

Section 2.4: Transport across Membranes

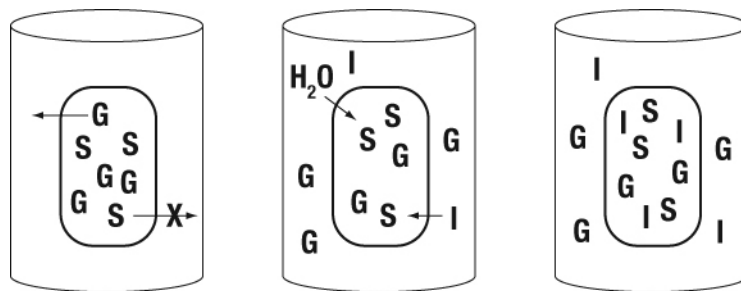
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A. No, the glucose was in the tubing initially. After 30 min the water in the beaker tested positive for the presence of glucose.

B. Yes, the solution in the tubing changed colour. It turned blue/black. The water in the beaker remained yellow/orange and may appear slightly lighter in intensity. This proves the Lugol's solution diffused into the tubing and reacted with the starch. It also proves that the starch could not diffuse out—otherwise the solution in the beaker would also have turned blue/black.

C. Yes, there was a small increase in mass. The tubing may have looked a little more swollen than it did at the beginning. This suggests that water entered into the tubing by osmosis.

D.



Glucose (G) diffuses out of the tube; starch (S) cannot and remains in the tube

Water enters the tube through osmosis. Iodine (I) enters the tube through diffusion.

Starch could not diffuse out of the tubing, but glucose did. Iodine diffused into the tubing and water entered the tubing by osmosis. These results suggest that substances diffuse from an area of high concentration to an area of low concentration, but the starch molecules were probably too large to pass through the tiny pores in the dialysis tubing so they were unable to diffuse.

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1. (a) A concentration gradient is the gradual difference in concentration of a dissolved substance in a solution between regions.

(b) No, “concentration gradient” is not being used correctly as water is usually the solvent, not the solute, and we do not refer to the concentration of the solvent.

2. Facilitated diffusion is specific in that specific transport proteins will carry certain polar or charged molecules but not others.

3. The cytosol of the cell was hypertonic to the solution in the beaker, which in turn was hypotonic to the cell. When the cell was placed in the beaker, water entered the cell by osmosis until the cell burst.

4. Distilled water is hypotonic to body cells as it has a lower concentration of solutes than the cells do.

5. Passive transport requires no energy; active transport requires energy. Primary active transport expends energy directly through ATP hydrolysis. Secondary active transport relies on pre-established ion gradients for energy rather than direct hydrolysis of ATP.

6. (a) The ability of a substance to diffuse across a membrane is hindered by larger size, polarity, and charge.

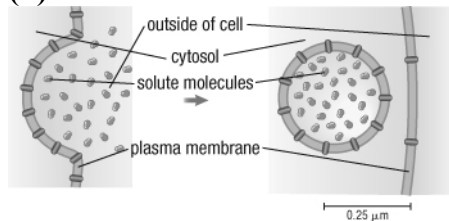
(b) Large polar substances as well as ions require help moving across a membrane due to the hydrophobic core of the membrane itself. Small and non-polar molecules can move across the membrane via simple diffusion.

7. (a) The concentration of the solute controls the direction of passive transport. The solute will diffuse across a membrane from the region of high concentration to the region of low concentration.

(b) Primary active transport is not dependent on solute concentration and actively works against the solute's concentration gradient. Secondary active transport utilizes an ion concentration gradient, created by primary active transport processes, to move another solute against its own concentration gradient.

8. (a) The process shown in the micrograph is endocytosis.

(b)



9. (a) Red blood cells carry oxygen throughout the body, so the oxygen needs to get into and out of the blood cells.

(b) Cells in the gut absorb nutrients to fuel the body, so these solutes and molecules need to move in and out of cells.

(c) Hormones are released from cells in glands. Without transport across membranes, the hormones would not be released to help regulate the body.

10. A person with a K^+ transport malfunction could have long QT syndrome, which affects the heartbeat. A person with a Na^+ transport disorder could have Liddle's syndrome, in which kidney malfunction leads to increased sodium absorption and high blood pressure.