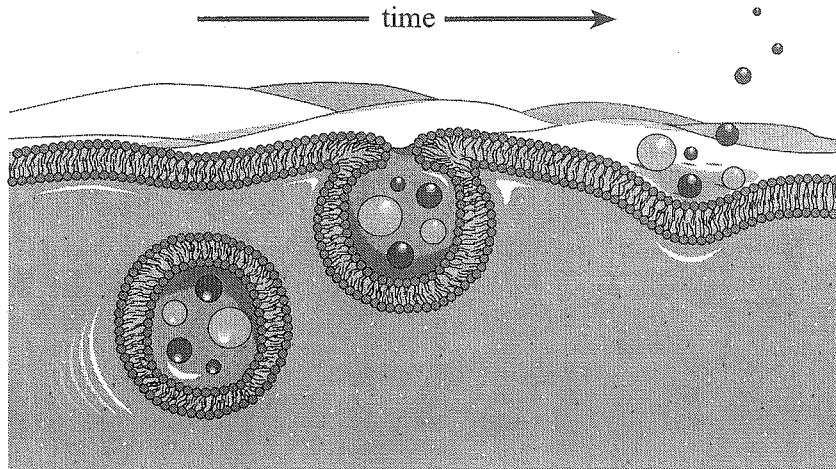


G. Transport Across Cell Membrane

Use the following diagram to answer question 1.



1. Which of the following situations is an example of the process shown above?

- A. the absorption of glucose by the cell
- B. red blood cells moving in the bloodstream
- C. the excretion of hydrogen ions in the kidney
- D. the secretion of neurotransmitters at the synapse

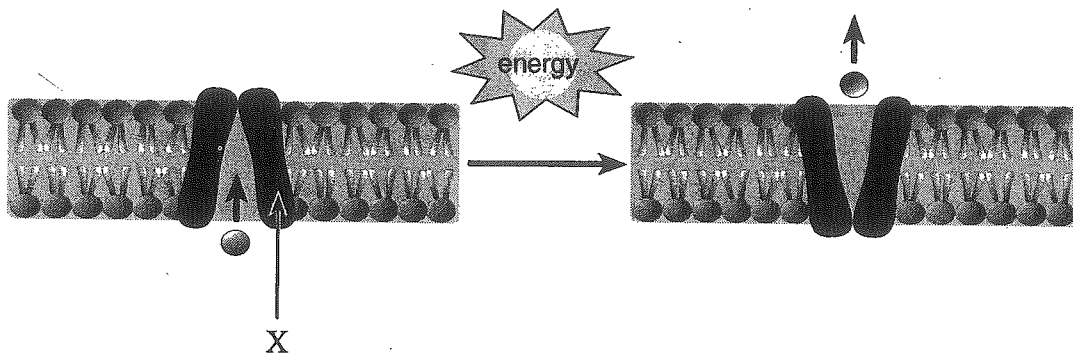
2. Worn-out red blood cells are removed from the blood by the process of

- A. osmosis.
- B. exocytosis.
- C. endocytosis.
- D. simple diffusion.

3. The fluid-mosaic membrane model describes the membrane as having a

- A. sheet of protein.
- B. phospholipid bilayer.
- C. sugar-phosphate backbone.
- D. complementary base template.

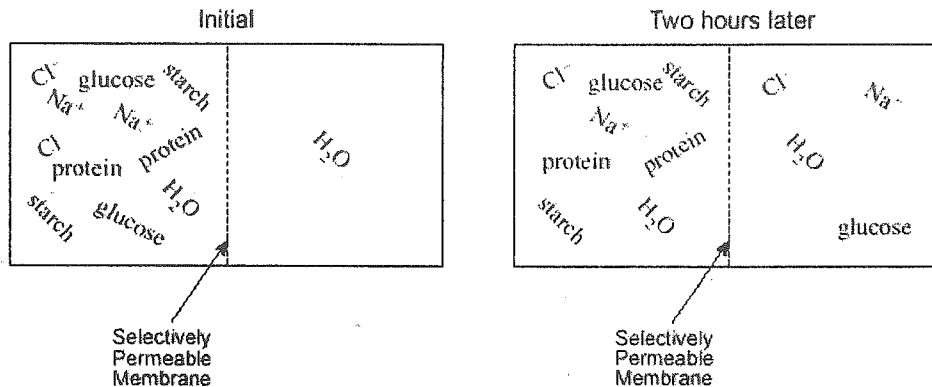
Use the following diagrams to answer question 4.



4. What is a function of the structure labelled X in the process shown above?
- A. to engulf bacteria by phagocytosis
 - B. to transport lipid-soluble molecules
 - C. to pump sodium ions out of neurons
 - D. to increase the rate of diffusion of carbon dioxide
5. Facilitated transport may be described as the movement of particles from an area of
- A. low to high concentration using protein carriers.
 - B. low to high concentration without using protein carriers.
 - C. high to low concentration using protein carriers.
 - D. high to low concentration without using protein carriers.
6. As a cell increases in size, the
- A. metabolic rate increases.
 - B. surface area to volume ratio increases.
 - C. volume increases and the surface area increases.
 - D. surface area increases and the volume decreases.
7. If a 0.9% salt solution is isotonic to a certain type of animal cell, the cell will lose mass if it is placed in
- A. distilled (pure) water.
 - B. 0.5% salt solution.
 - C. 0.9% salt solution.
 - D. 1.2% salt solution.

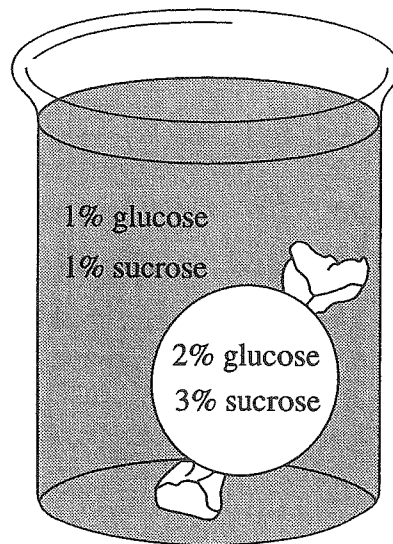
- 8 Molecules in the cell membrane that function as receptors are
- proteins.
 - glycerol.
 - cholesterol.
 - phospholipids.

Use the following diagrams to answer question 9



9. The diagrams illustrate that the membrane selects according to the
- size of the molecules.
 - temperature of the solution.
 - concentration of the molecules.
 - electronic charge of the molecules.

Use the following diagram to answer question 10

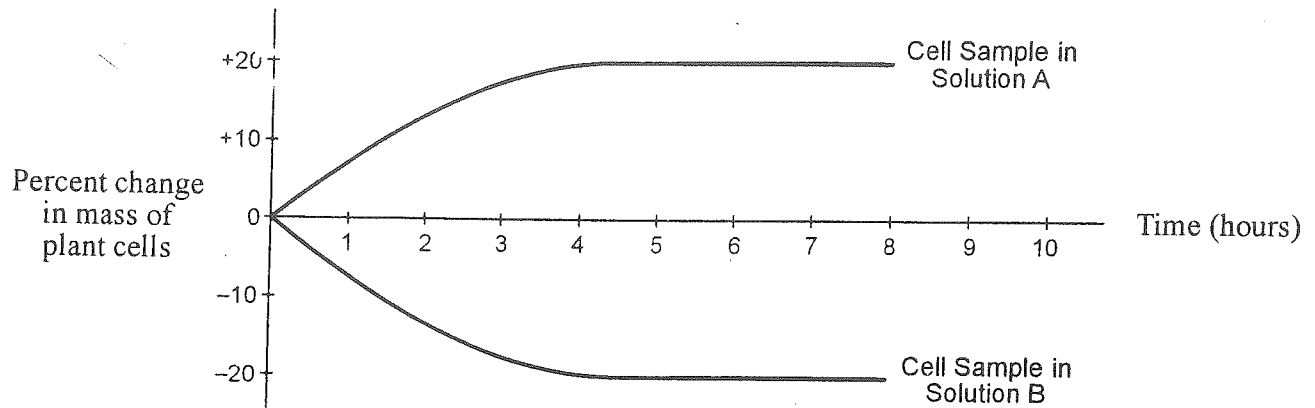


10. A 2% glucose and 3% sucrose solution was added to a bag made from a membrane that is permeable only to water and glucose. The bag was then placed in a beaker of water containing a 1% glucose and 1% sucrose solution.

Which of the following would describe the sugar concentrations inside the bag after one hour?

- Both the glucose and sucrose concentrations would increase.
- Both the glucose and sucrose concentrations would decrease.
- The sucrose concentration would increase and the glucose concentration would decrease.
- The sucrose concentration would decrease and the glucose concentration would increase.

11. Two identical plant cell samples of equal mass were taken from the same plant and were prepared for an experiment. Each sample was placed in a different solution. The percent change in mass was recorded and graphed over an eight hour period as shown below.



Given the results, which of the following statements is accurate?

- A. Solution A was hypotonic to the plant cells.
 - B. Both solutions were isotonic to the plant cells.
 - C. Both solutions were hypertonic to the plant cells.
 - D. Solution A was hypertonic and solution B was hypotonic to the plant cells.
12. List **four** factors that would affect the rate of diffusion of molecules crossing a cell membrane. (4 marks)

i) _____

ii) _____

iii) _____

iv) _____

13. When put in a hypotonic environment, an animal cell will
- A. swell.
 - B. shrink.
 - C. secrete enzymes.
 - D. remain unchanged.

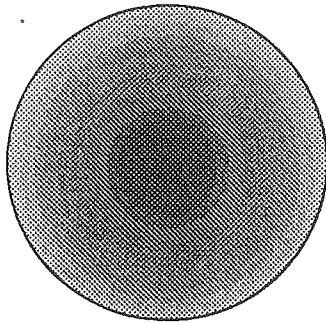
14 Which of the following molecules will pass through a cell membrane by simple diffusion?

- A. water
- B. an enzyme
- C. nucleic acid
- D. carbohydrate

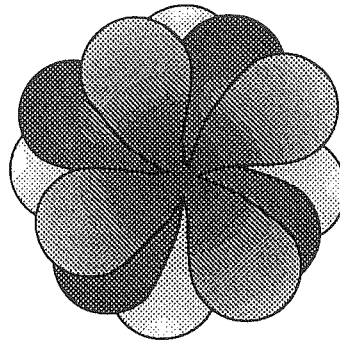
15 Red blood cells are placed in a highly concentrated salt solution. Which of the following describes their environment and what would happen to the cells?

	ENVIRONMENT INSIDE OF CELLS RELATIVE TO ENVIRONMENT OUTSIDE OF CELLS	ENVIRONMENT OUTSIDE OF CELLS RELATIVE TO ENVIRONMENT INSIDE OF CELLS	WHAT HAPPENS TO THE CELLS
A.	hypertonic	hypotonic	swell
B.	hypertonic	hypotonic	shrink
C.	hypotonic	hypertonic	swell
D.	hypotonic	hypertonic	shrink

Use the following diagram to answer question 16.



Cell X

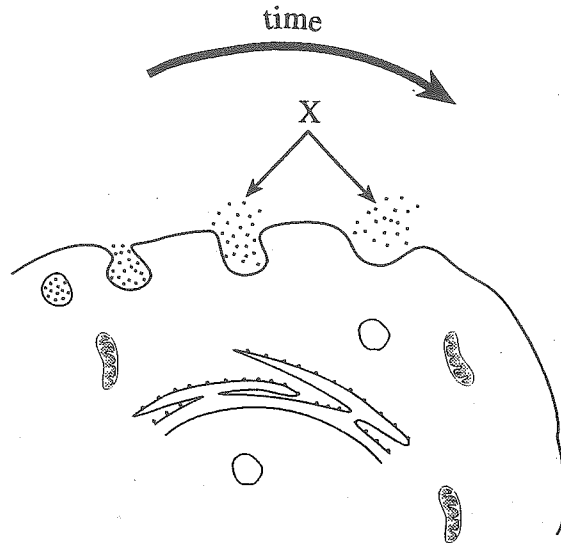


Cell Y

16. Simple diffusion of molecules would occur most rapidly in which of the cells above?

- A. Cell X, because it has a smaller volume.
- B. Cell X, because it synthesizes proteins at a faster rate.
- C. Cell Y, because it can move around more quickly.
- D. Cell Y, because it has a larger surface area.

Use the following diagram to answer questions 17 and 18



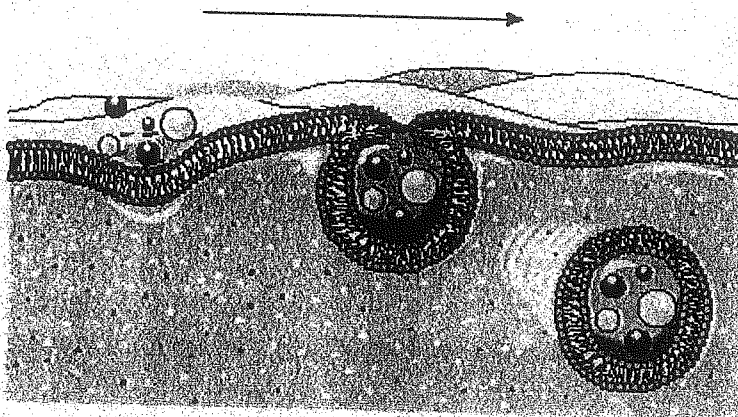
17. The process shown is an example of

- A. exocytosis.
- B. pinocytosis.
- C. endocytosis.
- D. phagocytosis.

18. The material labelled X could be

- A. water.
- B. insulin.
- C. amino acids.
- D. sodium ions.

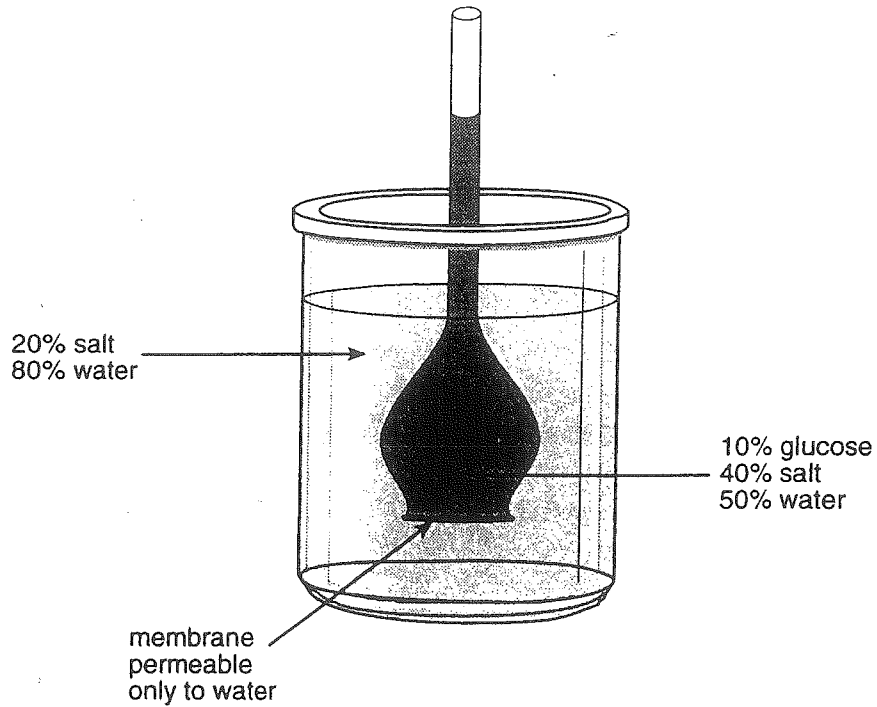
Use the following diagram to answer question 19



19. Which of the following processes is represented above?

- A. Osmosis.
- B. Diffusion.
- C. Hydrolysis.
- D. Endocytosis.

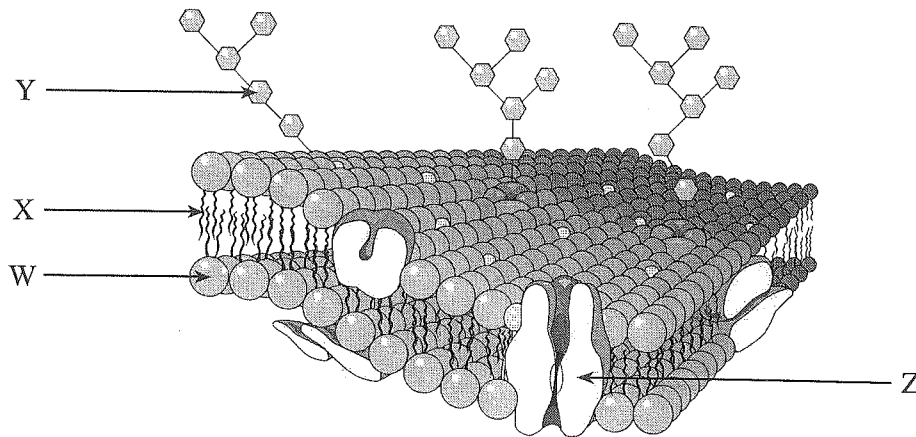
Use the following diagram to answer question 20



20 The diagram above shows a thistle tube suspended in a solution. The initial concentrations of the solutions inside and outside the thistle tube are indicated. What will happen to the concentration of the salt solution surrounding the thistle tube?

- A. It will decrease as salt moves into the thistle tube.
- B. It will increase as salt moves out of the thistle tube.
- C. It will increase as water moves into the thistle tube.
- D. It will decrease as water and glucose move out of the thistle tube.

Use the following diagram to answer question 21



21 Which of the following represents the part of a cell membrane that requires the breakdown of ATP for the transport of sodium ions?

- A. W
- B. X
- C. Y
- D. Z

22 State how each of the following transport mechanisms functions to move materials into a cell.
(4 marks: 1 mark each)

Diffusion:

Osmosis:

Facilitated transport:

Active transport:

23 How many of the following factors would affect the permeability of the cell membrane?

- Size of molecules.
- Lipid solubility of molecules.
- Presence of transport channels.
- Presence of ATP inside the cell.

- A. One.
- B. Two.
- C. Three.
- D. Four.

24. Identify and describe the process by which each of the following substances moves into a cell.
(4 marks: 1 mark each for process; 1 mark each for description)

oxygen:

Name of process: _____

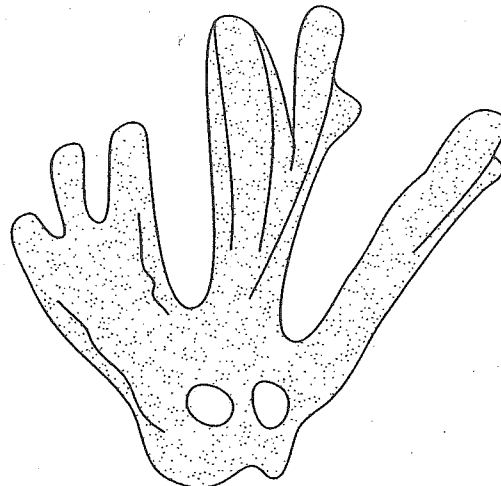
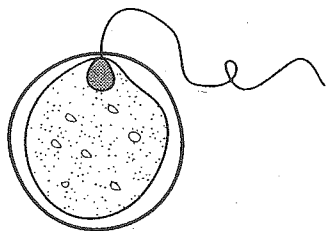
Description: _____

macromolecule:

Name of process: _____

Description: _____

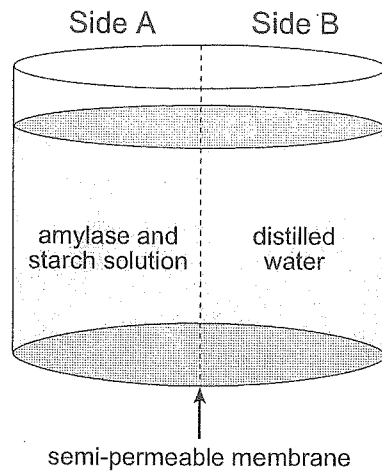
Use the following diagrams to answer question 25.



25. Spherical protozoans (single-celled organisms), such as A, are generally much smaller than irregularly-shaped protozoans, such as B, because

- A. irregular protozoans do not divide as often.
- B. spherical protozoans use greater amounts of energy.
- C. irregular protozoans have a greater surface area to volume ratio.
- D. spherical protozoans are able to obtain more food using phagocytosis.

Use the following diagram to answer question 26.



26. Side A contains a solution of amylase and starch. Side B, which only contains distilled water, is separated from side A by a semi-permeable membrane. The contents of the beaker are kept at 37°C.

a) What characteristic does the semi-permeable membrane share with a living membrane? (1 mark)

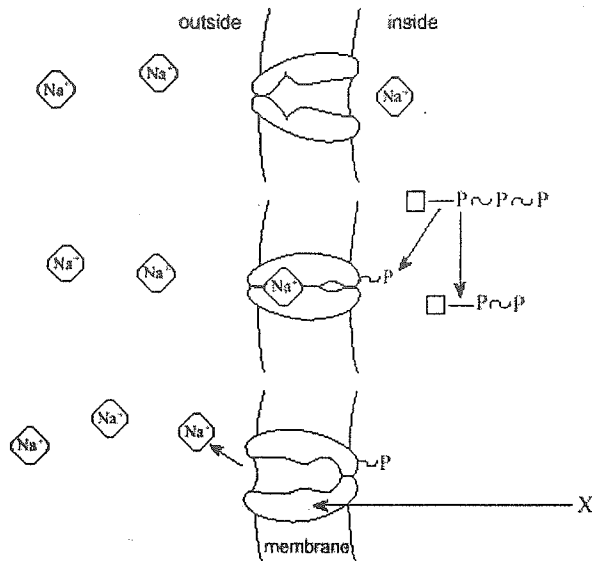
b) After 20 minutes, the liquid on side B was tested and a disaccharide was found. Identify this disaccharide and account for its presence on side B. (3 marks: 1 mark for name; 2 marks for explanation)

Name: _____

Explanation: _____

27. A biologist determined the surface area and volume of four cells: two flat cells with the same thickness and two spherical cells. Which of the four cells would have the greatest surface area to volume ratio?

- A. The small, flat cell with a volume of 5 microlitres.
- B. The small, spherical cell with a volume of 5 microlitres.
- C. The large, flat cell with a volume of 10 microlitres.
- D. The large, spherical cell with a volume of 10 microlitres.



28 a) Identify the process shown in the diagram above. (1 mark)

b) Give one example in which this process is used in the body. (1 mark)

c) Describe the function of the molecule represented by $\square - P \sim P \sim P$ (1 mark)

d) What is the function of molecule X? (1 mark)

29. Describe the following mechanisms of transport across cell membranes.

(3 marks: 1 mark each)

osmosis:

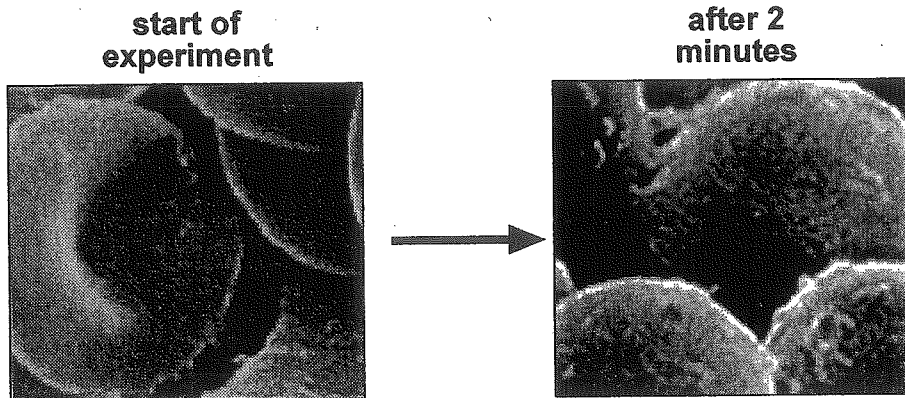
facilitated transport:

active transport:

30. Facilitated and active transport both

- A. require ATP.
- B. require protein carrier molecules.
- C. operate in the sodium-potassium pump.
- D. move molecules against the concentration gradient.

Use the following micrographs to answer question 31.



31. Red blood cells were placed in an unknown solution. Micrographs were taken at the start of the experiment and after two minutes. The movement of which component of the solution caused the observed change?

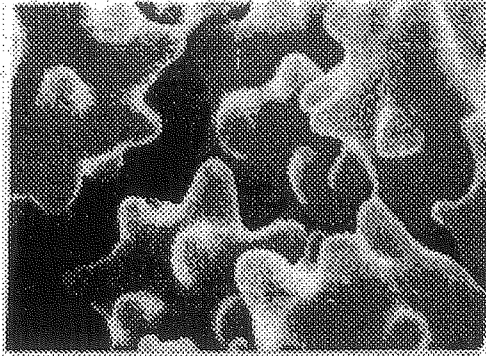
- A. salt
- B. water
- C. protein
- D. glucose

32. Materials move across the cell membrane either actively or passively. Complete the following table to compare and contrast these two ways of moving materials.

(4 marks)

ACTIVE TRANSPORT	PASSIVE TRANSPORT

Use the following diagram of red blood cells in solution to answer part 33. & 34.



33. A sample of cells from **Solution B** (at five hours) was examined under the microscope. Explain why they appear as in the diagram above. (2 marks)

34. Give **one** reason for the results obtained from the cells placed in **Solution B** between three and eight hours. (1 mark)

35. a) Explain why a cell membrane is described as *selectively permeable*. (1 mark)

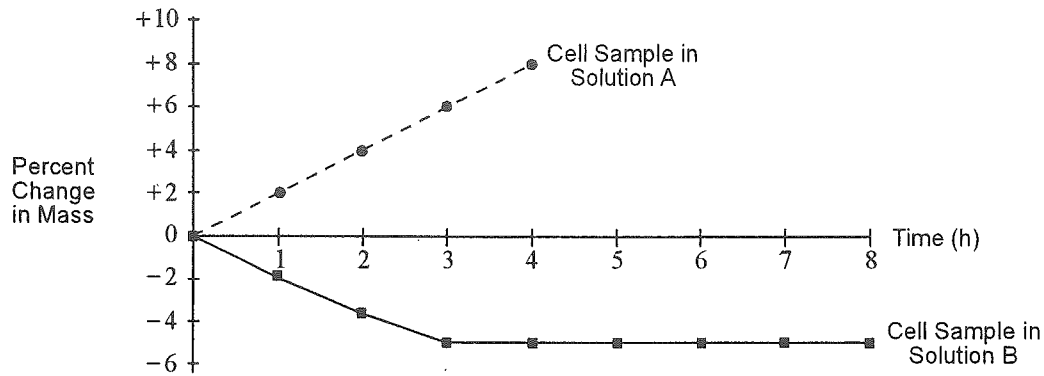
b) Describe how the structure of the cell membrane permits molecules to enter the cell by the following processes. (3 marks: 1 mark each)

i) Osmosis:

ii) Facilitated Transport:

iii) Pinocytosis:

36. Two identical red blood cell samples were prepared for an experiment. The samples were placed in two different solutions and the percent change in mass was recorded and graphed over an eight hour period as shown below.



a) Account for the change in mass of the cells in **Solution A** during the first four hours. (2 marks)

b) What happened to the cells in **Solution A** after four hours? (1 mark)

37. Which of the following cells is the most efficient in terms of diffusion of wastes out of the cell?

CELL	SURFACE AREA (μ^2)	VOLUME (μ^3)
A.	2	3
B.	4	5
C.	6	5
D.	5	5

38. An experiment was devised in which blood cells were placed in three beakers containing solutions of different concentrations. The results are given below.

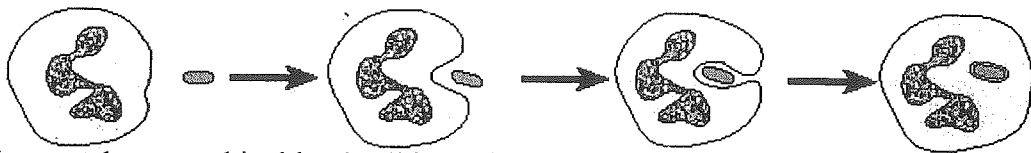
BEAKER	% SOLUTE IN RED BLOOD CELLS	% SOLUTE IN THE SOLUTION
A	2	2
B	2	1
C	2	3

- a) Describe what happened to the cells in beaker B and explain the results. (2 marks)

- b) Describe what happened to the cells in beaker C and explain the results. (2 marks)

- c) Explain why the solution in beaker A is isotonic to the red blood cells. (1 mark)

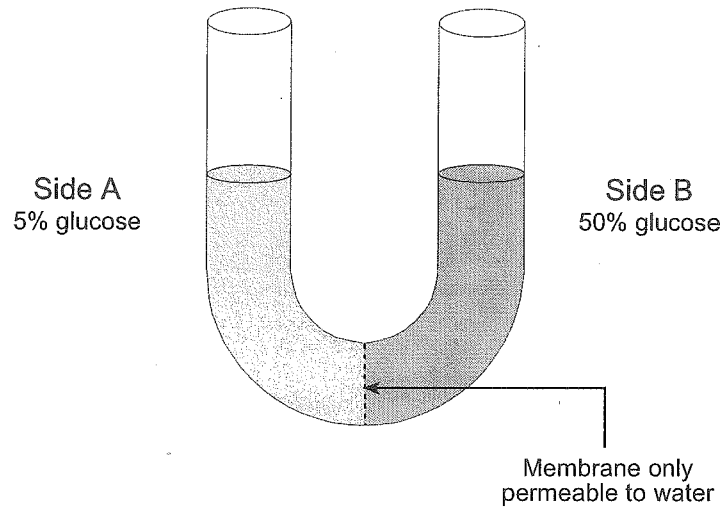
Use the following diagram to answer question 39.



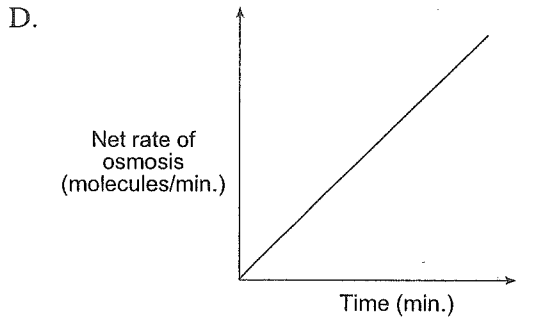
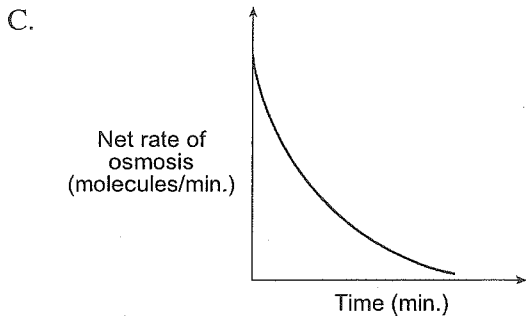
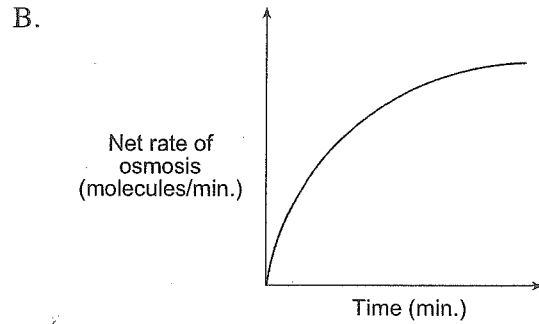
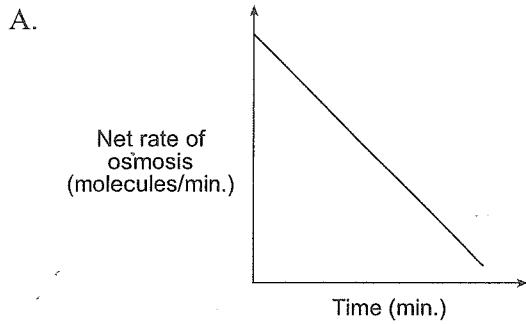
39. The diagram shows a white blood cell ingesting a bacterium. The bacterium enters the white blood cell by

- A. diffusion.
- B. pinocytosis.
- C. phagocytosis.
- D. active transport.

Use the following diagram to answer question 40



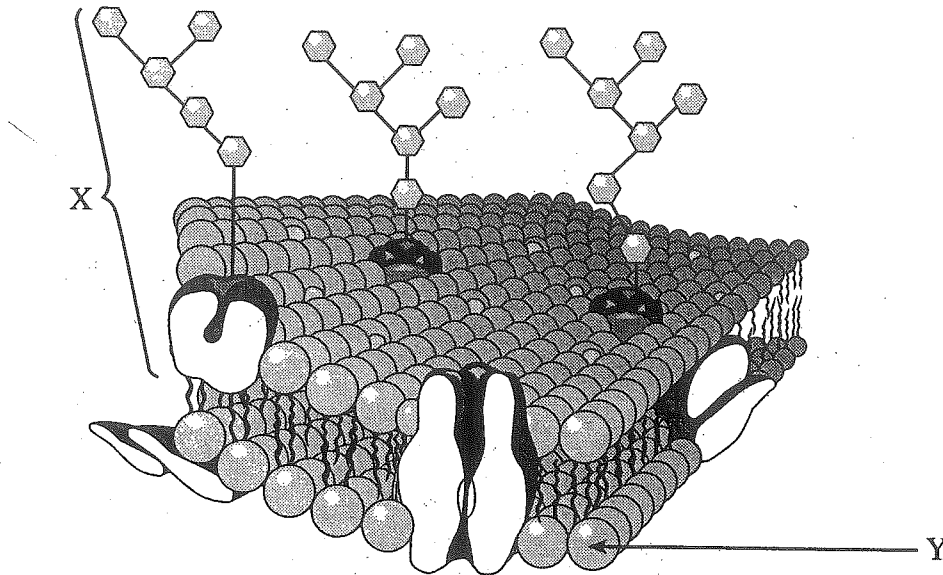
40. The diagram above represents the initial conditions of an experiment. Which of the following graphs most accurately represents the change in the net rate of osmosis over time?



41. When Na^+ (sodium ions) are moved across the cell membrane against the concentration gradient,

- A. ATP is used.
- B. osmosis occurs.
- C. diffusion occurs.
- D. vesicles are formed.

Use the following diagram to answer questions 42 and 43



42. What is the function of the structure labelled X?

- A. move cells
- B. trap nutrient molecules
- C. enable cellular recognition
- D. increase the rate of diffusion

43. The molecule labelled Y contains

- A. protein.
- B. steroids.
- C. glycerol.
- D. amino acids.

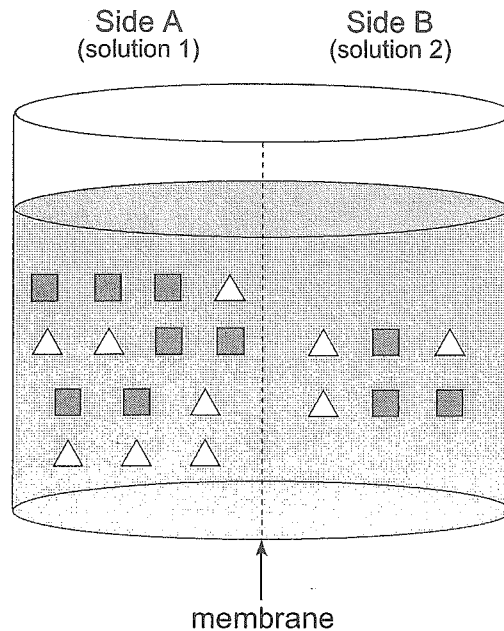
44. The cell membrane is selectively permeable because

- A. all particles can pass through it.
- B. particles can quickly pass through it.
- C. only certain particles can pass through it.
- D. only nutrient molecules can pass through it.

45. The movement of an oxygen molecule throughout a cell occurs by

- A. osmosis.
- B. diffusion.
- C. pinocytosis.
- D. facilitated transport.

Use the following diagram to answer questions 46 and 47



46. The diagram shows two solutions containing solutes \blacksquare and \triangle dissolved in water and separated by a membrane. If the membrane is only permeable to water, which of the following will occur?

- A. \triangle will move from side A to side B.
- B. The concentration of \blacksquare on side A will increase.
- C. The concentration of \blacksquare on side B will increase.
- D. Final amounts of \blacksquare , \triangle and water will be equal on each side.

47. If the membrane is permeable to \blacksquare but **not** to \triangle or water, side A will

- A. swell and possibly burst.
- B. become isotonic to side B.
- C. remain hypertonic to side B.
- D. become hypotonic to side B.

48. What happens when a cell is placed in a hypotonic solution?

- A. The cell swells.
- B. The cell shrinks.
- C. The cell metabolizes faster.
- D. There is no effect on the cell's volume.

49 An experiment was conducted to determine the concentration of molecules in the cytoplasm of potato cells. The following steps were taken:

1. Five different sugar solutions were added to five numbered test tubes as shown in the data table below.
2. Five potato discs (cut from the same potato) were weighed and one disc was added to each test tube.
3. After 24 hours, the potato discs were removed, blotted dry, and weighed again.

TEST TUBE	CONCENTRATION OF SUGAR SOLUTION (%)	INITIAL POTATO MASS (grams)	FINAL POTATO MASS (grams)	CHANGE IN MASS (%)
1	30.0	5.0	4.0	-20
2	20.0	4.8	4.3	-10
3	10.0	5.2	5.5	+6
4	5.0	4.7	5.4	+15
5	0.0 (distilled water only)	5.1	6.1	+20

- a) Name and describe the process that allowed the potato cells to gain and lose mass when placed in the sugar solutions. (2 marks: 1 mark for name; 1 mark for description)

Name of Process: _____

Description of Process: _____

- b) Explain the change in mass of the potato disc in test tube 1. (2 marks)

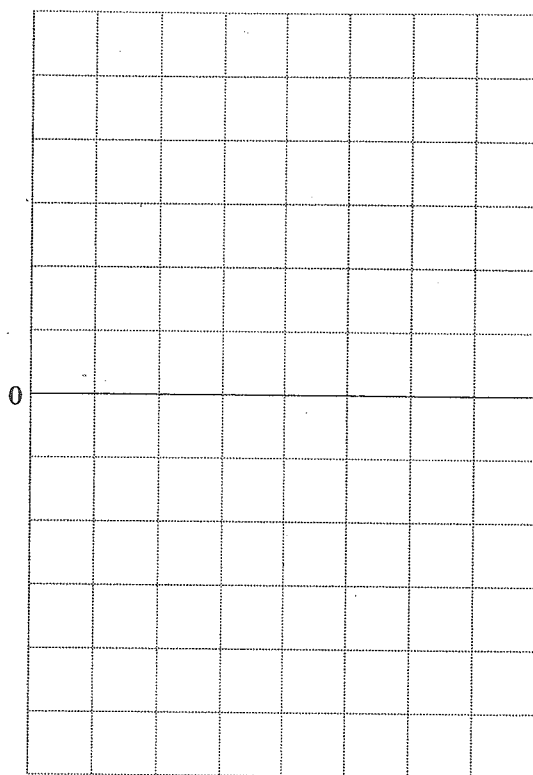
50. In an experiment, 10 cubes of potato each weighing 10 grams and cut from the same potato were placed in 10 different numbered beakers. Each beaker contained a different concentration of sucrose solution as shown in the table below. After 24 hours, the potato cubes were removed, blotted dry and their weights entered into the data table.

Beaker	Concentration of Sucrose (%)	Weight of Potato Cube After 24 Hours (grams)	Percent Change in Mass (%)
1	0.0	13.4	34
2	0.5	12.5	25
3	1.0	11.2	12
4	1.5	10.3	3
5	2.0	9.2	-8
6	2.5	8.5	-15
7	3.0	8.0	-20
8	3.5	7.7	-23
9	4.0	7.5	-25
10	4.5	7.4	-26

a) Why were all the pieces cut from the same potato?

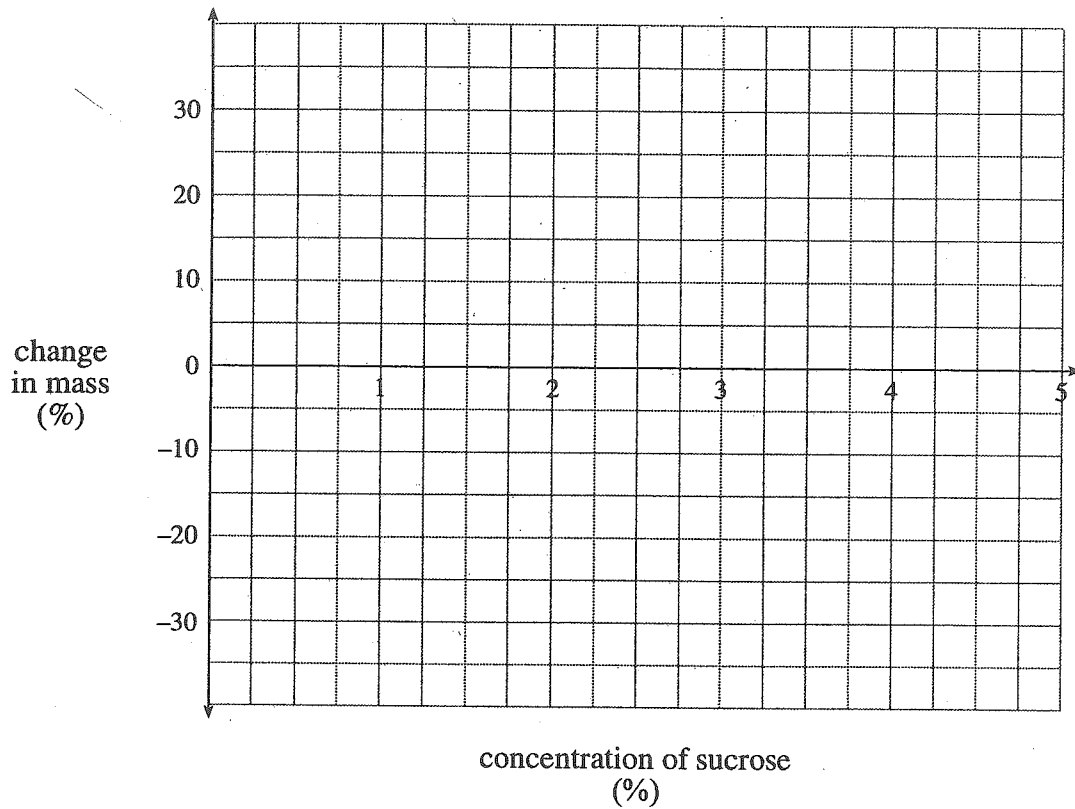
(1 mark)

- c) Draw a graph that compares the concentration of sugar solution (%) to the change in mass (%) of the potato discs. Label the x -axis as the concentration of sugar solution (%). (2 marks)



- d) Use your graph to determine the concentration of sugar solution (%) that would be isotonic to the cytoplasm of the potato cells. (1 mark)

- b) Graph the data that compares the concentration of sucrose to the percent change in mass.
(2 marks: 1 mark for plotting points; 1 mark for drawing line)



- c) Use your graph to estimate at what point the concentration of sucrose in the potato is equal to the sucrose concentration in the beaker. (1 mark)

- d) Explain why some of the potato cubes gained mass. (2 marks)
