Name _____ Period _____Date _____

STUDY GUIDE 3.4: DIFFUSION AND OSMOSIS

KEY CONCEPT

Materials move across membranes because of concentration differences.

VOCABULARY

passive transport	osmosis	hypotonic
diffusion	isotonic	facilitated diffusion
concentration gradient	hypertonic	

MAIN IDEA: **Diffusion and osmosis are types of passive transport.**

1. The difference in the concentration of a substance from one location to another is called a _____.
2. A molecule that diffuses down a concentration gradient goes from an area of _____ concentration into an area of _____ concentration.

Complete the following Concept Map about passive transport. Write the letter of each statement listed below in the appropriate box.

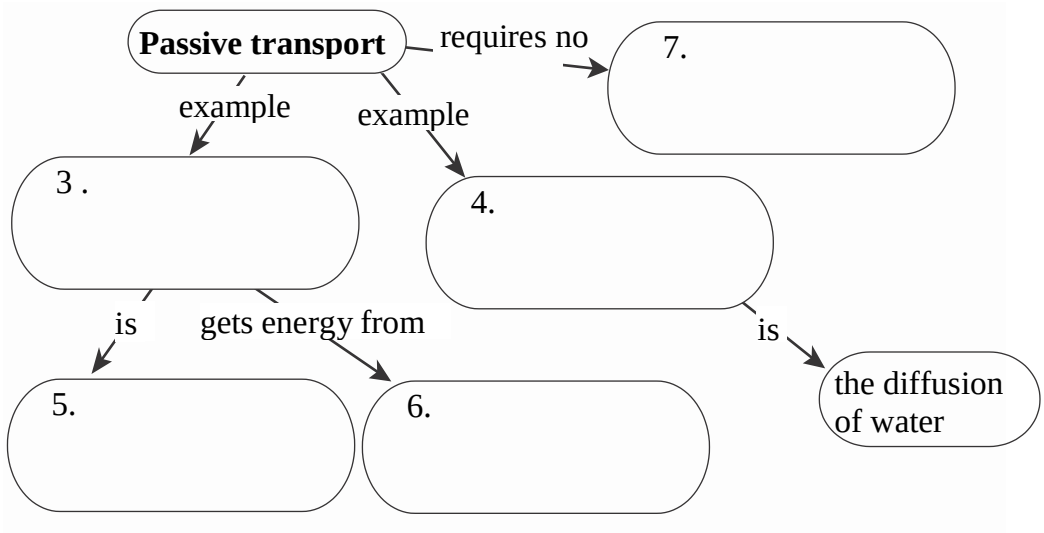
a. the natural motion of particles

b. osmosis

c. the movement of molecules down a concentration gradient

d. energy from the cell

e. diffusion



8. The higher the concentration of dissolved particles in a solution, the _____ the concentration of water molecules in that solution.

Suppose you have three solutions with different concentrations of particles. Relative to the concentration of particles in a cell, one solution is isotonic, one is hypertonic, and one is hypotonic. Use this information to answer the next two questions.

9. The _____ solution has the highest concentration of particles.

10. The _____ solution has the highest concentration of water molecules.

MAIN IDEA: **Some molecules diffuse through transport proteins.**

Circle the word or phrase that best completes the statement.

11. *Simple / Facilitated* diffusion occurs across the membrane, but *simple / facilitated* diffusion occurs through selective transport proteins.

12. In facilitated diffusion, molecules move *down a concentration gradient / against a concentration gradient.*

Vocabulary Check

Fill in the blank with the word or phrase that best completes the sentence.

13. The difference in the concentration of a substance from one location to another is called a _____.

14. People with more energy than most other people are described as hyper.
A solution with a higher level of solutes than the solution it is being compared to is called _____.

15. The word *facilitate* means "to make easier." _____ means that the transport protein makes it easier for a molecule that cannot directly cross the cell membrane to enter or exit a cell.

REINFORCEMENT 3.4: OSMOSIS & DIFFUSION

KEY CONCEPT Materials move across membranes because of concentration differences

Cells are continuously exchanging materials with their environment across the cell membrane. **Passive transport** is the movement of molecules across a cell membrane that does not require energy input by the cell. **Diffusion,** a type of passive transport, is the movement of molecules from an area of higher concentration to an area of lower concentration. This difference in concentration from one area to another is called a **concentration gradient.** When a molecule diffuses, it can be described as moving down its concentration gradient.

Not all molecules can cross the cell membrane. **Facilitated diffusion** is the diffusion of molecules across a membrane through transport proteins, proteins that form channels across the membrane.

Diffusion is a result of the natural energy of molecules. When molecules are in solution, they collide and scatter. Over time, these molecules will become evenly spread throughout the solution, which means that the molecules have reached dynamic equilibrium. The molecules continue to move, but their concentration remains equal.

Water also moves from a higher water concentration to a lower water concentration. The diffusion of water is called **osmosis.** The higher the concentration of dissolved particles that are in a solution, the lower the concentration of water molecules. The reverse is also true. That is, the lower the concentration of dissolved particles that are in a solution, the higher the concentration of water molecules.

Scientists have developed terms to compare the concentration of solutions with some reference point. Here, our reference point is the concentration of particles in a cell.

- An **isotonic** solution has the same concentration of dissolved particles as a cell. A cell in an isotonic solution will not change.
- A **hypertonic** solution has a higher concentration of dissolved particles than a cell. A cell in a hypertonic solution will shrivel.
- A **hypotonic** solution has a lower concentration of dissolved particles than a cell. A cell in a hypotonic solution will swell.

1. Organize the terms *isotonic*, *hypertonic*, and *hypotonic* in order from the solution with the lowest concentration of dissolved particles to the highest concentration.

   _____

2. Suppose you have a container divided by a membrane that is permeable to water but not to sugar. Side A has a 10% sugar solution. Side B has a 40% sugar solution. Both start out at 10 cm in height. Over time, the height of one side drops to 7 cm, and the height of the other side increases to 13 cm. Which side of the container is now at 7 cm? Explain.

   _____

SECTION QUIZ 3.4: DIFFUSION & OSMOSIS

Choose the letter of the best answer.

_____ 1. Which phrase best describes passive transport?
a. requires transport proteins
b. requires no energy from the cell
c. requires an isotonic solution
d. requires facilitation by enzymes

_____ 2. Water moves into a cell when the solution surrounding the cell is
a. hypertonic.
b. hypotonic.
c. isotonic.
d. concentrated.

_____ 3. What is the term for the diffusion of water across a semipermeable membrane?
a. osmosis
b. equilibrium
c. transport
d. isotonic

_____ 4. The movement of molecules down a concentration gradient through transport proteins in the cell membrane is a type of
a. selective transport.
b. osmosis.
c. energy expenditure.
d. facilitated diffusion.

_____ 5. The difference in the concentration of dissolved particles from one location to another is called a
a. concentration gradient.
b. concentrated solution
c. saline solution.
d. dynamic gradient.