

Diffusion and Osmosis Problems

Directions: Investigate the cell diagrams. In each diagram a “cell” with a permeable membrane has been placed in a beaker containing substances dissolved in water. Draw a blue arrow to show the movement of water. Draw a black arrow to show movement of any other materials. Answer each question based on the diagram provided.

- The membrane is permeable to: glucose, K^+ , Na^+ , water, iodine, and the imaginary substances X and Z.
- The membrane is impermeable to: starch and imaginary substance Y.
- When iodine and starch mix, a bluish/black color will be seen.

Helpful Hint: The problems have been broken down into parts for your benefit. Look at one substance at a time!

⇒ Where is the substance more concentrated?

⇒ What direction will the substance move?

⇒ What direction does the water move?

(Diffusion says it will go from an area of _____ concentration to _____ concentration)

⇒ Is the membrane permeable to the substance?

Problem 1:

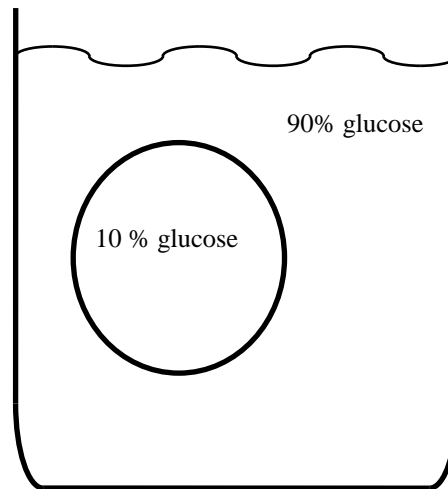
1) Is the membrane permeable to glucose?

2) Will glucose diffuse? _____
If so, in what direction?

3) What is the % water inside the cell? _____

What is the % water outside the cell? _____

4) Will osmosis occur? _____
If so, in what direction?



5) The movement of WATER will cause changes in cell shape and size.

Will this cell shrink or swell? _____ Why?

6) Is the solution in the beaker hypotonic, hypertonic, or isotonic?

Problem 2:

1) Will glucose diffuse? _____
If so, in what direction?

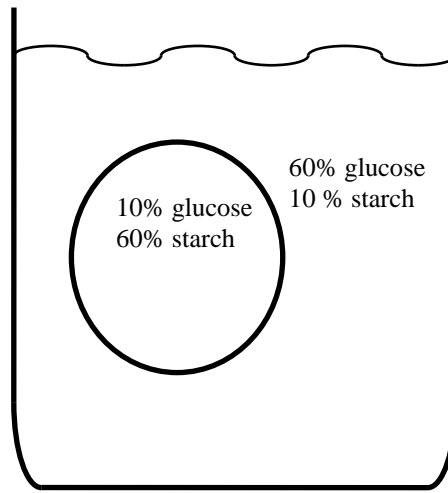
2) Will starch diffuse? _____
If so, in what direction?

3) What is the % water inside the cell? _____

What is the % water outside the cell? _____

4) Will osmosis occur? _____
If so, in what direction?

5) Is the solution in the beaker hypotonic, hypertonic, or isotonic?



Problem 3:

1) What is the % water inside the cell? _____

2) Will potassium (K+) diffuse? _____
If so, in what direction?

3) Will sodium (Na+) diffuse? _____
If so, in what direction?

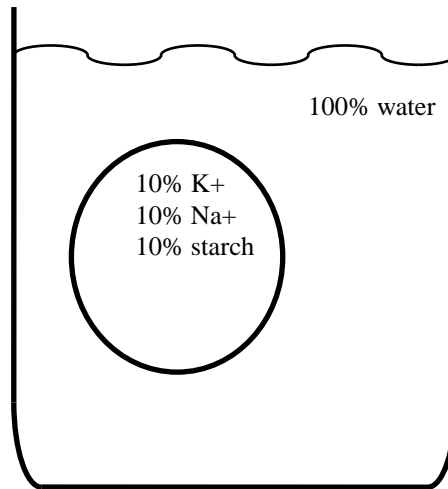
4) Will starch diffuse? _____
If so, in what direction?

5) Will osmosis occur? _____
If so, in what direction?

6) Will the cell swell or shrink? _____

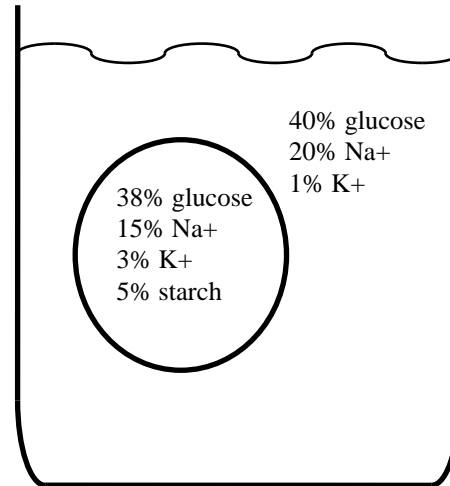
Why?

7) Is the solution in the beaker hypotonic, hypertonic, or isotonic?



Problem 4:

- 1) Will osmosis occur? If so, in what direction?
- 2) Will any other substances diffuse across the membrane?
Which ones?
- 3) What direction will each substance diffuse?

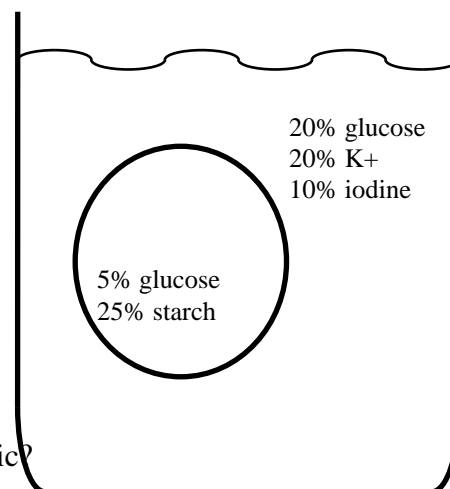


- 4) Will the cell swell or shrink? _____
- 5) Is the solution in the beaker hypotonic, hypertonic, or isotonic?

6) Iodine is a yellowish solution. A starch solution is white. A starch solution turns purplish-black in the presence of iodine. If you wait a few hours, then add iodine to the beaker, what color would the beaker solution be? Explain your answer.

Problem 5:

- 1) Will osmosis occur? If so, in what direction?
- 2) Will any other substances diffuse across the membrane?
Which ones?
- 3) What direction will each substance diffuse?



- 4) Is the solution in the beaker hypotonic, hypertonic, or isotonic?
- 5) What will be the initial color of the solution (immediately after the “cell” is put in the beaker)
in the cell? _____ in the beaker? _____
- 6) What will be the final color of the solution (after the “cell” sits in the solution for several minutes)
in the cell? _____ in the beaker? _____

Problem 6:

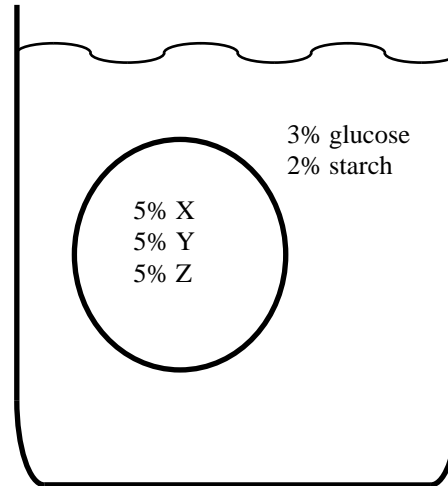
1) What substance(s) shows net movement into the “cell”?

2) What substance(s) show net movement into the beaker?

3) Does osmosis occur? If so, in what direction?

4) If you were told that one of the molecules X, Y, or Z was the polysaccharide, glycogen, which would you guess to be the glycogen? Why?

Hint start with the definition of a polysaccharide (HINT: Look at your *Chemistry of Life* notes)



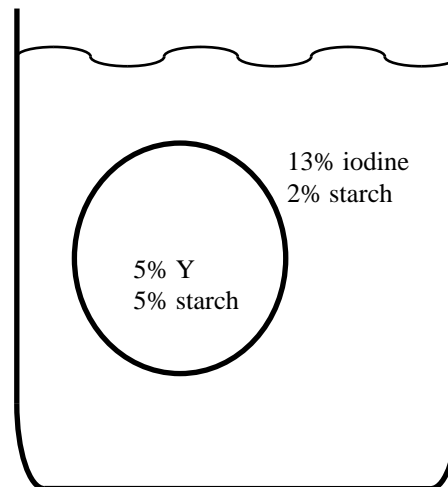
Problem 7:

1) What substance(s) shows net movement into the “cell”?

2) What substance(s) show net movement into the beaker?

3) Does osmosis occur? If so, in what direction?

4) At the end of your experiment, what color would the “cell” liquid be? Explain your answer.



BONUS: Are these problems examples of active or passive transport? Explain your answer.