

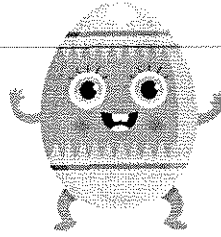
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## Chapter 8: Cells In Their Environment



CLASS DEMO:  
DIFFUSION OF AIR FRESHENER /  
FOOD COLORING IN LARGE  
FLASK; INTRODUCE SEL.  
PERM. MEMBRANE?  
PHOSPHOLIPID.

### Section 1: Cell Membrane

Read pages 175-176 and answer the questions that follow.

Homeostasis p. 175

1. The **cell membrane** PROTECTS the cell and helps MOVE substances and messages IN and OUT of the cell.

2. **Homeostasis** is THE MAINTENANCE OF STABLE INTERNAL CONDITIONS IN A CHANGING ENVIRONMENT.

3. One way that cells maintain homeostasis is by controlling the MOVEMENT of substances across the CELL MEMBRANE.

4. The cell membrane is made up of a "sea" of LIPIDS in which PROTEINS float.

Lipid Bilayer p. 176

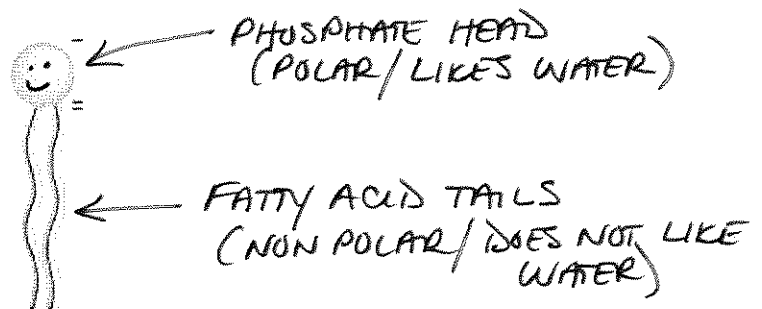
1. The cell membrane is made of a "sea" of PHOSPHOLIPIDS.

2. A **phospholipid** is a specialized lipid made of a PHOSPHATE "head" and two FATTY ACID "tails".

3. The phosphate head is POLAR and is ATTRACTED to water.

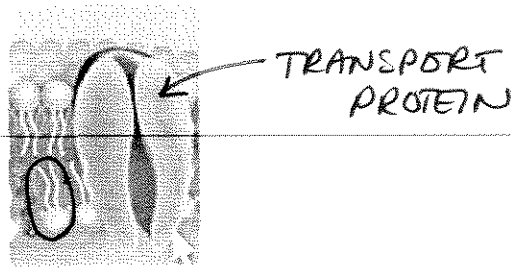
4. The fatty acid tails are NON POLAR and REPEL water.

5. In the figure of the lipid below. Label the phosphate "head" and the fatty acid "tails". Also label which end is polar and which end is non-polar.



6. Because there is water inside and outside of the cell, the phospholipids form a double layer called a LIPID BILAYER.

7. In the figure of the cell membrane below, circle one phospholipid and label the transport protein.



Membrane Proteins p. 176-177

1. Use the descriptions below to identify the type of membrane protein.

CELL SURFACE MARKERS - Proteins that act as a marker to identify the type of cell

RECEPTOR PROTEINS - Proteins that enable the cell to sense its surroundings

ENZYMES - Proteins that help with biochemical reactions inside of the cell

\* TRANSPORT PROTEINS - Proteins that aid in the movement of substances in and out of the cell  
↳ ONLY THIS ONE IS COVERED IN THIS CHAPTER.

## Section 2: Cell Transport

### *Air Freshener & Food Coloring Demonstration*

Read pages 178-183 and answer the questions that follow.

Passive Transport p. 178-179

1. In a solution, randomly moving molecules tend to fill up a space. When the space is filled evenly, a state called EQUILIBRIUM is reached.
2. Concentration is the amount of a substance in a given volume. DIFFUSION is the movement of molecules "down the concentration gradient". In other words, movement from a high concentration where molecules are crowded to a low concentration where they are less crowded. HIGH → LOW
3. Some substances enter and leave the cell by diffusing across the CELL MEMBRANE.
4. In PASSIVE TRANSPORT, substances cross the cell membrane down the concentration gradient (from high to low concentration).
5. SIMPLE diffusion is when small, nonpolar molecules pass directly through the lipid bilayer.
6. FACILITATED diffusion is when transport proteins help ions and polar molecules (charged materials) pass through the lipid bilayer.
7. Not in the book. What do you think the word passive means? CALMLY LET SOMETHING GO.

Review Figure 5 and Figure 6 to answer to complete the table below.

Substance to Transport	Polar (charge) or Nonpolar (no charge)?	Simple or Facilitated Diffusion?
Na <sup>+</sup>	POLAR	FACILITATED DIFFUSION
Cl <sup>-</sup>	POLAR	FACILITATED DIFFUSION
O <sub>2</sub>	NON POLAR	SIMPLE DIFFUSION

PROTEIN NEEDED

→ EGGS IN VINEGAR

↳ NO PROTEIN NEEDED

Osmosis p. 180 / IN THE CLUB VIDEO BEFORE OSMOSIS

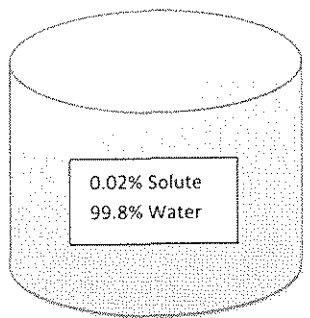
1. **Osmosis** occurs as free WATER molecules move down their CONCENTRATION GRADIENT into the solution that has the LOWER concentration of free water molecules. - WATER MOVING FROM HIGH → LOW
2. The cell membrane contains CHANNEL PROTEINS that only water molecules can pass through.
3. In humans, water channels help in the regulation of BODY TEMPERATURE, in digestion, in reproduction and in water conservation in the KIDNEYS.

4. Complete the definitions below. We will practice with these and they will eventually make sense!  
 Hypertonic Solution: The solution has a HIGHER solute concentration than the cytoplasm does. The water moves OUT of the cell. The cell loses water and SHRINKS.

Hypotonic Solution: The solution has a LOWER solute concentration than the cytoplasm does. The water moves INTO the cell. The cell gains water and EXPANDS in size.

Isotonic Solution: The solution has the same solute concentration than the cytoplasm does. Water diffuses IN and OUT OF the cell at equal rates. The cell stays the SAME size.

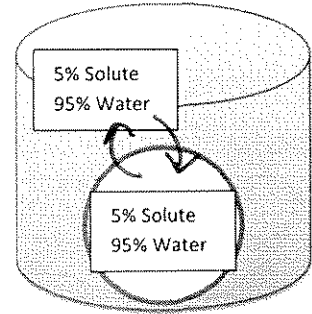
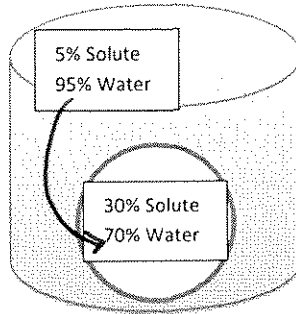
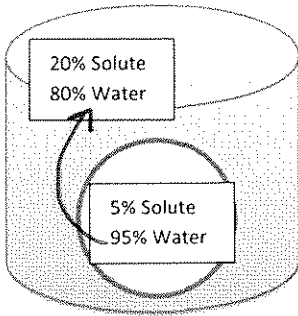
Not in the book: Before we move on, let's talk about liquid solutions. Cells of organisms are commonly in liquid environments and that environment can affect the cell. A **solution** is a mixture of two or more substances. Solutions are made of a **solute** and a **solvent**. Water is considered a universal solvent. The solute is whatever substances is mixed with the water. For example, if I mix 2 grams of salt into 100 mL of water I will have made a salt water solution. Salt is the solute and water is the solvent. Solutions are named by the % of solute in the solution. This example would be called a 0.02% solution.



2g. SALT = SOLUTE  
 + 100ML WATER = SOLVENT  
 →  
 0.02% SALT SOLUTION

Use the drawings below to predict water movement across the cell membrane. Label each solution in which the cell is surrounded as **hypertonic, hypotonic, or isotonic**. Remember that only the water moves and it moves from high concentration to low concentration across the cell membrane.

*ONLY WATER MOVES! FOLLOW THE WATER FROM HIGH → LOW!*



HYPERTONIC  
"SHRINKS"

HYPOTONIC  
"BIGGER"

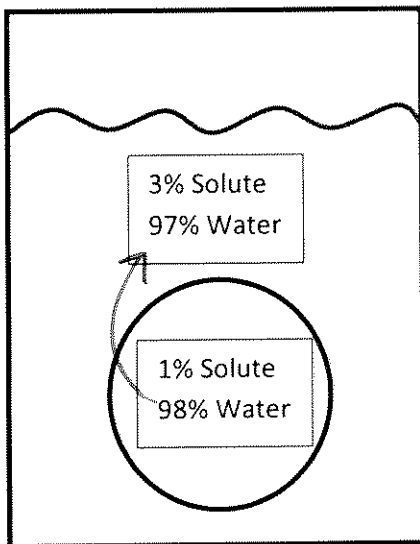
ISOTONIC  
"SAME SIZE"

Effects of Osmosis p. 181

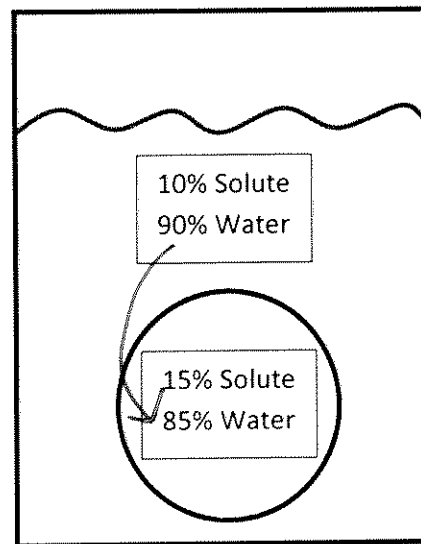
1. What causes a plant cell to NOT burst in a hypotonic solution? RIGID CELL WALLS
2. How do animal cells avoid cell swelling due to osmosis? REMOVE SOLUTES FROM THE CYTOPLASM.

**Science Skills:** Review the figures below to determine (using an arrow) if water will move into the cell, out of the cell, or both ways equally. Then identify the solution as hypotonic, hypertonic, or isotonic.

*\* ONLY WATER MOVES HIGH → LOW*



Type of Solution:  
HYPERTONIC



Type of Solution:  
HYPOTONIC

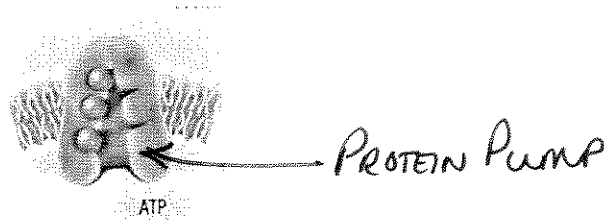
→ EGGS INTO SOLUTION

Active Transport p. 182

LOW → HIGH

- Active transport requires ENERGY to move substances AGAINST their concentration gradient.
- What cell part makes energy for the cell? MITOCHONDRIA This cellular energy is called ATP.
- A transport protein that requires energy is called a PUMP.
- The most important pump in animal cells is called a SODIUM-POTASSIUM pump.

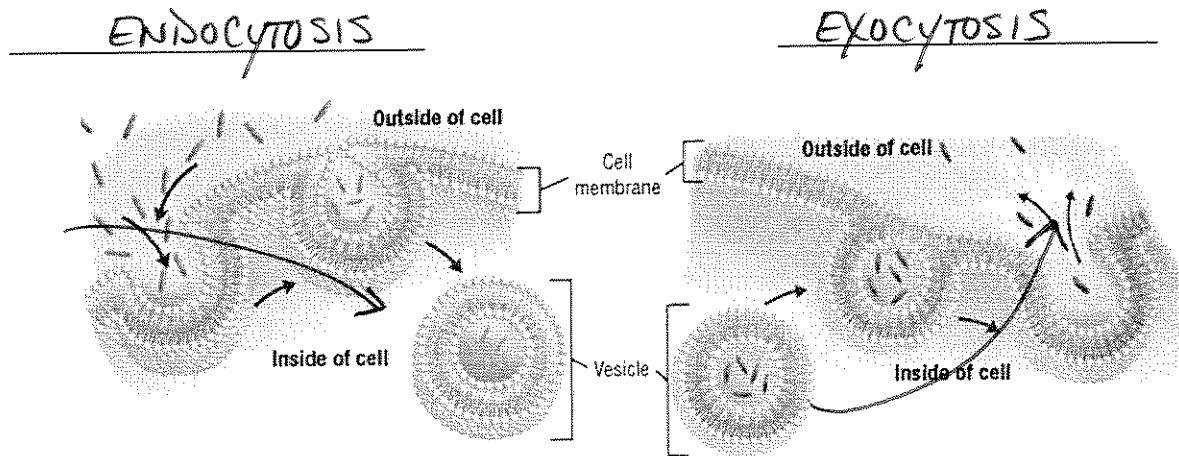
Use the image below to label the protein pump.



p. 183

- If a substance is too big to move through a pump, it will cross the cell membrane in VESICLES.
- The movement of large substances into the cell using a vesicle is called ENDOCYTOSIS.
- The movement of large substances out of the cell using a vesicle is called EXOCYTOSIS.

Use the image below to label a endocytosis and exocytosis.



→ FINISH LAB

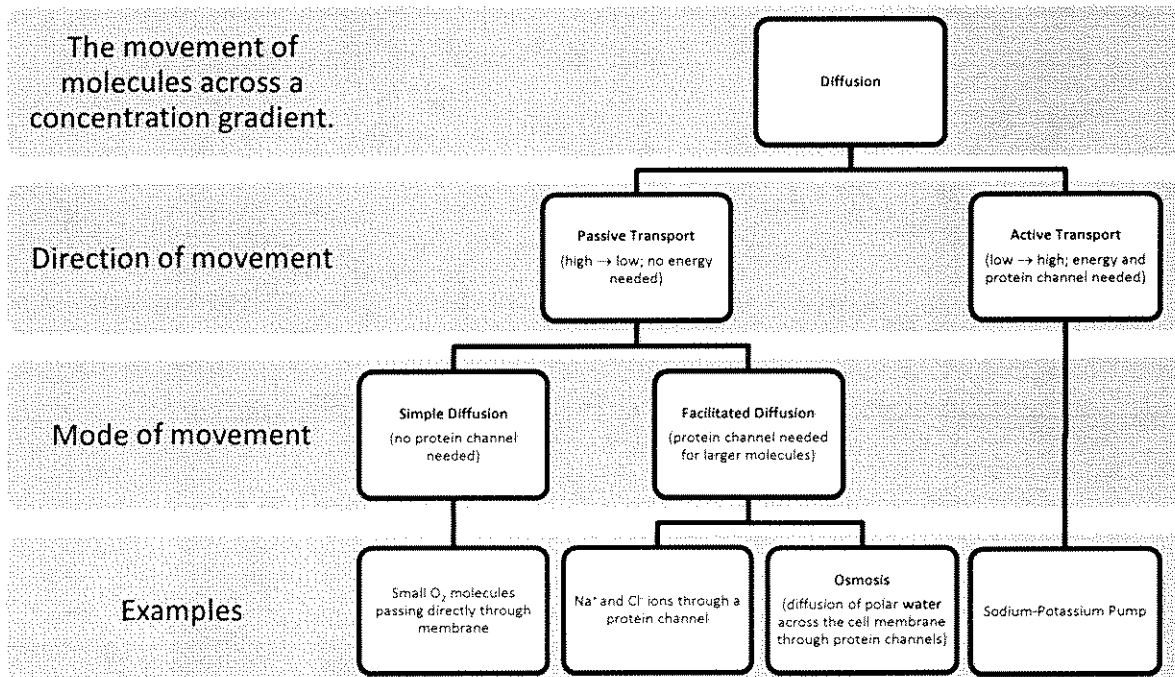
Section 3: Cell Communication

Read pages 184-185 and answer the questions that follow.

- Cells communicate and coordinate activity by sending CHEMICAL signals that carry information to other cells.
- Signals that have to travel a long distance use NERVE cells to carry information. P. 185
- A RECEPTOR protein binds only to signals that match the specific shape of its binding site.
- Read over p. 187. Why does caffeine increase our heart rate? CAFFEINE IS SHAPED LIKE A SIGNAL MOLECULE THAT INCREASES OUR HEART RATE. THE RECEPTOR PROTEIN DOESN'T RECOGNIZE THE DIFFERENCE.

# Chapter 8: Cells In Their Environment

## Organizer



### Key Vocabulary

Cell Membrane: protects the cell and controls materials passing in and out of the cell

Phospholipid: molecule that makes up the double layer of the cell membrane; polar heads which like water and nonpolar tails which do not like water

Transport Protein: (or channel protein); transports large molecules through the cell membrane.

Diffusion: The movement of any molecule from high to low concentration

Osmosis: The diffusion of water across the cell membrane

Hypertonic Solution: Solutions with higher solute and lower water than the cell; causes cells to shrink

Hypotonic Solution: Solutions with lower solute and higher water than the cell; causes cells to expand

Isotonic Solution: Solutions with the same solute and water concentration than the cell; cells stay the same size