

The Processes of the Cell

Essential Question:

What processes are necessary for the survival of a cell, tissue, organ, and organ system?

Standard:

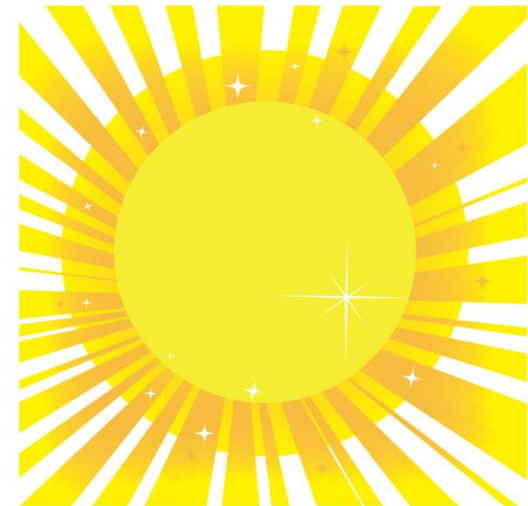
S7L2a. Explain that cells take in nutrients in order to grow and divide and to make needed materials.

Your cells are constantly working to perform many activities such as getting food, removing wastes, growing, reproducing, and making new materials.

What do your cells need in order to conduct these necessary activities?

To stay alive, cells need a constant supply of energy.

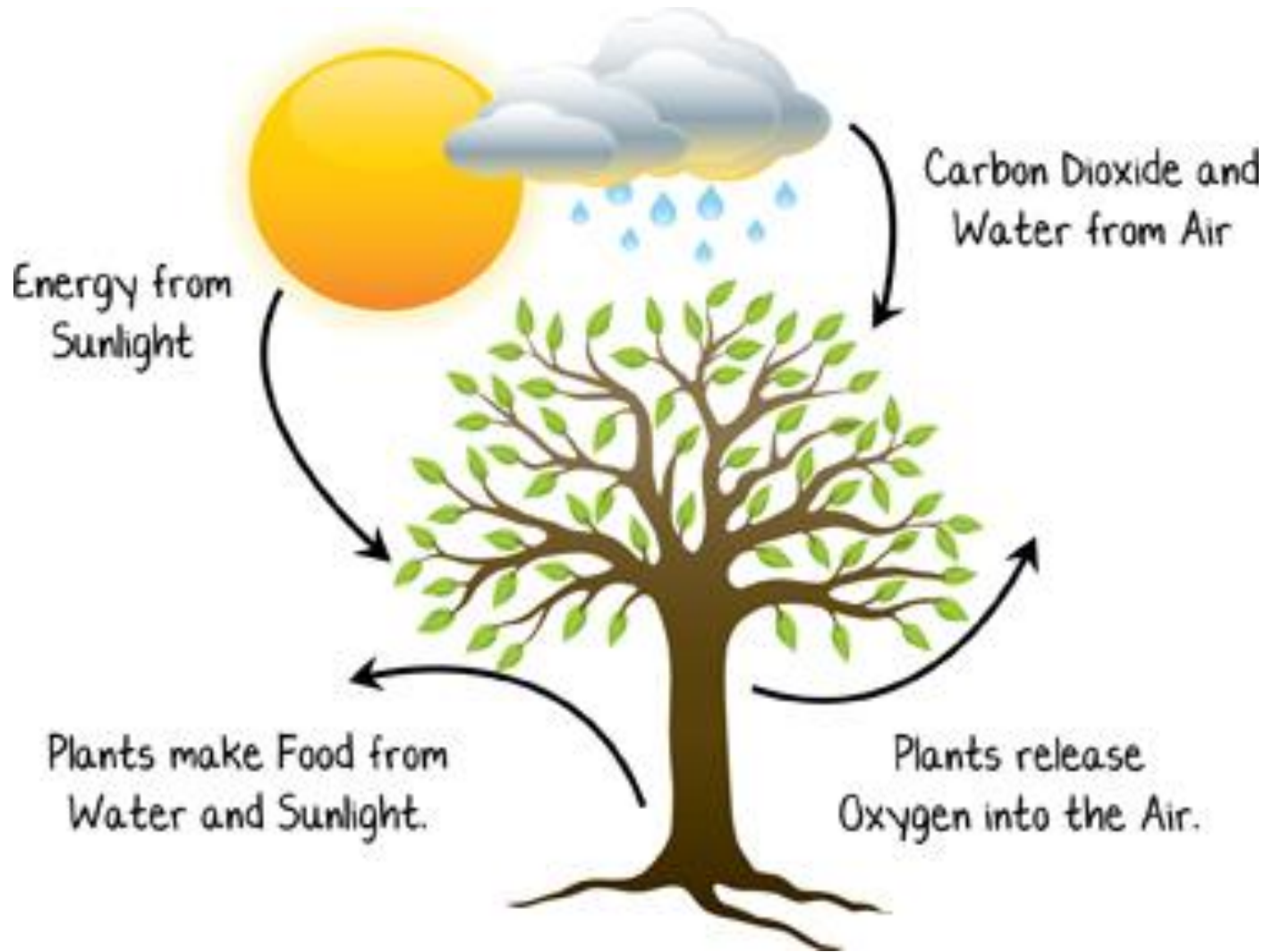
Animal cells get energy from food, while plant cells get energy from sunlight.



All cells need chemical energy.
Chemical energy is stored in the
bonds between the atoms of
every molecule.

A major source of chemical
energy for most cells is stored in
a **sugar** molecule called
glucose.

Photosynthesis



Plant cells make their own food through the process of **photosynthesis**.

In this process, plant cells take in **light energy** and change it into **chemical energy** in the form of **glucose (food)**. Photosynthesis occurs in the **chloroplasts**.

What do plants need to survive?



Photosynthesis

Sunlight + Water + Carbon Dioxide
= $C_6H_{12}O_6$ (Glucose)
and Oxygen

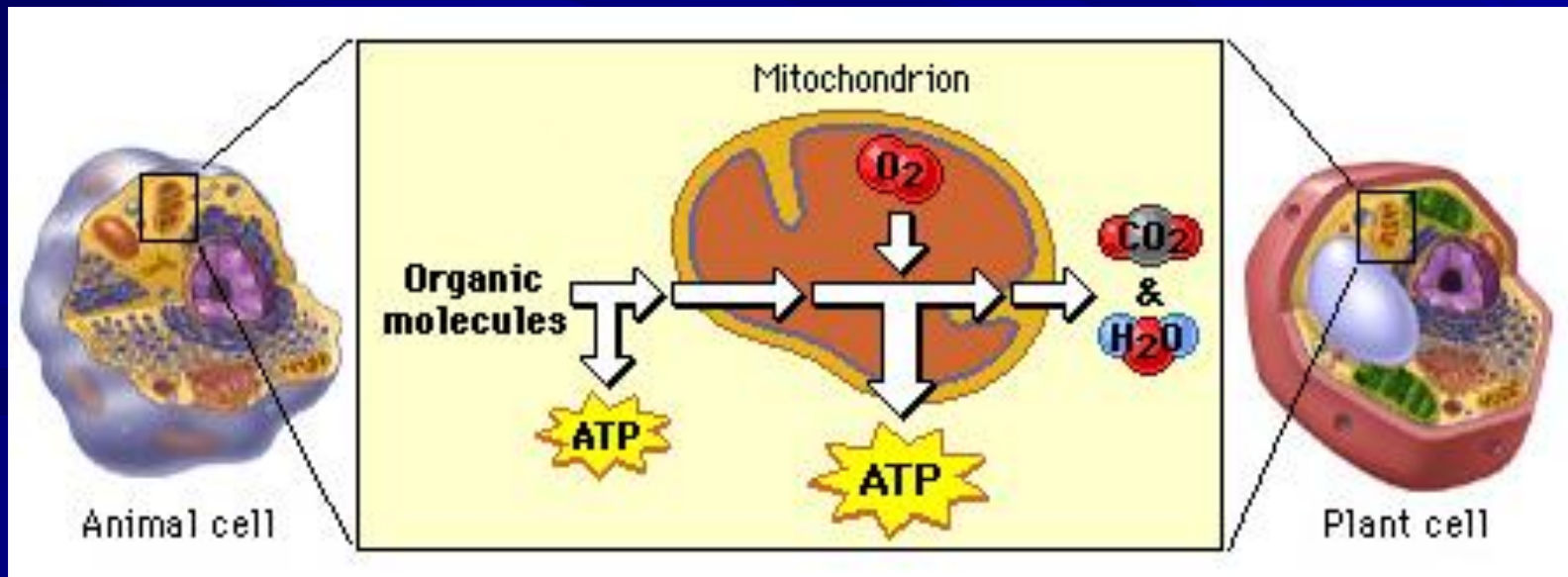
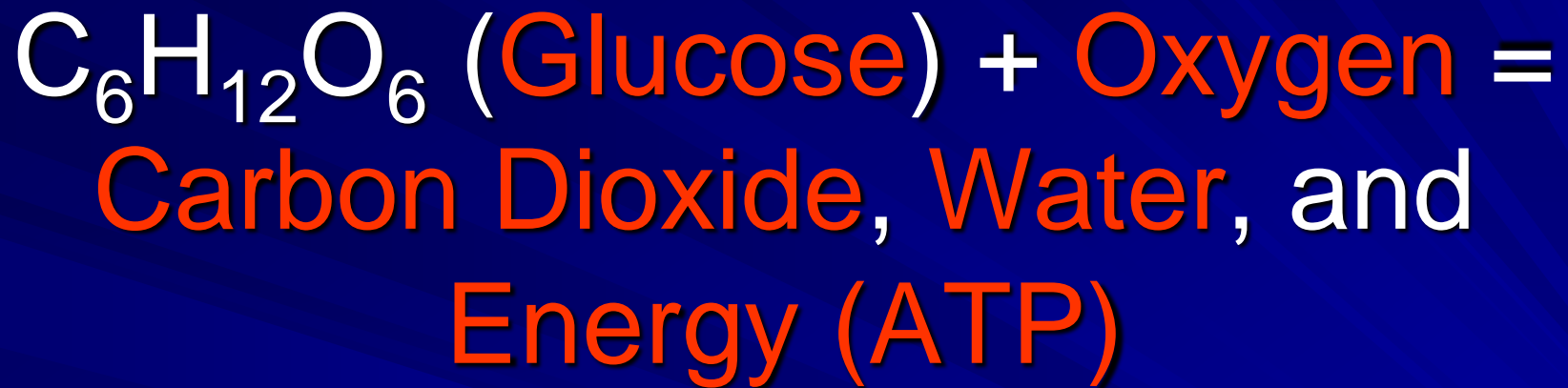
So, why are plants so
important to us?

<http://www.pbs.org/wgbh/nova/nature/photosynthesis.html>

Once food is obtained in animal cells and made in plant cells, it must be broken down to release the **chemical energy**.

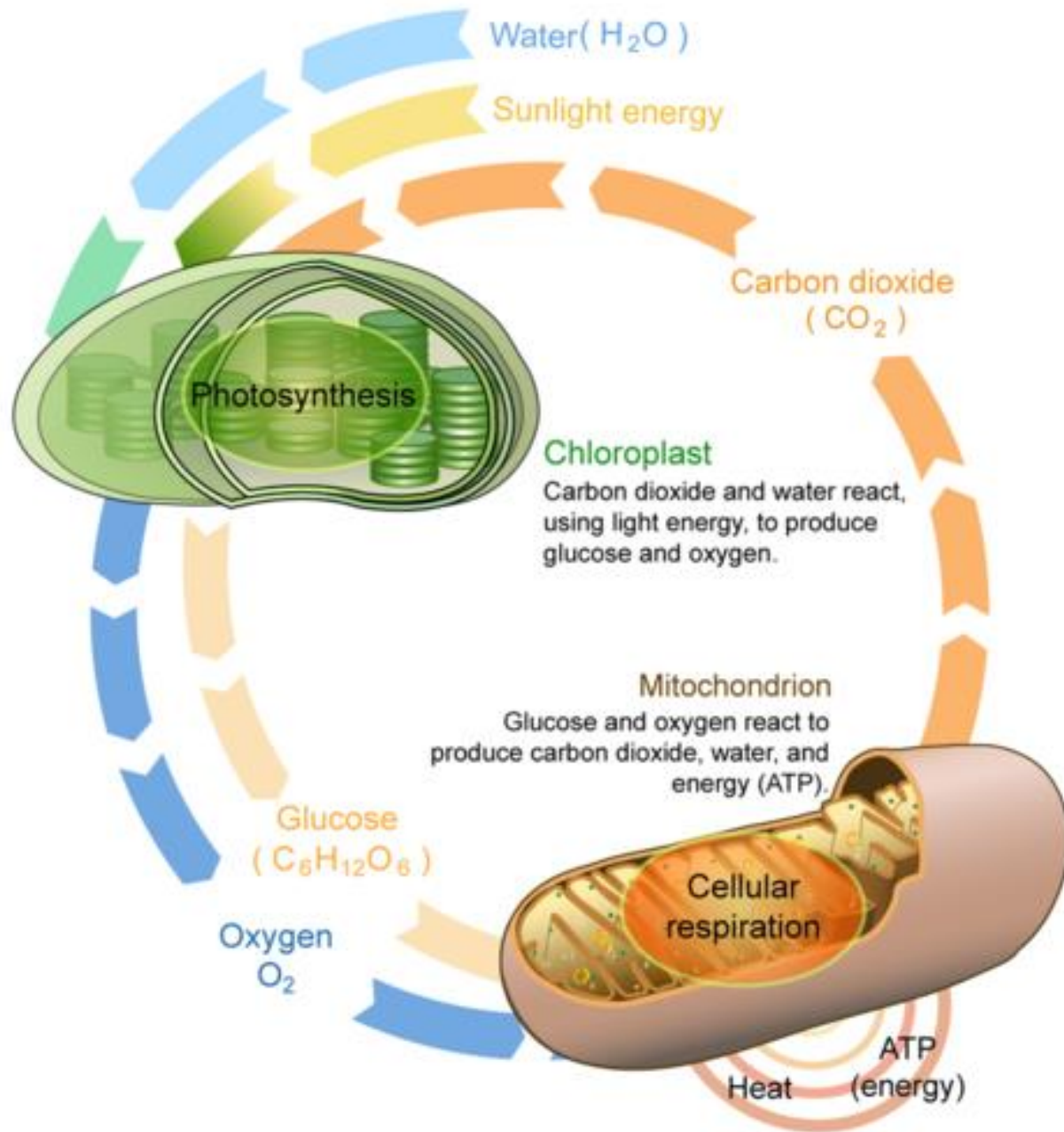
This process is called **Cellular Respiration**. Cellular respiration occurs in the **Mitochondria**.

Cellular Respiration

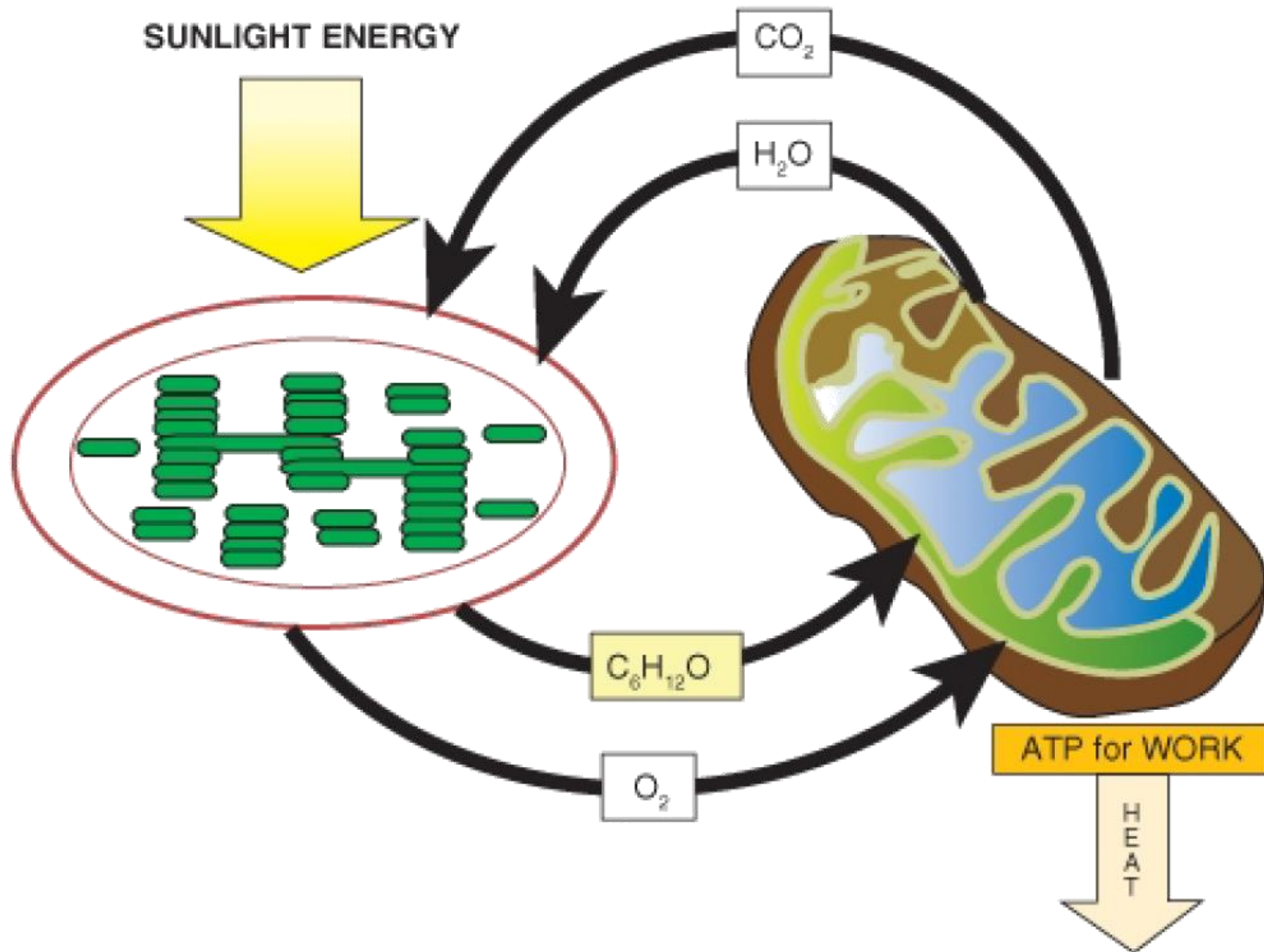


Photosynthesis and Cellular
Respiration are the
opposite of one another.

The input of one process is
the output of the other
process and vice versa.



Which is Photosynthesis? Cellular Respiration? How do you know?

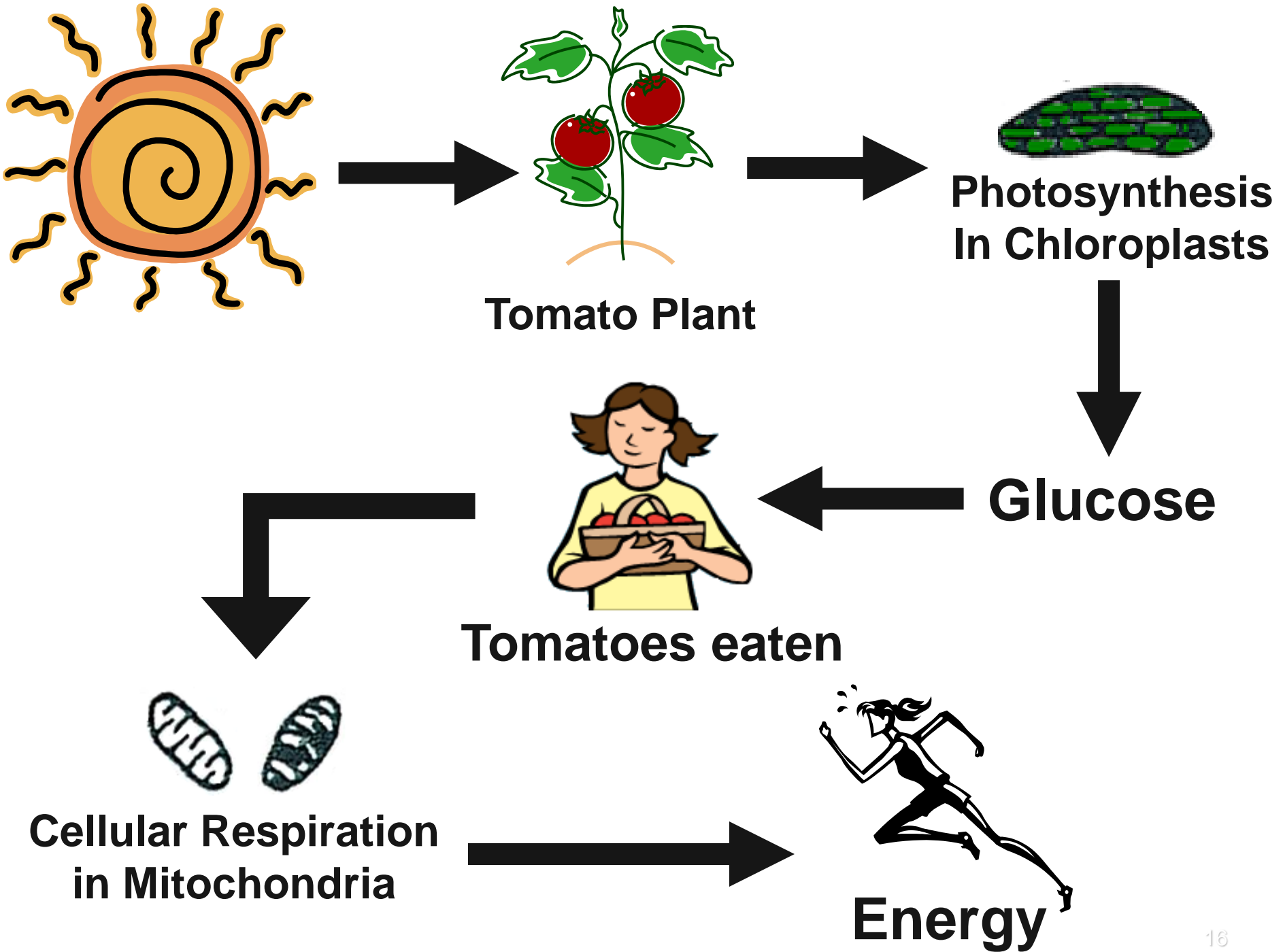


Animations/Video Clips on Photosynthesis and Cellular Respiration

Animation of Cellular Respiration and Photosynthesis:
http://www.exploratorium.edu/traits/cell_explorer.html

BrainPop Video on Photosynthesis and Cellular Respiration:
<http://glencoe.mheducation.com/sites/dl/free/0078778425/164155/00053412.html>

Video animation on Cellular Respiration and Photosynthesis:
<http://www.sumanasinc.com/webcontent/animations/content/cellularrespiration.html>

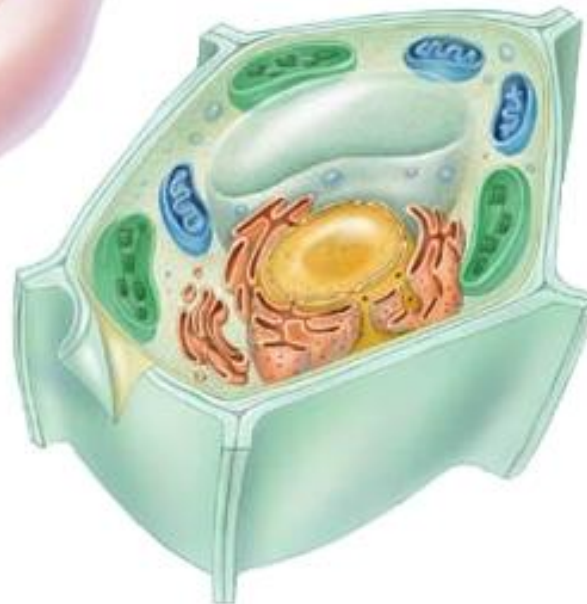


Movement of Material In and Out of the Cell



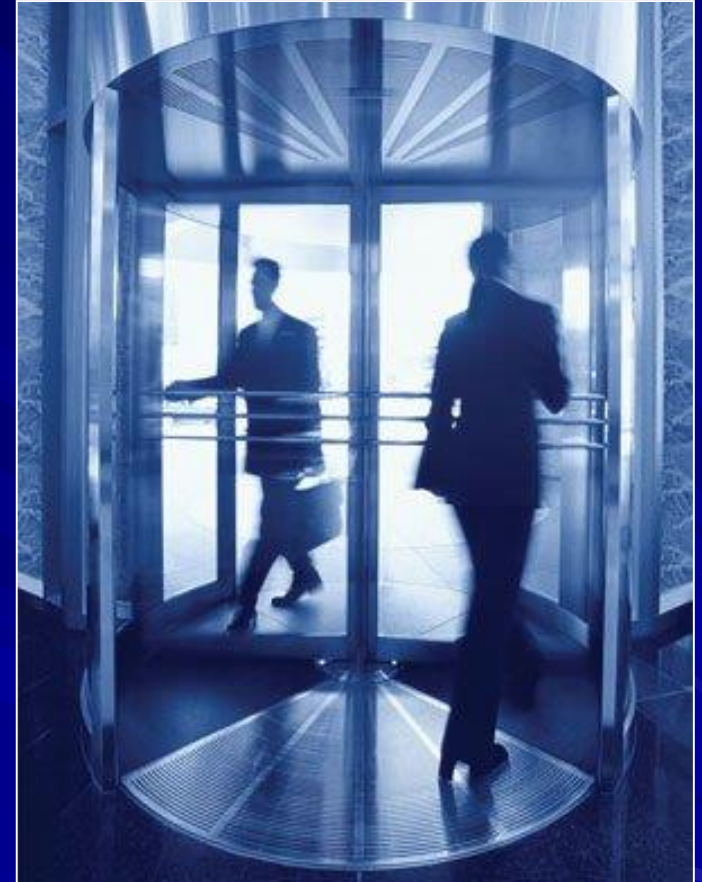
Animal cell

Plant cell

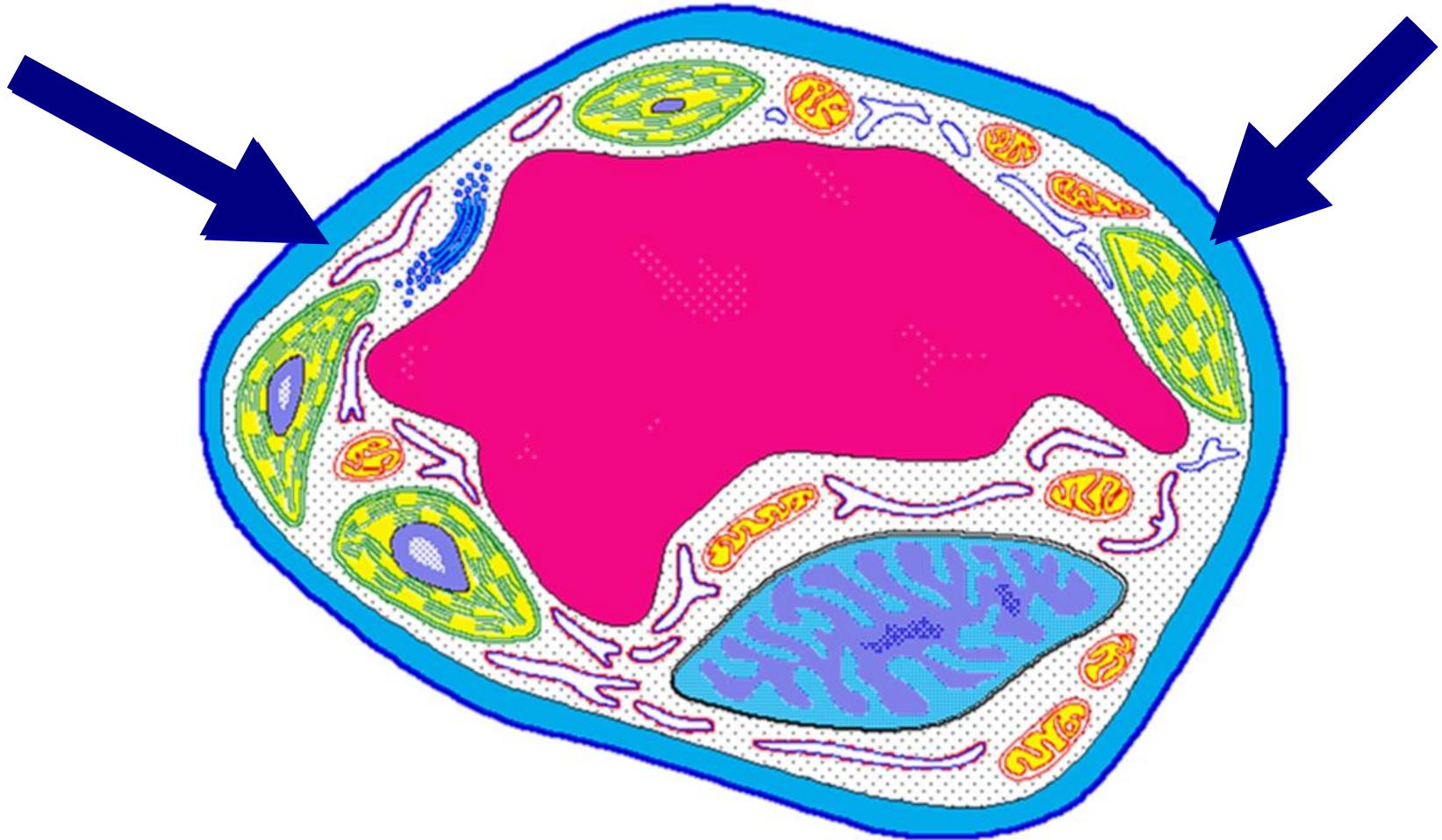


We learned through photosynthesis and cellular respiration that oxygen, carbon dioxide, water, glucose, and energy are constantly used in cells.

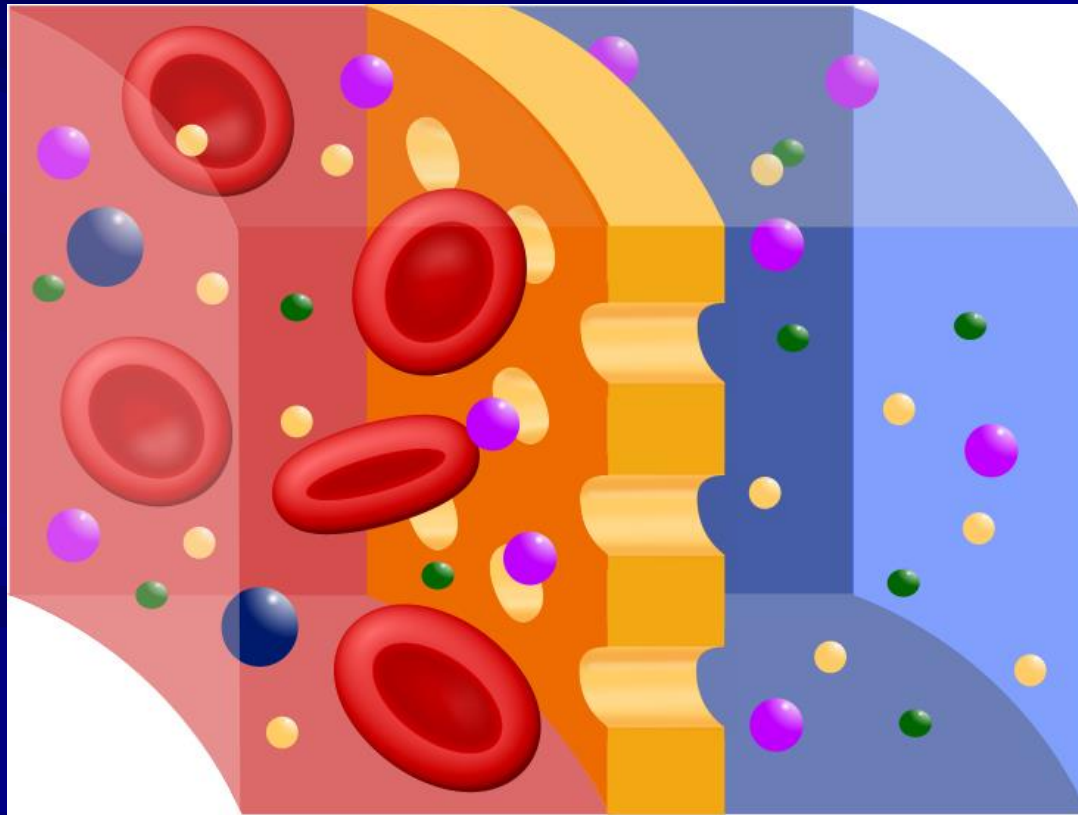
How then do these particles and many others get in and out of cells?



In our previous unit, we learned that the job of the cell membrane is to allow materials in and out of the cell.



The cell membrane is **semi-permeable**.
This means that it can let some
materials pass through while others
can not.

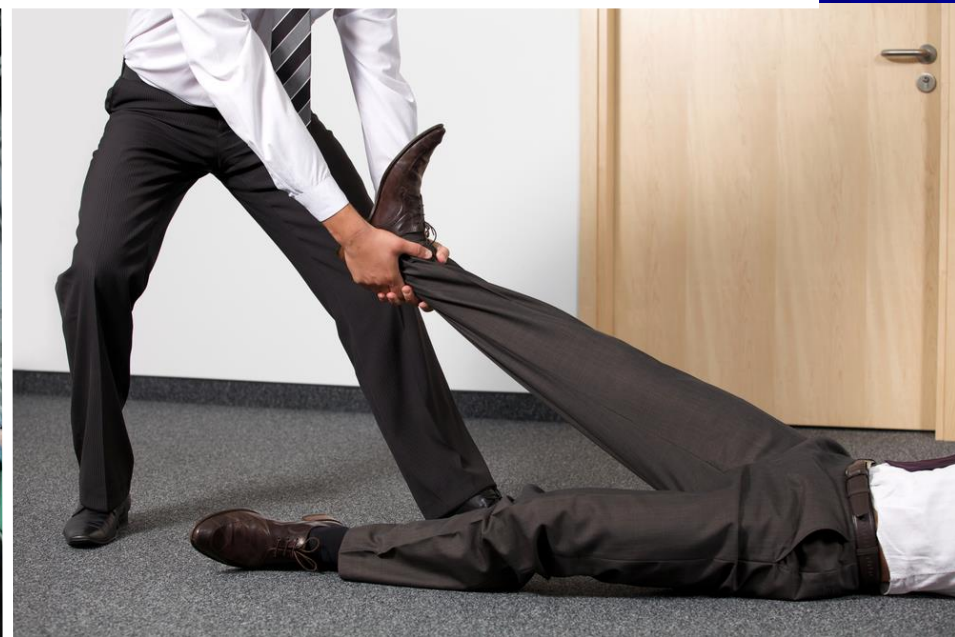


Animation of Semi-Permeable

[https://www.youtube.com/watch?
v=Pt4Ch-YW-xs](https://www.youtube.com/watch?v=Pt4Ch-YW-xs)

Some materials can move in and out of the cell membrane easily.

Other materials require help or are forced to move in and out of the cell.



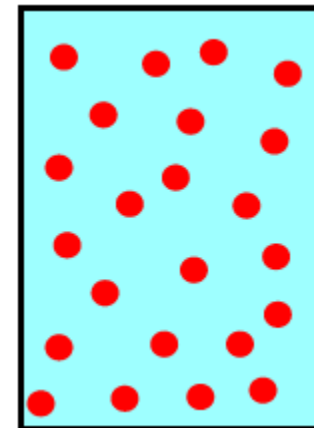
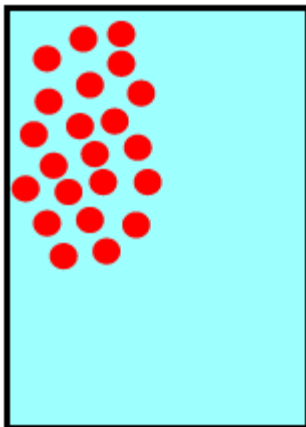
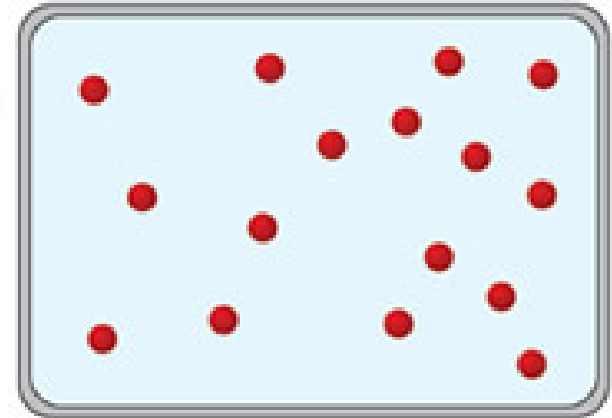
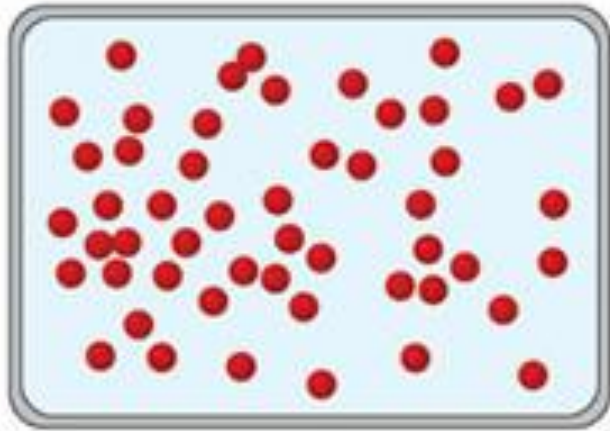
Particles naturally want to move from where they are more crowded to where they are less crowded.



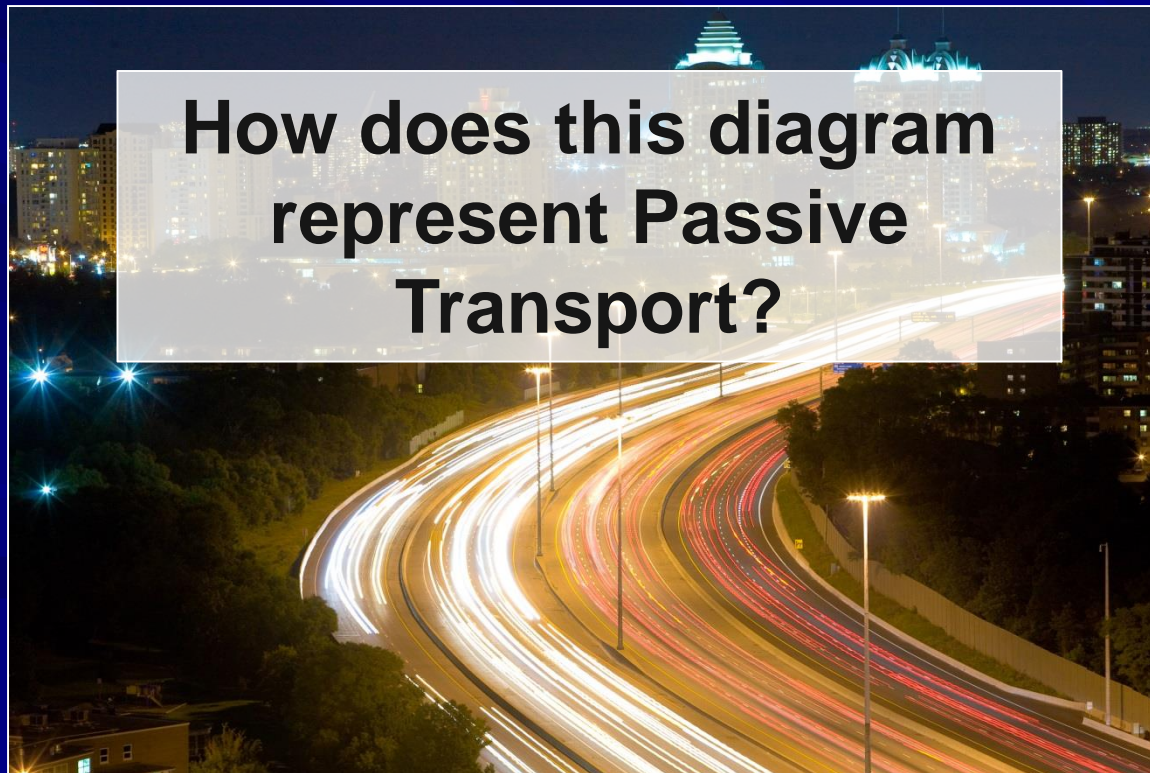
Natural Movement of Particles

More Crowded
(High Concentration)

Less Crowded
(Low Concentration)



The transport (movement) of substances across cell membranes without the use of energy is called **Passive Transport.**



Passive Transport

In Passive Transport, substances or particles move from high concentration to low concentration.

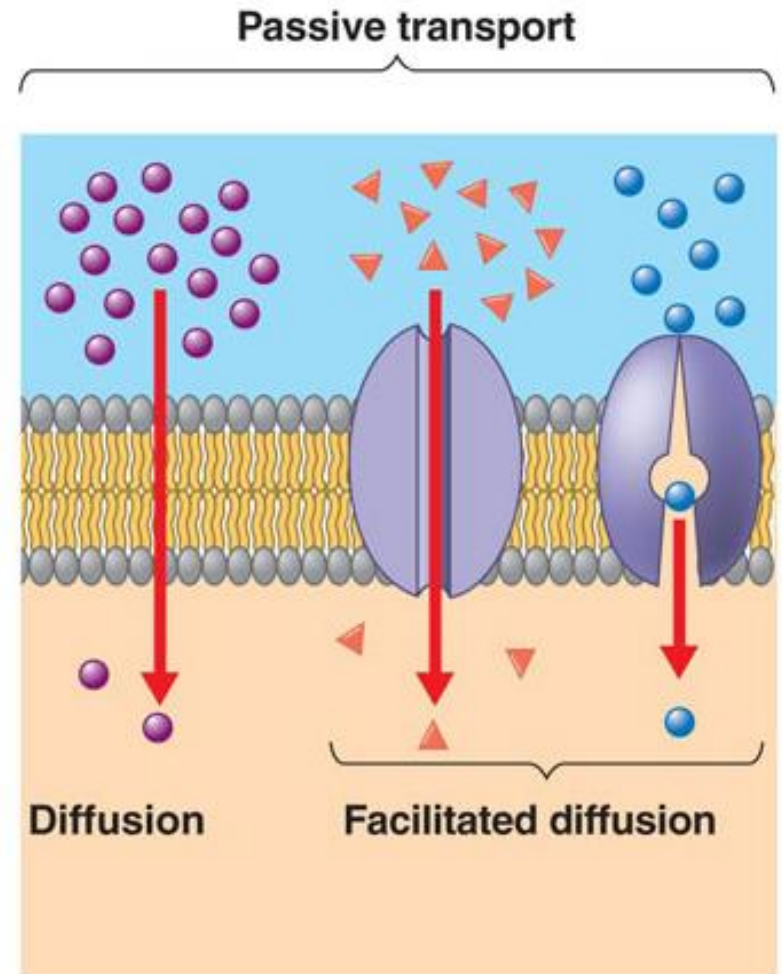
Why do you think energy is not required for passive transport?

Turn to an elbow partner and describe an experience that you could compare to Passive Transport

[ex. Easily moving from a crowded area to a less crowded area]

Passive Transport

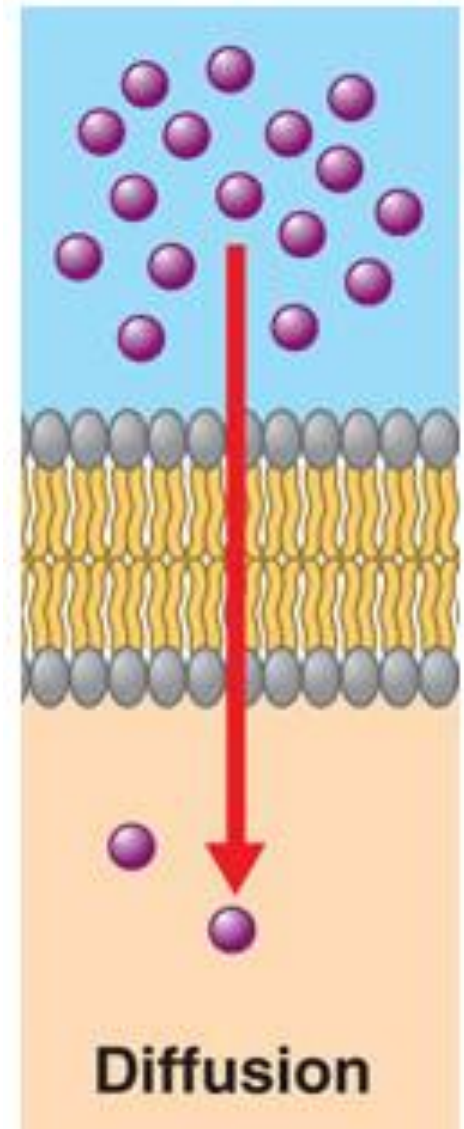
There are different types of Passive Transport.



Diffusion

Small particles such as oxygen and carbon dioxide move easily across the cell membrane from areas of high concentration to low concentration.

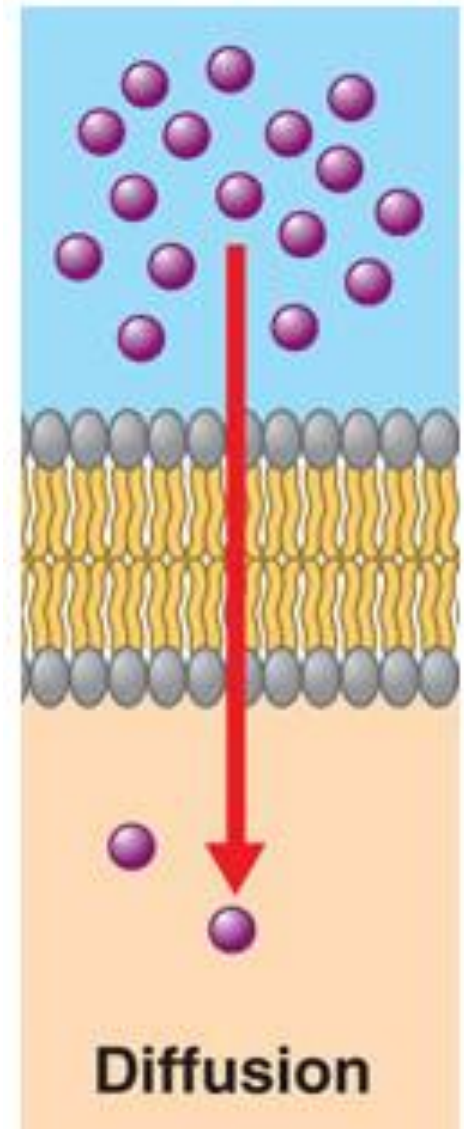
Diffusion is a type of passive transport. Why?



Diffusion

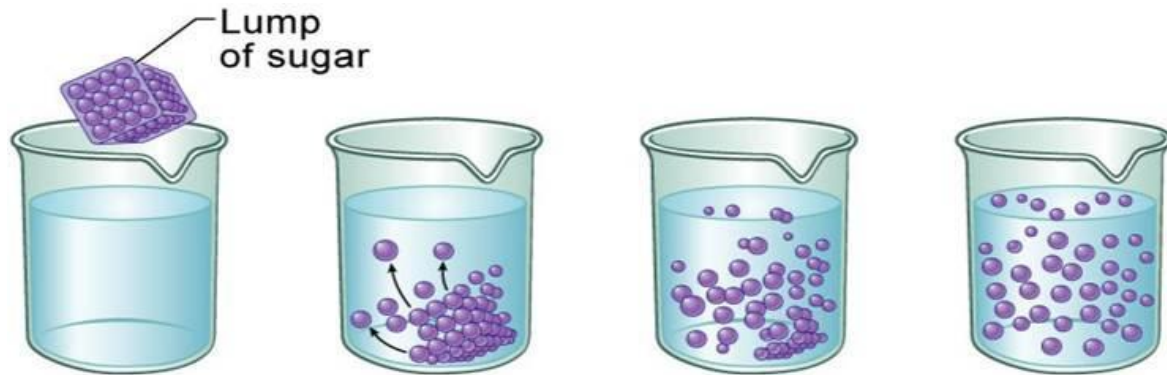
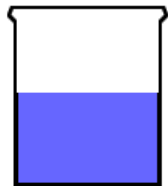
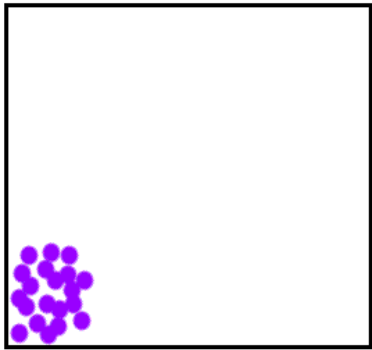
How is diffusion important for Photosynthesis and Cellular Respiration?

Oxygen and Carbon Dioxide easily diffuse through the cell membrane. Both are necessary for energy production.



Everyday Examples of Diffusion

Smell of food, perfume, air freshener, and other substances.



Time

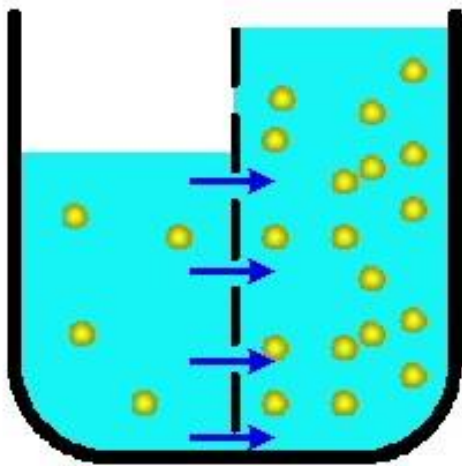
Diffusion Animations

<http://www.sumanasinc.com/webcontent/animations/content/diffusion.html>

<http://esminfo.prenhall.com/science/BiologyArchive/lectureanimations/closerlook/diffusion.html>

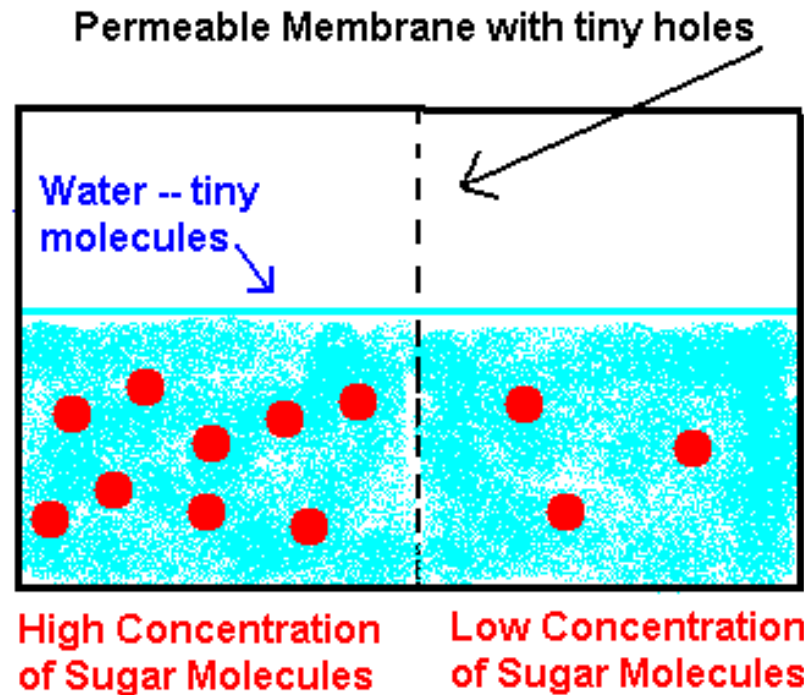
http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_diffusion_works.html

Osmosis is the diffusion of water. Water moving from where it is crowded (high concentration) to where it is less crowded (low concentration).



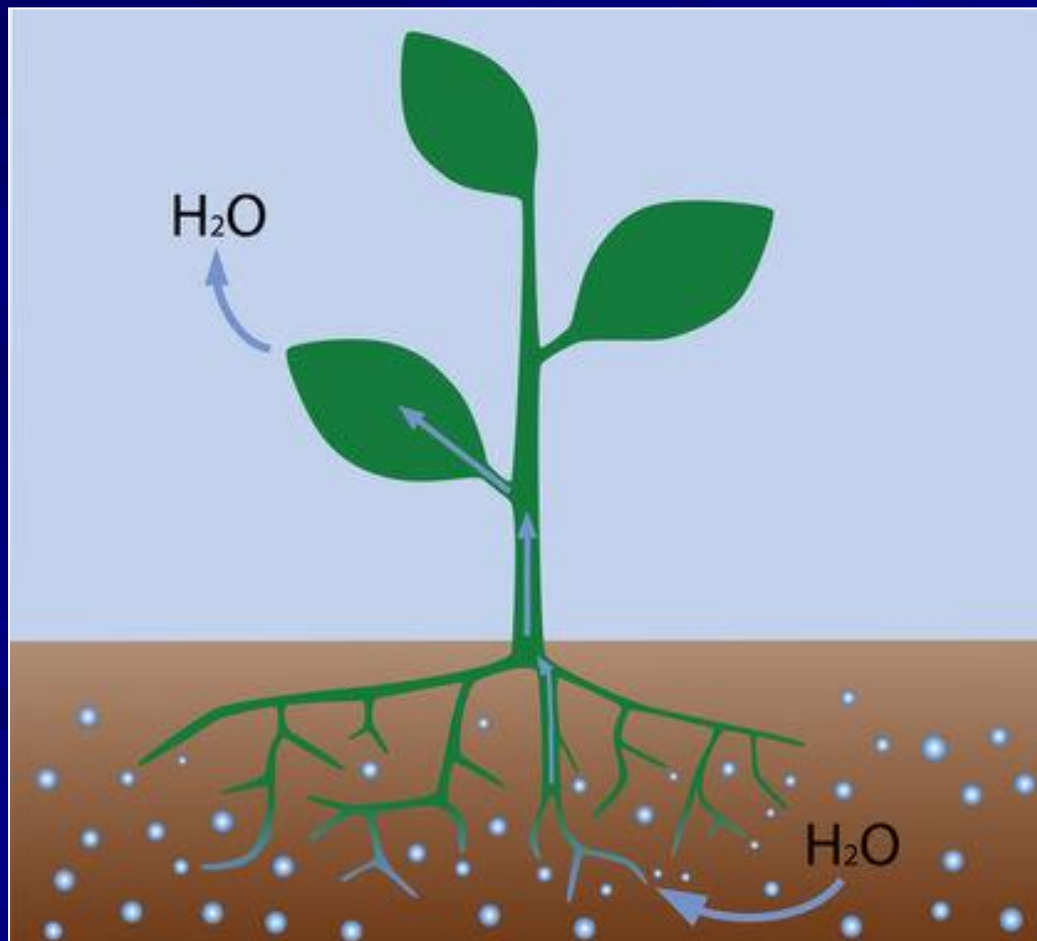
Osmosis

(Water moves by concentration gradient)



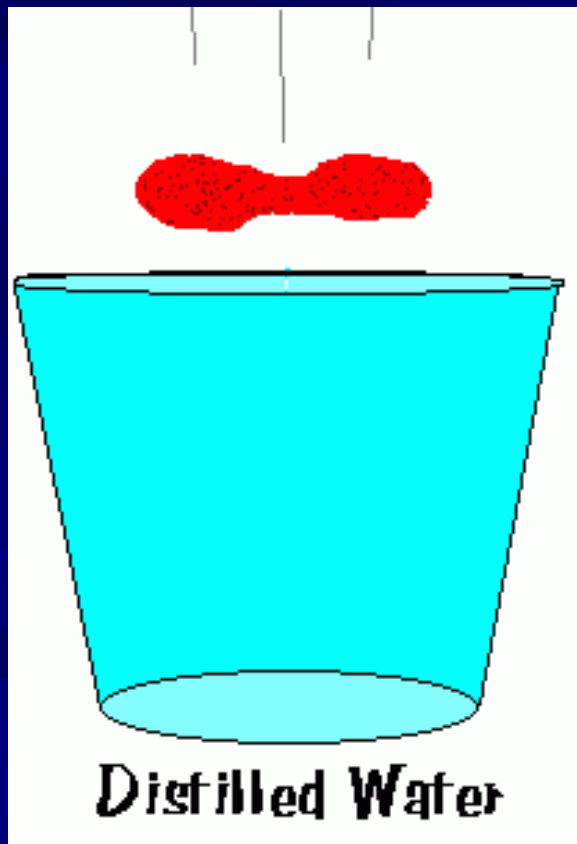
Example of Osmosis

Watering a plant



Pure water diffuses more than any other water mixture because it is more crowded (has a higher concentration) than any other water mixtures.

In this picture a red blood cell is put in a glass of distilled water (pure water with no salt or sugar in it).



Because there is a higher concentration of water outside the cell, water enters the cell by **OSMOSIS**. The cell bursts and dies.

Some materials can move in and out of the cell membrane easily.

Other materials require help or are forced to move in and out of the cell.



Diffusion

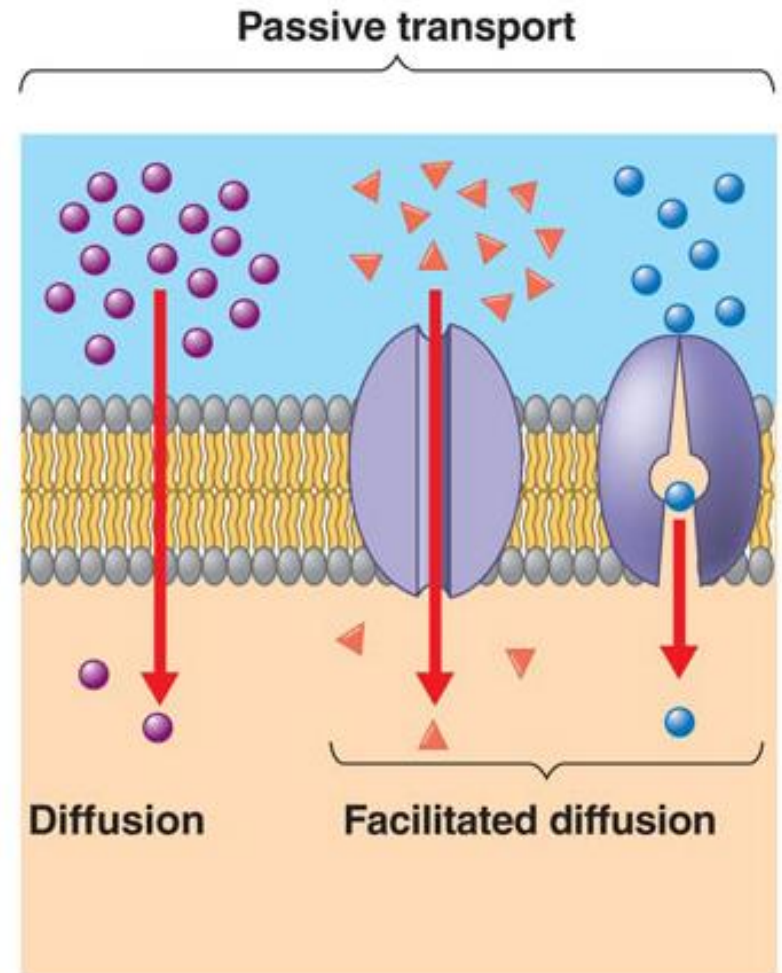


??????

Passive Transport

Some particles have to go through protein channels or doorways [shown as facilitated diffusion in the diagram to the right].

However, energy is not required and the particles still move from high concentration to low concentration.

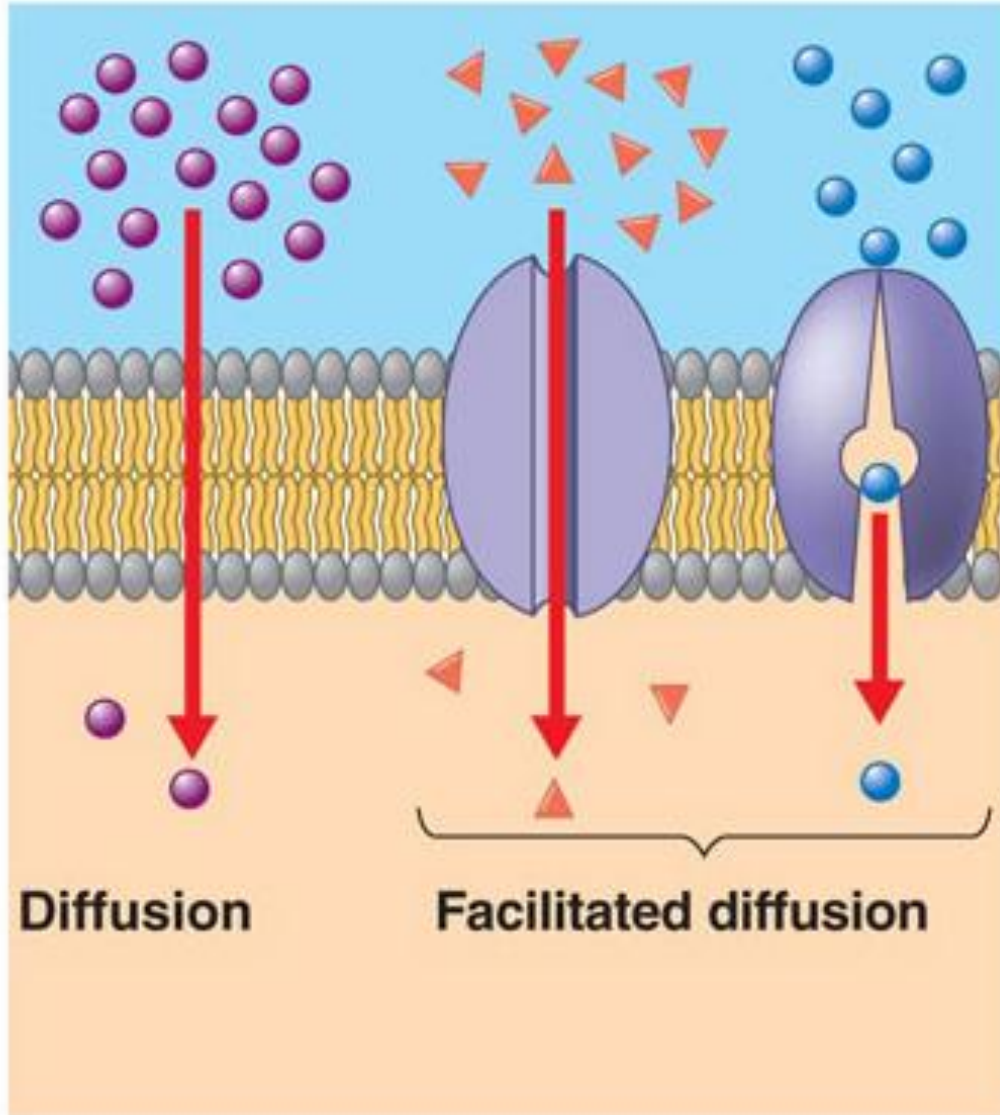


Active transport is different from passive transport because it requires **energy**.

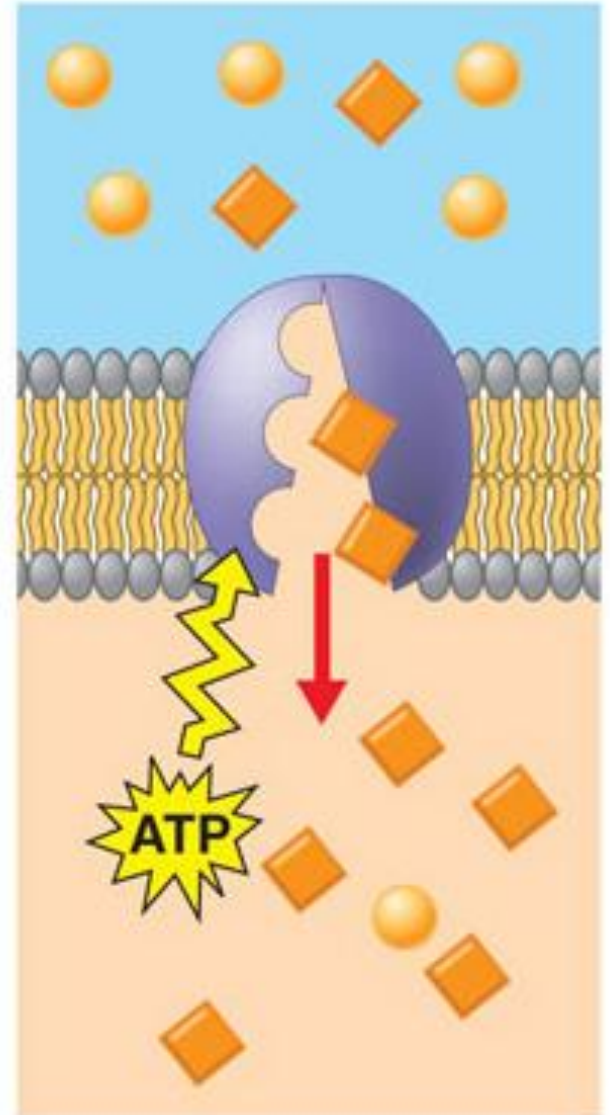
In active transport, particles move from **less crowded** (low concentration) to **more crowded** (high concentration).

Active transport is important in organs such as the kidneys when harmful particles are made to stay in the organ when they naturally want to diffuse

Passive transport



Active transport

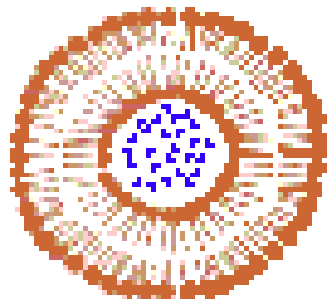


Animations of Passive and Active Transport

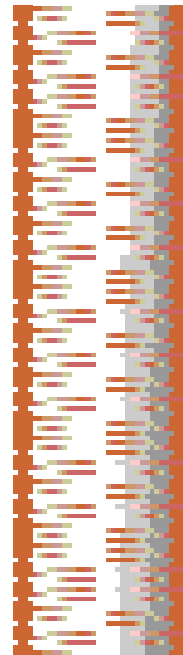
<http://www.northland.cc.mn.us/biology/Biology1111/animations/transport1.html>

Although some particles are too large to go through the cell membrane, they can still get in or out of the cell through the process of **Endocytosis** and **Exocytosis**.

Endocytosis is the process by which the cell membrane envelops (engulfs) material that is too large to pass through the membrane and then pinches off inside the cell.



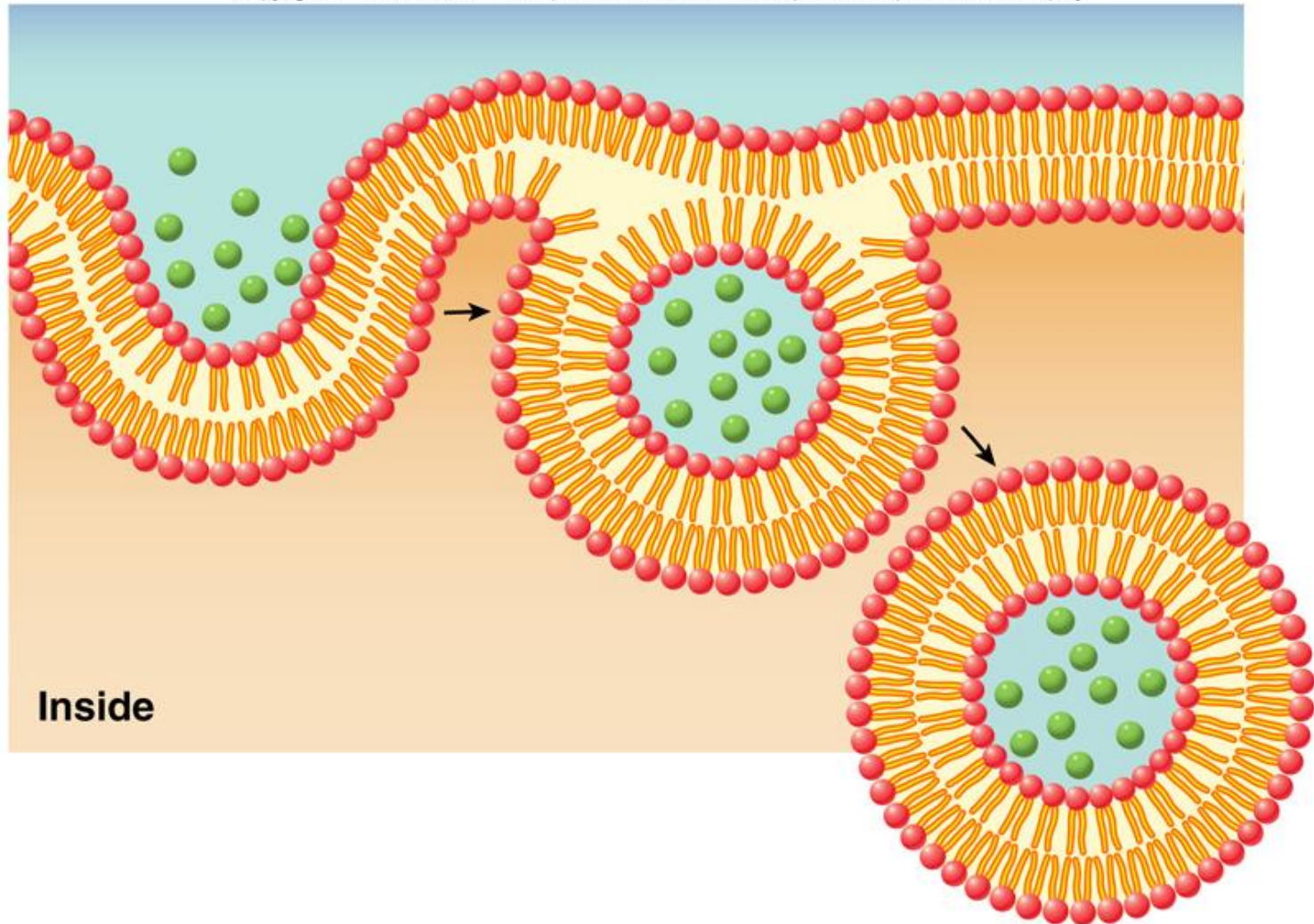
VESICLE



PLASMA
MEMBRANE

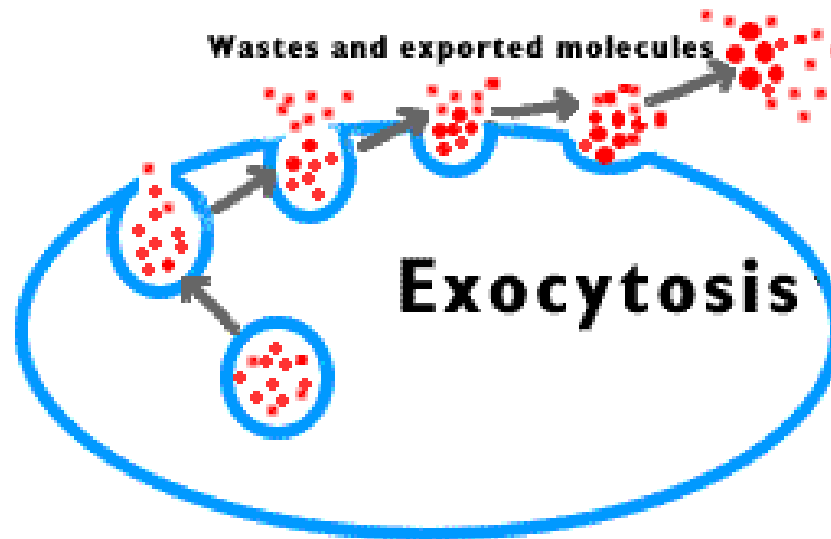
Endocytosis

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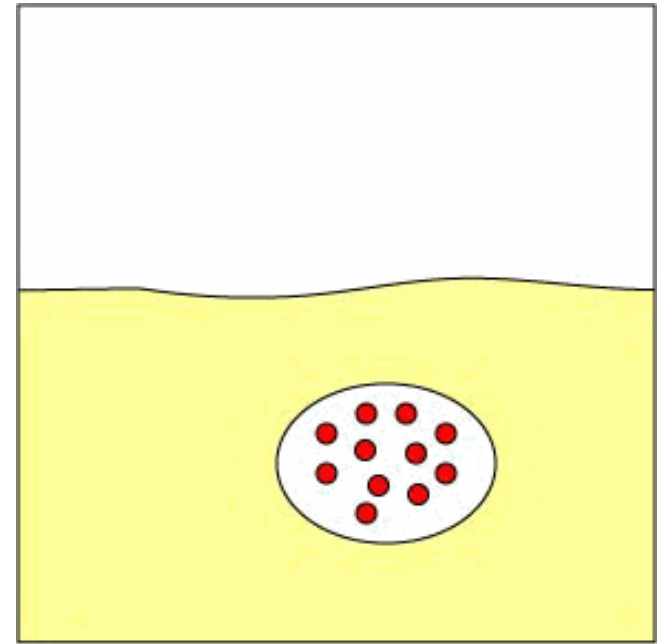
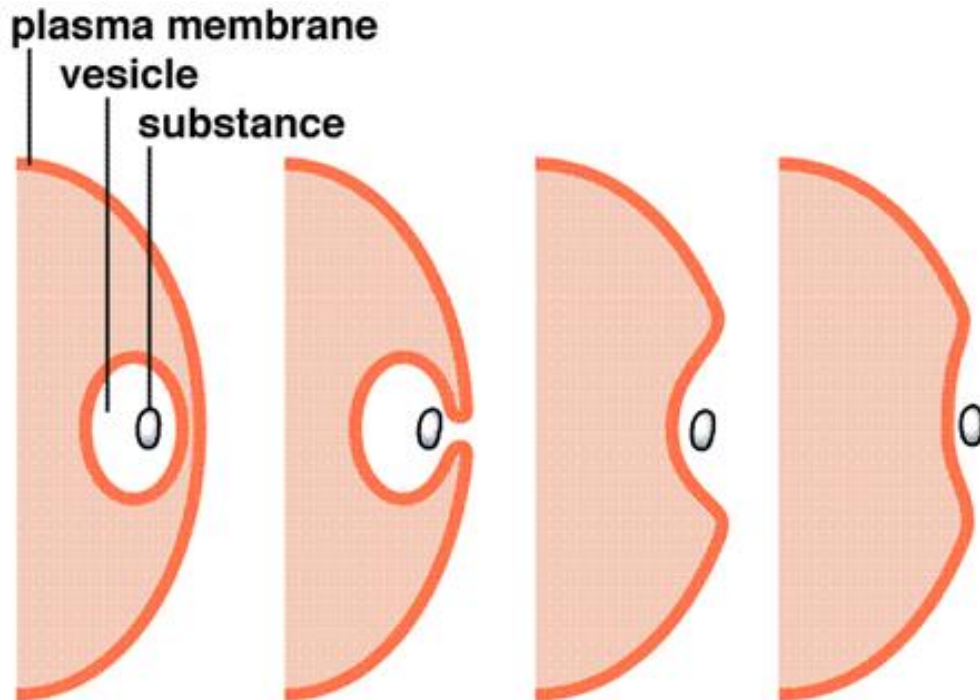


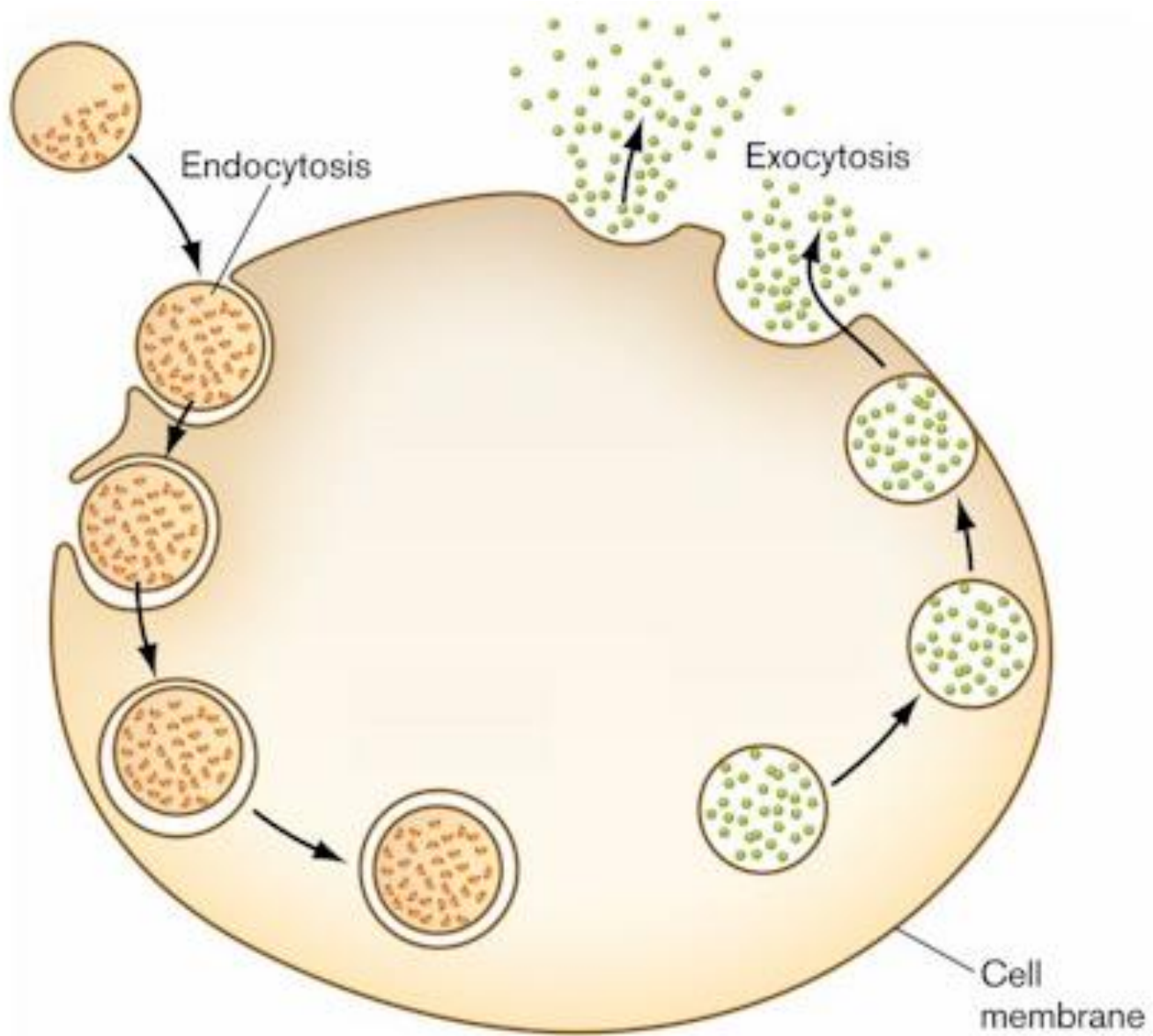
Exocytosis is the process by which the cell membrane removes material that is too large to pass through the membrane.

The material is surrounded by a membrane within the cell and then expelled by being pushed out of the cell.



Exocytosis





Animated Cellular Processes: Passive Transport and Active Transport

