

Cell Transport

Lesson Objectives

- Describe passive transport.

Lesson Summary

Passive Transport The movement of materials across the cell membrane without using cellular energy is called passive transport.

- Diffusion is the process by which particles move from an area of high concentration to an area of lower concentration.
- Facilitated diffusion is the process by which molecules that cannot directly diffuse across the membrane pass through special protein channels.
- Osmosis is the facilitated diffusion of water through a selectively permeable membrane.

There are three ways to describe the relative concentrations of solute and solvent in solutions on opposite sides of a membrane: two adjacent solutions are isotonic if they have the same concentrations of solute; a hypertonic solution has a higher concentration of solute compared to the other solution; and a hypotonic solution has a lower concentration of solute compared to the other solution.

- Osmotic pressure is the force caused by the net movement of water by osmosis.

Questions:

- Passive transport is movement of materials across a membrane _____ using energy.
- Diffusion moves particles from an area of _____ concentration to an area of _____ concentration.
- Facilitated diffusion must use _____ channels for molecule movement.
- Isotonic solution have the _____ concentration of solute.
- Hypertonic solutions have a _____ concentration of solute.
- Hypotonic solutions have a _____ concentration of solute.
- Osmosis is _____ diffusing through a membrane.
- Osmotic pressure is the force caused by movement of _____ by _____

For Questions 1–4, write the letter of the correct answer on the line at the left.

- _____ 9. If diffusion is occurring, which of the following is likely true?
- Molecules or particles must have different sizes.
 - Special protein channels are available.
 - There are areas of different concentrations.
 - Energy is being used.
- _____ 10. Which of the following statements tells how facilitated diffusion differs from simple diffusion?
- Particles move through cell membranes without the use of energy by cells.
 - Particles tend to move from high concentration to lower concentration.
 - Particles move within protein channels that pass through cell membranes.
 - Particles tend to move more slowly than they would be expected to move.
- _____ 11. Which term refers to the condition that exists when *no* net change in concentration results from diffusion?
- concentration
 - equilibrium
 - osmosis
 - randomness
- _____ 12. Air has a higher concentration of oxygen molecules than does the cytoplasm of your lung cells. Where in your lungs will there be a net increase of oxygen?
- in the air breathed in
 - in the air breathed out
 - outside of the lung cells
 - inside of the lung cells

For Questions 13-15, match the situation with the result. Write the letter of the correct answer on the line at the left.

Situation

- _____ 13. Cells are in an isotonic solution.
- _____ 14. Cells are in a hypertonic solution.
- _____ 15. Cells are in a hypotonic solution.

Result

- The cells lose water.
- The cells gain water.
- The cells stay the same.

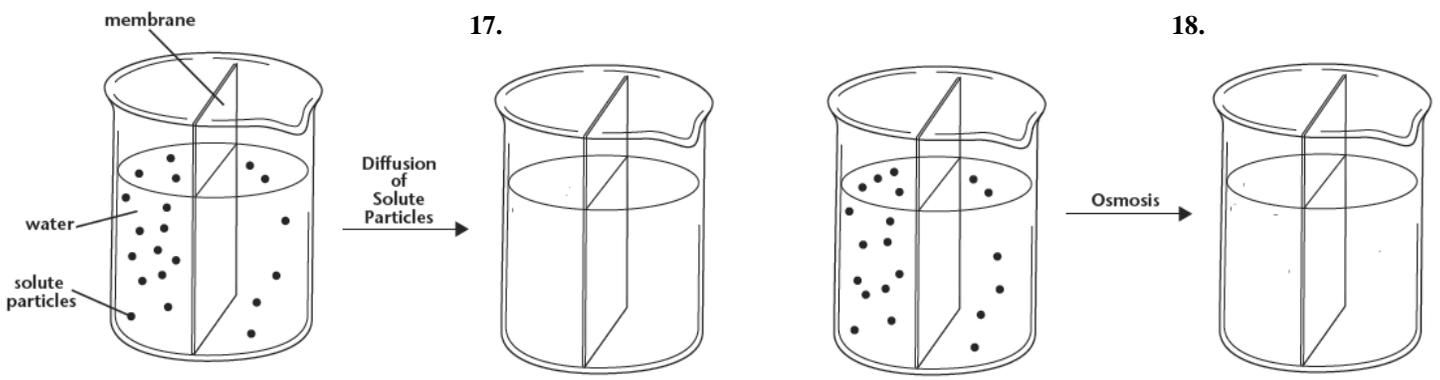
16. In the table below, draw how each type of cell will look after being placed in a hypertonic solution. **Draw** arrows of the water movement.

Appearance of Cells in a Hypertonic Solution	
Animal Cells	Plant Cells

Diffusion and Osmosis

Diffusion is the movement of particles from an area of high concentration to an area of low concentration. Osmosis is the diffusion of water through a selectively permeable membrane.

Look at the beakers on the left. In the beakers on the right, (questions 17 and 18) **draw** in any changes in water level using arrows and **draw** the solute particles on each side of the membrane that occur as a result of the described process.

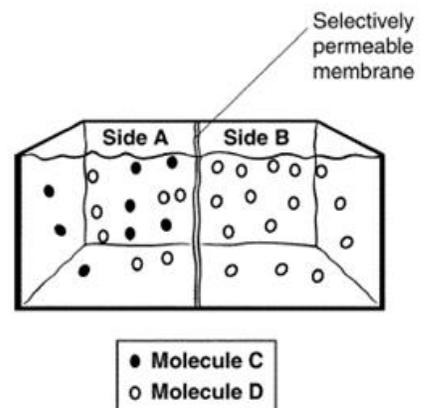


Use the diagrams to answer the question.

- 19. Look at the first beaker. What would happen if the membrane did not allow water or solute particles to pass through it? _____
- 20. Once equilibrium is reached, explain why water molecules continue to move across the membrane and in which direction would the molecules move? _____

Circle the best response to the following questions.

21. A student put together the experimental setup shown to the right. The selectively permeable membrane is permeable to both types of solute molecules shown. How would you expect the molecules to change over time in the diagram?



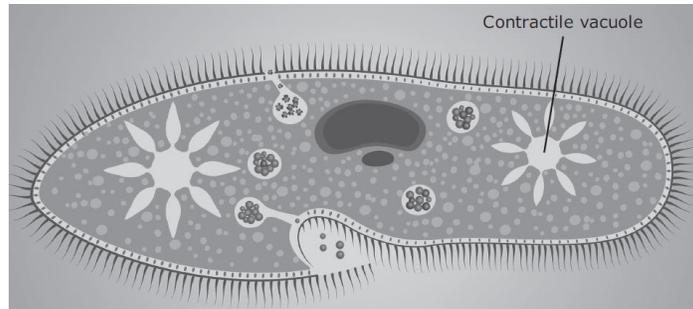
- a) There will be no change over time.
- b) All of molecule C will move to side B.
- c) All of molecule D will move to side B.
- d) Both types of molecules will move to reach equilibrium.

22. Most sports drinks are isotonic in relation to human body fluids. Explain why athletes should drink solutions that are isotonic to body fluids when they exercise rather than ones that are hypotonic to body fluids (contain a greater proportion of water in comparison to the fluids in and around human body cells).

23. A single-celled organism can be classified as a prokaryote based on the absence of –

- A. Cell membrane
- B. Chromosomes
- C. Ribosomes
- D. Nucleus

24. The picture shows a contractile vacuole of a unicellular freshwater organism. The contractile vacuole regulates the flow of water into and out of the cell in an aquatic environment.



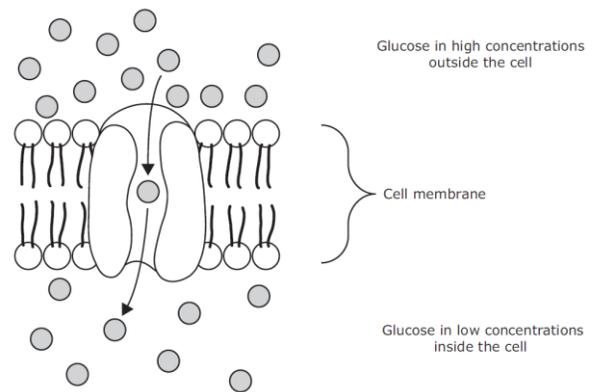
What conditions cause the contractile vacuole to fill with water?

- F The concentration of water is greater outside the cell than inside the cell.
- G The temperature of water in the vacuole is higher than the temperature of its environment.
- H The concentration of water inside the cell is the same as the concentration outside the cell.
- J The temperature of water in the vacuole is lower than the temperature of its environment.

25. This diagram shows cellular activity across a cell membrane.

Which two processes does this diagram most directly model?

- A. Energy conversions and synthesis of new molecules
- B. Synthesis of new molecules and homeostasis
- C. Transport of molecules and energy conversions
- D. Homeostasis and transport of molecules

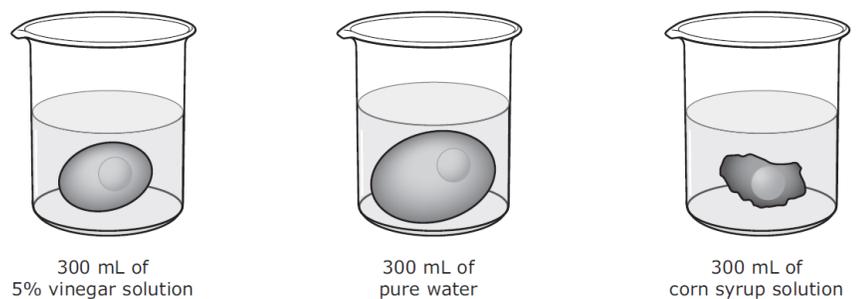


26. Some students used vinegar to dissolve away the shells of three eggs and used these eggs as models of human red blood cells. The students observed the changes in the eggs when they were placed in different solutions.

Which statement best describes the role of the cell membrane in this model?

- A The cell membrane is an impermeable barrier that prevents water from entering the cell.
- B The cell membrane allows solutes to enter the cell, which causes the cell to shrink.
- C The cell membrane allows water to enter and leave the cell.
- D The cell membrane removes solutes from the environment.

Red Blood Cell Model in Different Solutions



27. Some fungi secrete substances that are toxic to bacteria that compete with them for food. Scientists have used their knowledge of this ability of fungi in order to produce which of the following substances?

- F Yogurt
- G Fertilizers
- H Plastic
- J Antibiotics

28. Which of these best demonstrates mutualism between certain types of bacteria and humans?

- A Intestinal bacteria obtain nutrients from the gut and produce vitamin K used by humans.
- B Bacteria become resistant to antibacterial medication that humans use for treatment.
- C Invasive bacteria at an area of injury produce toxins that damage healthy tissues of the human body.
- D Bacteria in improperly prepared food is consumed by humans, causing food poisoning.

29. Carbohydrates are more easily metabolized than lipids. However, on a gram-for-gram basis lipids provide cells with more —

- F nitrogen
- G proteins
- H structure
- J energy

30. Using a light microscope, a student identified the following characteristics of four organisms found in a sample of pond water. Which organisms are prokaryotes?

Pond-Water Organisms

- A Organisms 1 and 2
- B Organisms 3 and 4
- C Organisms 1 and 4
- D Organisms 2 and 3

Organism 1	Single-celled, nucleus, large vacuole
Organism 2	Single-celled, no nucleus, cell wall
Organism 3	Single-celled, no nucleus
Organism 4	Single-celled, nucleus

31. Which of the following biomolecules typically contains both nitrogen and phosphate?

- F Lipid
- G Protein
- H Nucleic acid
- J Carbohydrate

32. Cells must maintain homeostasis to survive. One method cells use to ensure a stable internal environment is facilitated diffusion. Which of the following is NOT true of facilitated diffusion?

- A Facilitated diffusion is a type of passive transport.
- B Facilitated diffusion occurs down a concentration gradient.
- C Facilitated diffusion is slower than simple diffusion.
- D Facilitated diffusion does not require extra energy.

33. Organisms are classified as eukaryotes or prokaryotes based on their basic body structure. Which of the following is true of organisms and the type of genetic information they contain?

- F Both eukaryotes and prokaryotes contain DNA enclosed in membrane-bound nuclei.
- G Both eukaryotes and prokaryotes contain DNA, but prokaryotes only have a single, circular chromosome.
- H All eukaryotes and most prokaryotes contain DNA, but Archaeobacteria only contain RNA.
- J All eukaryotes contain DNA, and all prokaryotes contain only RNA.

34. Which of the following correctly identifies the biomolecules described in the chart, from 1 to 4?

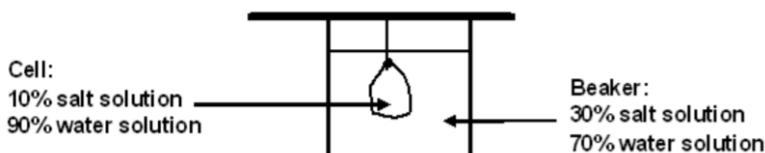
- A carbohydrates, lipids, proteins, and nucleic acids
- B carbohydrates, proteins, lipids, and nucleic acids
- C lipids, proteins, carbohydrates, and nucleic acids
- D nucleic acids, proteins, carbohydrates, and lipids

Type of Biomolecule	Major Function(s)
1	short-term energy storage; intermediate-term energy storage
2	form structures; regulation
3	form cell membranes; long-term energy storage
4	store information

35. A person with swollen gums rinses his mouth with warm salt water, and the swelling decreases. Which of the following has occurred?

- A The swollen gums have absorbed the saltwater solution.
- B The saltwater solution lowers the temperature of the water in the gums.
- C The salt in the solution has moved against the concentration gradient.
- D The water in the gums has moved out due to the high concentration of salt in the solution.

36. The drawing below shows a beaker containing a 30% salt solution and a suspended cell containing a 10% salt solution.

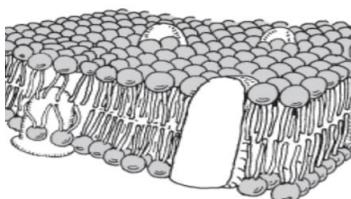


What statement best describes the cell after 20 minutes?

- A Water will move from the cell into the beaker, resulting in a smaller cell.
- B Water will move from the beaker into the cell, resulting in a larger cell.
- C Salt will move from the cell into the beaker, resulting in a smaller cell.
- D Salt will move from the beaker into the cell, resulting in a larger cell.

37. Look at the cell membrane model below. What is the name of the macromolecule that makes up the majority of the cell membrane?

- A nucleotide
- B lipid
- C carbohydrate
- D protein



38. In pure water, a red blood cell from an animal will swell and burst, but a leaf cell from a plant will not. Which structure in the leaf cell is responsible for this difference?

- A cell membrane
- B cell wall
- C mitochondrion
- D Nucleus