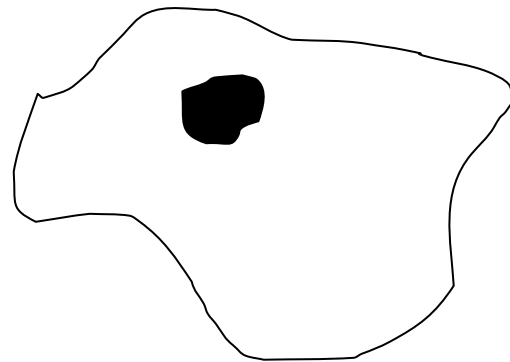


Figure 4:



6. Describe both of your illustrations.

Figure 3: _____

Figure 4: _____

7. If a cell's capacity of producing energy failed, which of the following processes continue: Osmosis, Active Transport, Passive Transport, Diffusion? Explain your answer.
