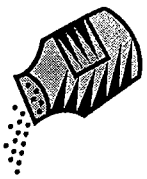
Passive Transport

It Just Happens!!!



The job of the **cell membrane** is to regulate what enters and exits the cell. The cell membrane acts in a way that is similar to the doors and windows of your house. Since some "stuff" can come in and some "stuff" must stay out, the cell membrane is said to be **selectively permeable.**

For the most part, your cell membrane does not have to work very hard in order to perform its job. Small molecules and molecules that do not have a charge can easily pass through the cell membrane without any energy required by the cell. This type of movement, when no energy is required, is called **Passive Transport** (no energy required – it just happens).

Passive Transport always happens when molecules that are in a high concentration area (crowded area) have the opportunity to move to a lower concentration area (less crowded area). Molecules will always move to areas where it is less crowded for them, without any energy needed. This movement of molecules from a high concentration area to a low concentration area is called "**moving down the concentration gradient** (concentration difference)". If you think about it, don't all things move "down" without any energy required?

There are 3 types of passive transport that you will have to know – Diffusion, Osmosis and Facilitated Diffusion. Remember that all 3 are passive transport – no energy required, all movement is from high concentration to low concentration! **Diffusion** is when **any molecule** moves from high to low concentration. **Osmosis** is when **water** moves from high to low concentration. **Facilitated Diffusion** is when large or charged molecules move from high to low concentrations **through a channel protein** in the cell membrane. The channel protein is similar to a "doggie door" in your house – it is just the right size hole for your dog to enter or exit without any energy required by you!

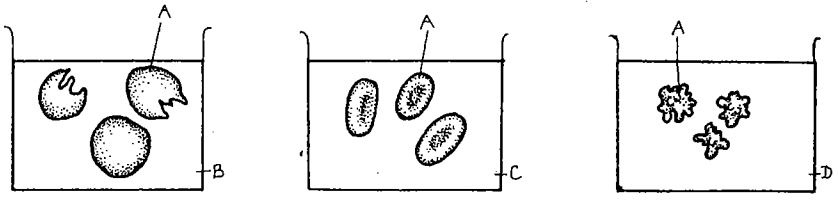
Since molecules will always move from high to low concentrations, living things use this mechanism of transport for most substances. When you breathe in air with a high concentration of oxygen in it, yet your blood has a lower concentration of oxygen – the oxygen will simply **diffuse** into your blood cells! If your blood fluid has a higher concentration of water than your cells, then **osmosis** will occur into your cells! If your blood sugar concentration is higher than your muscle cells, then **facilitated diffusion** will occur through channel proteins!

In addition, because of this natural movement of molecules, living things must keep water, sugar, salts, etc. at a constant level (**homeostasis**) to prevent major problems from occurring. Your body tries to maintain fluids in your body that are **Isotonic** to your cells (same concentrations). That way movement still happens in and out of the cell but it is in **equilibrium** – same amounts are going in as coming out. If your body fluids became **Hypotonic** (high water concentration, little sugars & salts) compared to the cells, the cells would fill up with too much water and burst. If your body fluids became **Hypertonic** (low water concentration, and lots of sugars & salts), water would leave your cells and your cells would shrivel up and die!

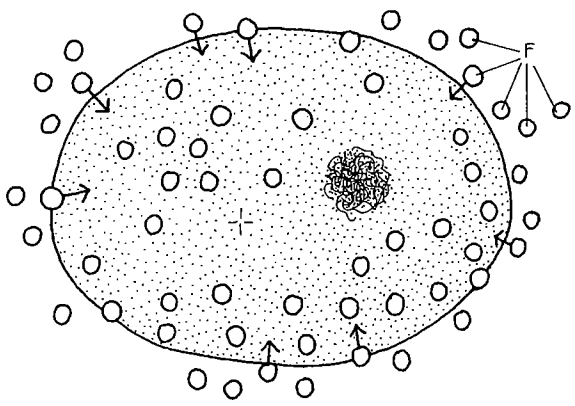
In conclusion, most molecules will move in or out of cells without any energy required – passively! To test your knowledge of passive transport, color the following diagrams and answer the analysis questions on the following page.

OSMOSIS.

ERYTHROCYTE$_A$
PURE WATER$_B$
0.85% SALT SOLUTION$_C$
2% SALT SOLUTION$_D$



FACILITATED TRANSPORT★
GLUCOSE MOLECULE$_F$



Analysis Questions

1. Why is the cell membrane said to be "selectively permeable"?

2. Define Passive Transport?

3. What are 3 types of passive transport?

4. What does it mean to "move down the concentration gradient"?

5. How is the "smell of popcorn" an example of **diffusion**?

6. Why is the "smell of popcorn" not an example of **osmosis**?

7. What types of molecules can diffuse through the cell membrane, without using a channel protein?

8. Why is it so important for your body to maintain water or sugar homeostasis?

9. Why do your fingers look like prunes after swimming for a long time?

10. Why can't Nemo live in a fish tank filled with goldfish? Explain.

11. Why does eating a lot of salt lead to high blood pressure?

12. What would happen to your cells if you tried to drink ocean water?

13. Why is **facilitated diffusion** a form of passive transport? What types of molecules need this type of help getting into the cell?

14. Draw pictures of a cell in the following solutions and draw arrows to show direction water would move:

Hypertonic	*Isotonic*	*Hypotonic*

15. What would happen if you watered your house plants with salt water?