

# WHAT IS PHOTOSYNTHESIS?



You will need to take notes.

Please take out your notebook or  
paper to take notes.

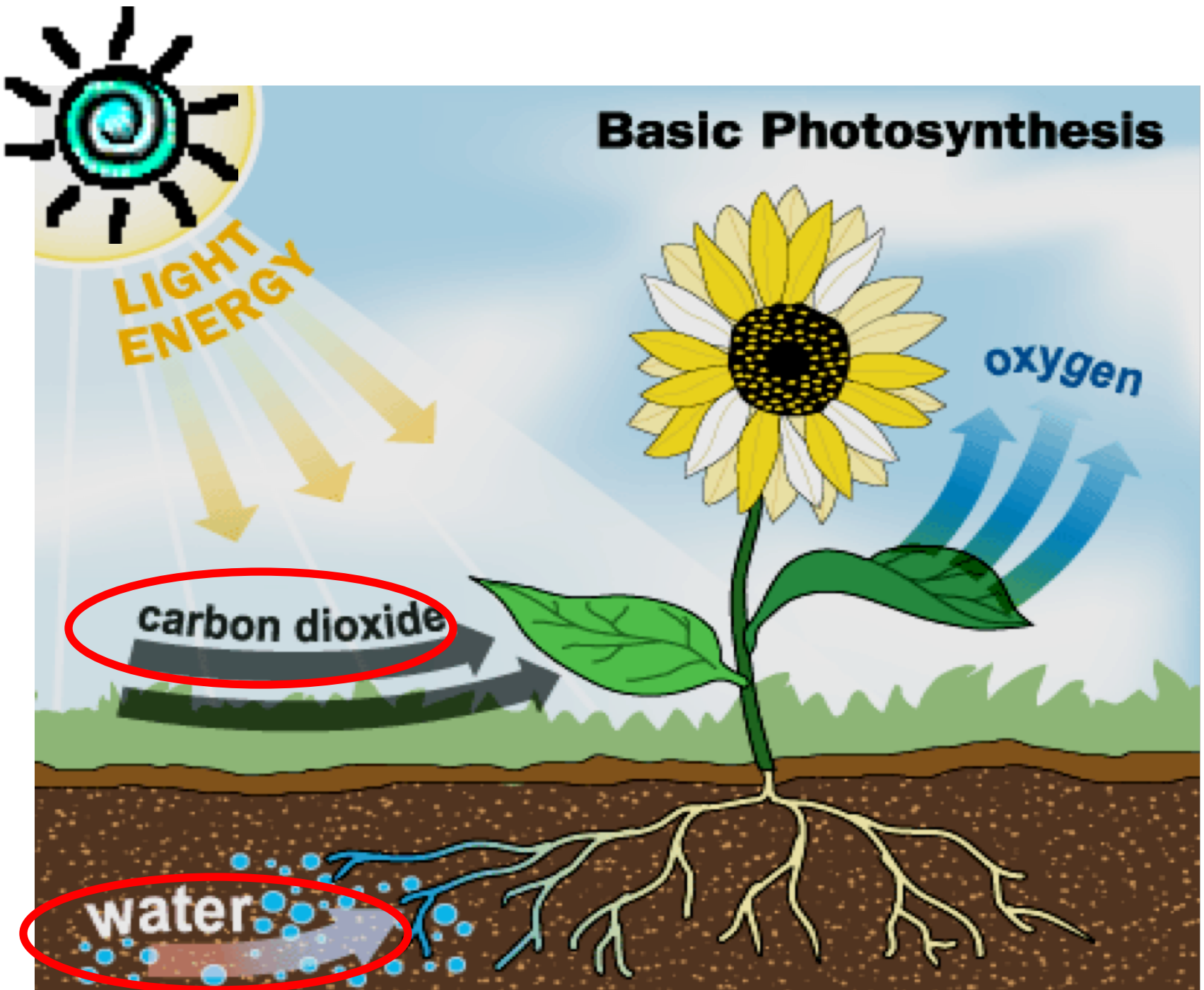


# **Photosynthesis**

**The food making process in green plants that uses sunlight.**



# Basic Photosynthesis

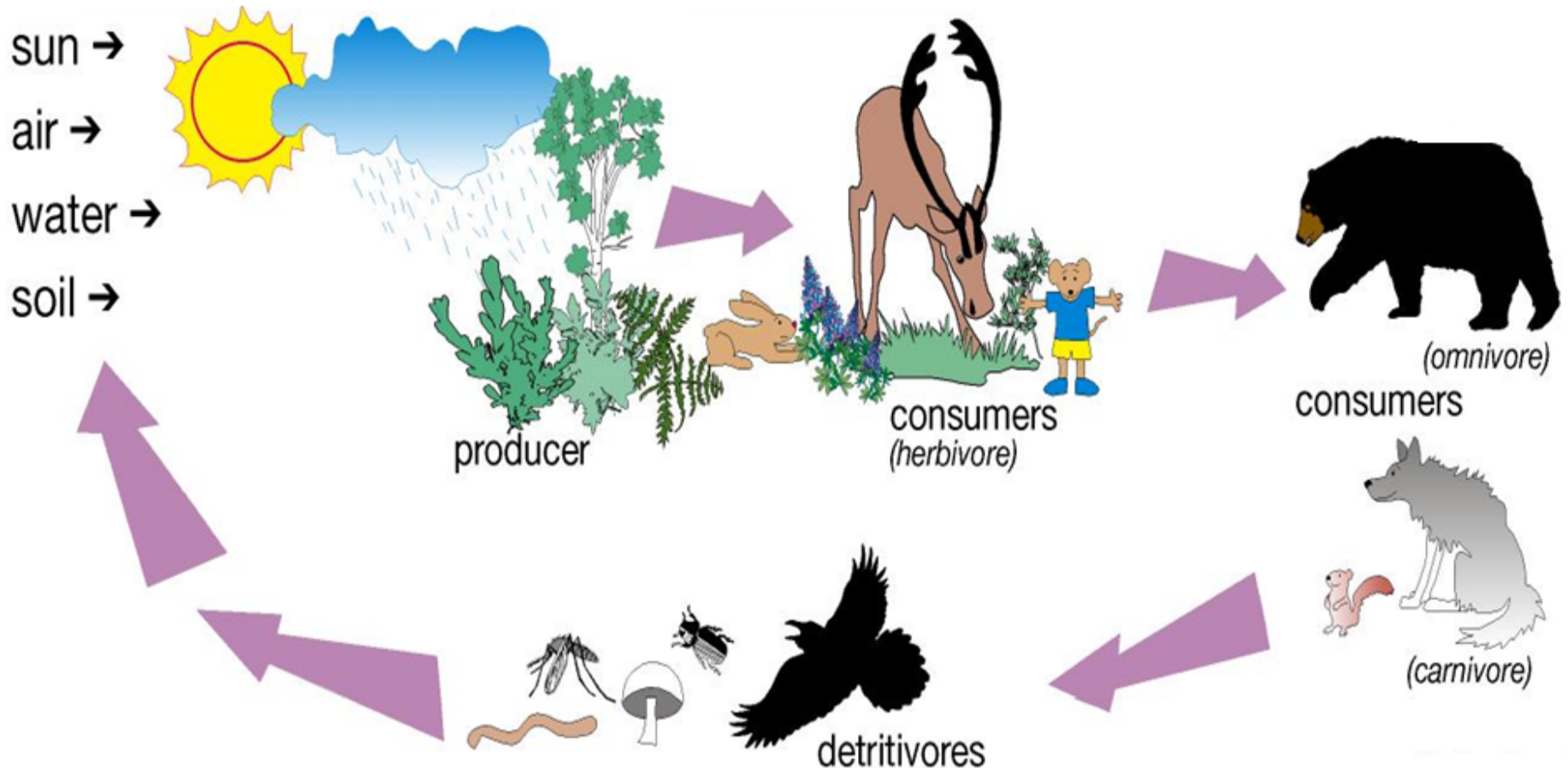




# Cell Energy (Photosynthesis and Respiration) Notes

## Energy:

- Energy for living things comes from **food**. Originally, the energy in food comes from the **sun**.



- Organisms that use **light energy** from the sun to produce food are called **autotrophs** (auto = self)  
Ex: **plants** and some microorganisms (some bacteria and protists)



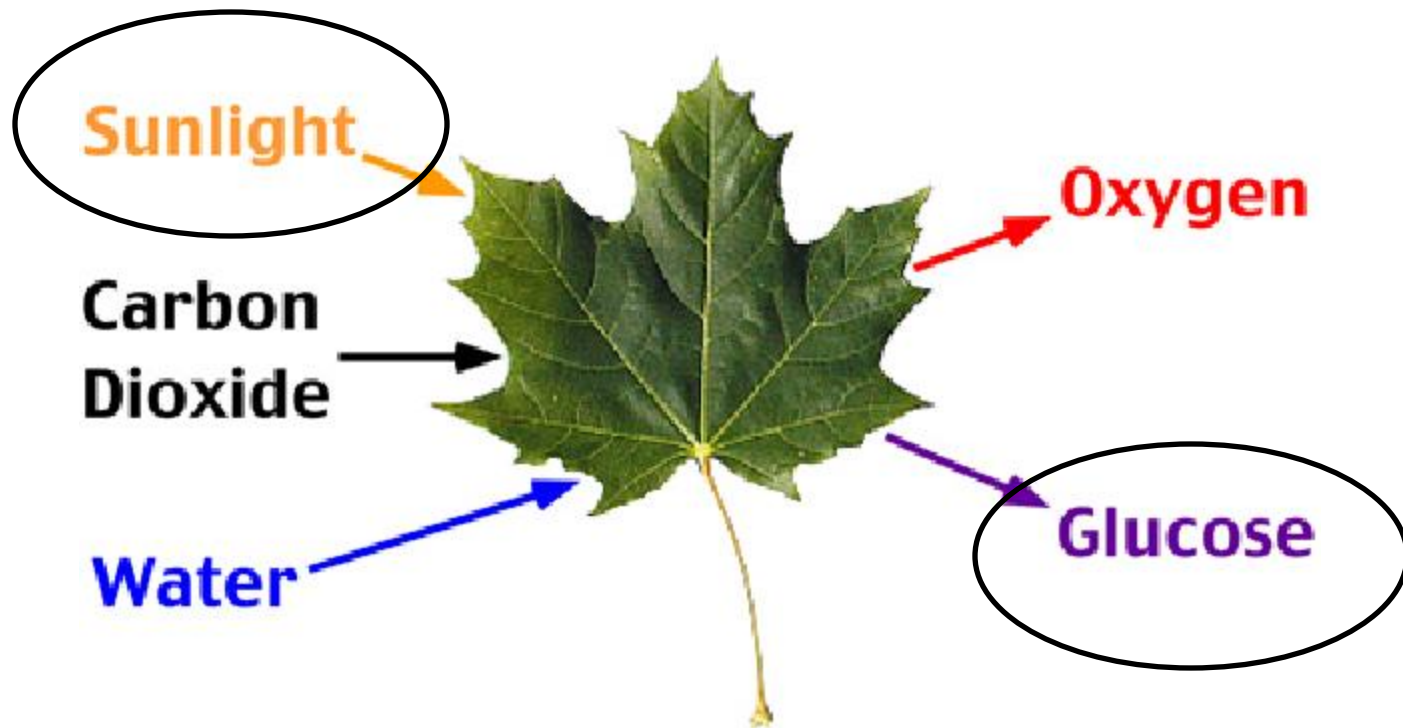




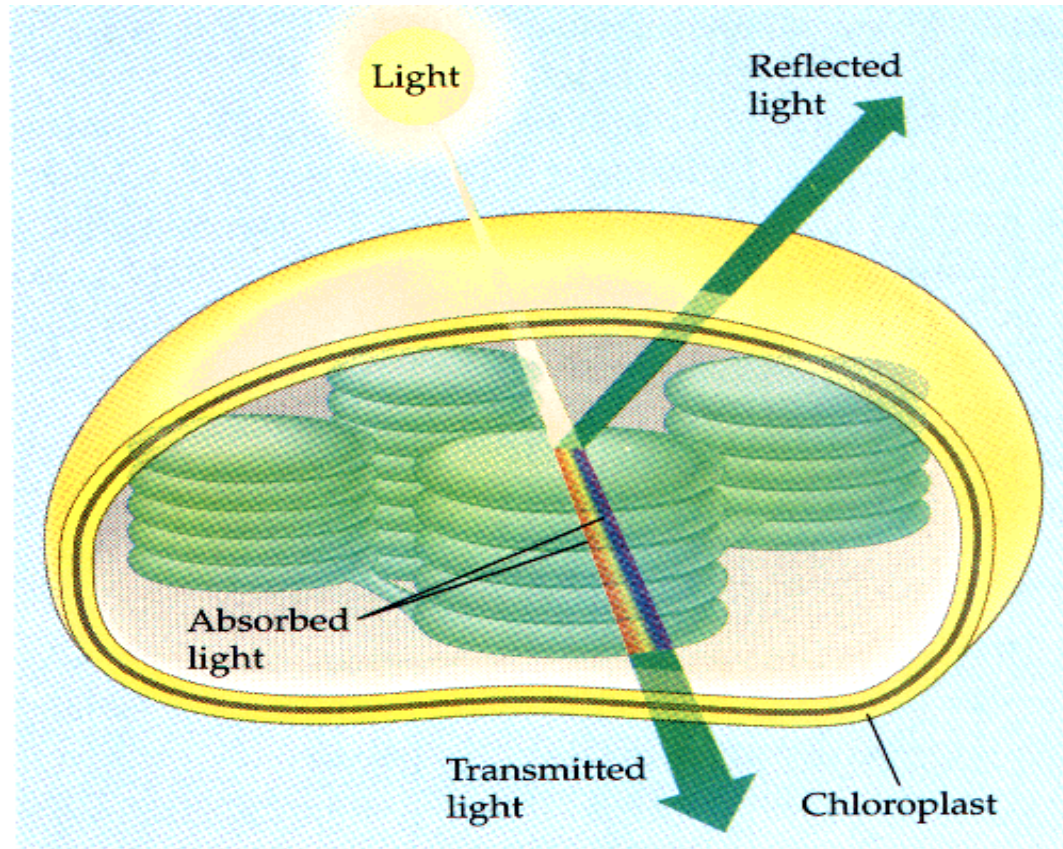


# Photosynthesis:

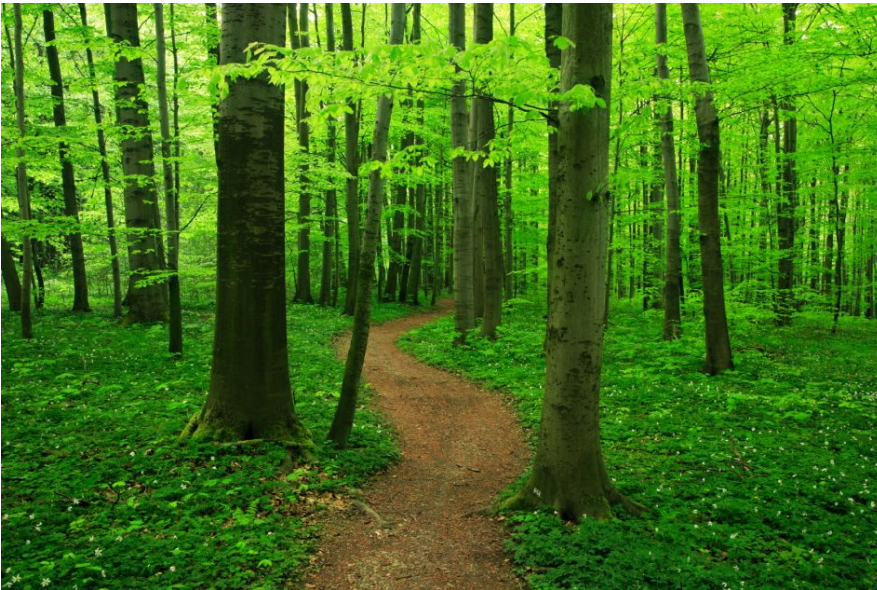
- Photosynthesis is the process by which the energy of sunlight is converted into the energy of glucose



- Photosynthesis occurs in the **chloroplasts** of plants
- Light absorbing compound is a **pigment**—pigments **absorb** some **wavelengths** of light and **reflect** others—the color our eyes see is the color that the pigment **reflects**



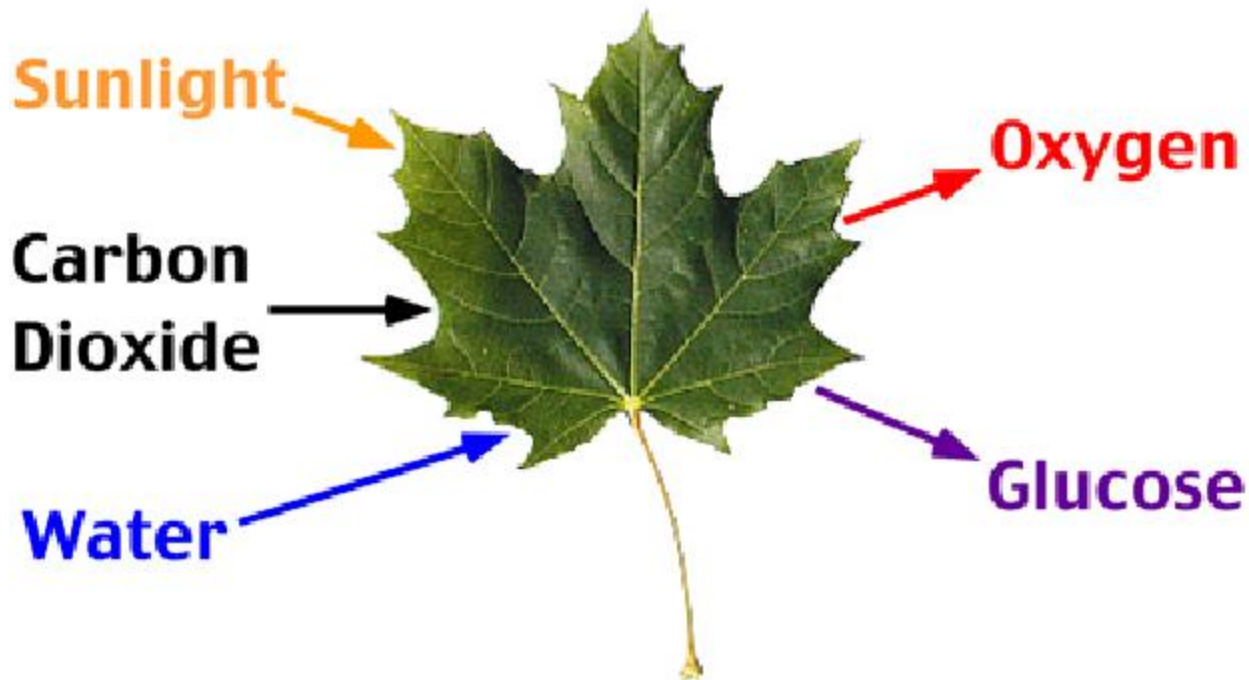
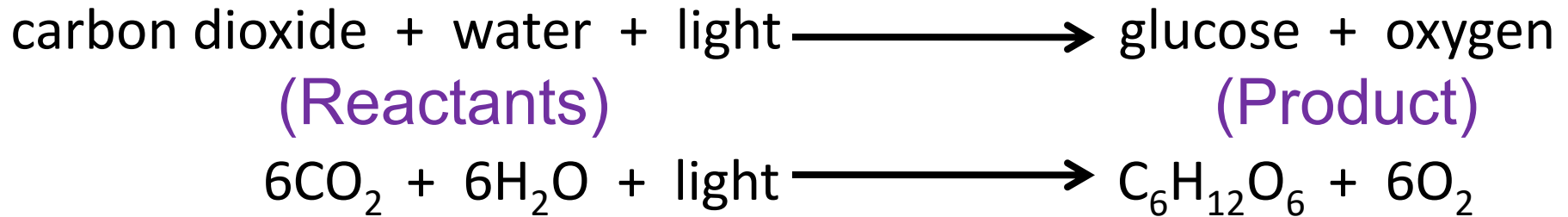
- **Chlorophyll** is the pigment inside the **chloroplast** that absorbs light for photosynthesis



**As the chlorophyll in leaves** decays in the autumn, the green color fades and is replaced by the oranges and reds of carotenoids.



- General formula for photosynthesis:



What is the equation for the chemical reaction of photosynthesis?



Light Energy



**What is the equation for the chemical reaction of photosynthesis?**

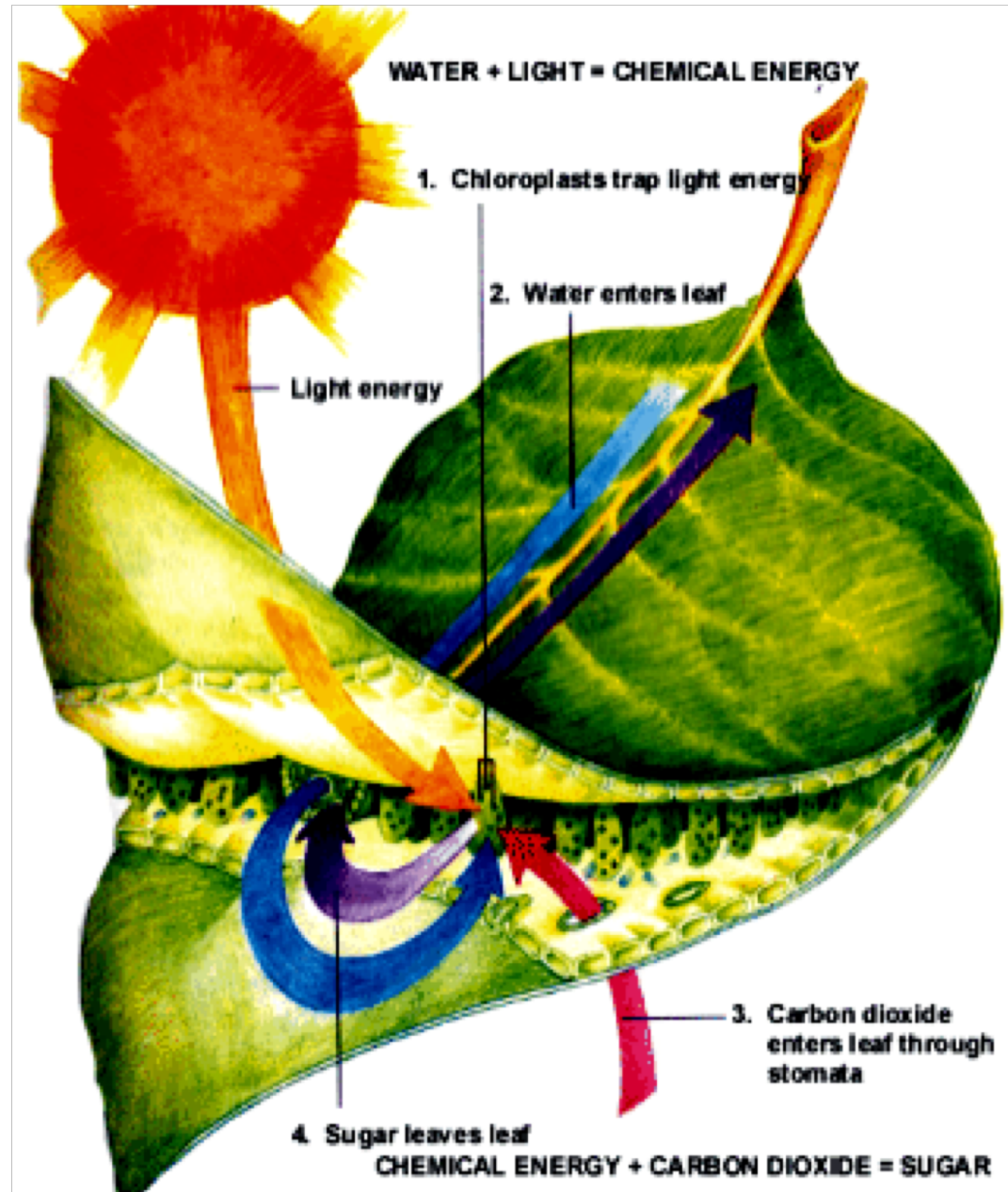


Six molecules of carbon dioxide react with six molecules of water to form 1 molecule of glucose and six molecules of oxygen.



# Photosynthesis

- **Chloroplasts** trap light energy.
- Water enters leaf through **xylem**.
- CO<sub>2</sub> enters leaf through **stomata**.
  
- Sugar exits leaf through **phloem**.
- Oxygen exits leaf through **stomata**.



# Note Set #1

1. What do plants need for photosynthesis?
2. What do plants make?
3. What traveled through stomata?
4. What organisms photosynthesize?

# Photosynthesis

- The process of changing light energy into chemical energy
- Energy is stored as sugar
- Occurs in plants, algae, some protists, and some bacteria
- Takes place in the chloroplasts of cells, using chlorophyll, the green pigment in plants



# What happens during photosynthesis?

- Chlorophyll of plants captures light energy and use that energy to change molecules of carbon dioxide and water into glucose and oxygen

# What happens during photosynthesis?

- Carbon dioxide enters the leaf through the stomata . Oxygen goes out the same way.
- CO<sub>2</sub> combines with water through a chemical reaction to make glucose (a sugar) and oxygen (a waste product)
- The sugar is moved through tubes (phloem) in the leaf to the roots, stems and fruits of the plants
- Some of the sugar is used right away by the plant for energy; some is stored as starch; and some is built into plant tissue

# Note Set #2

5. What is the equation for the chemical reaction of photosynthesis?
6. Photosynthesis--The process of changing \_\_\_\_\_ energy into \_\_\_\_\_ energy.
7. Energy is stored as \_\_\_\_\_.
8. Occurs in plants, algae, some protists, and \_\_\_\_\_ bacteria.
9. Takes place in the \_\_\_\_\_ of cells, using \_\_\_\_\_, the green pigment in plants.
10. What happens during photosynthesis? \_\_\_\_\_ of plants captures light energy and use that energy to change molecules of \_\_\_\_\_ and \_\_\_\_\_ into \_\_\_\_\_ and \_\_\_\_\_.

# Note Set #2

11. Carbon dioxide \_\_\_\_\_ the leaf through the stomata . \_\_\_\_\_ exits the leaf the same way.
12. \_\_\_\_\_ combines with \_\_\_\_\_ through a chemical reaction to make \_\_\_\_\_ (a sugar) and \_\_\_\_\_ (a waste product)
13. The sugar is moved through tubes ( \_\_\_\_\_ ) in the leaf to the \_\_\_\_\_, stems and \_\_\_\_\_ of the plants
14. Some of the \_\_\_\_\_ is used right away by the plant for energy; some is stored as \_\_\_\_\_; and some is built into \_\_\_\_\_



# Why is this important to us?

- Plants are producers, the first step in the food chain.
- We cannot make our own food; we must get our food from plants.

# Why is this important to us?

- The oxygen released during photosynthesis is necessary for almost all living things.
- Oxygen enters the human through the mouth and nose. Carbon dioxide exits our mouth and nose the same way.
- Carbon dioxide enters the leaf through stomata. Oxygen exits the leaf the same way.

# More about stomata—Transpiration

- Unfortunately for most plants, water vapor escapes from leaves through the stomata. This is called **transpiration**.
- **Guard cells** surround the stomata and close them at times to prevent too much water loss.

So photosynthesis is required for respiration, and vice versa.

<http://www.ftexploring.com/me/photosyn1.html>

# Note Set #3

15. Why is this important to us? Plants are \_\_\_\_\_, the first step in the food chain.
16. We cannot make our own food; we must get our food from \_\_\_\_\_.
17. The oxygen released during photosynthesis is necessary for almost all \_\_\_\_\_  
\_\_\_\_\_.



# Note Set #3

18. Oxygen \_\_\_\_\_ the human through the \_\_\_\_\_ and \_\_\_\_\_. Carbon dioxide \_\_\_\_\_ the mouth and nose same way.
19. Carbon dioxide \_\_\_\_\_ the leaf through the stomata . Oxygen \_\_\_\_\_ the leaf the same way.
20. So \_\_\_\_\_ is required for \_\_\_\_\_, and vice versa.

# What is Cellular Respiration?

The release of chemical energy for use by cells.

# What is Cellular Respiration?

- Once the energy that was in sunlight is changed into chemical energy (glucose) by photosynthesis, an organism has to transform the chemical energy into a form that can be used by the organism.
- This process is cellular respiration.
- We need respiration because we can't use sunlight to move our cells and bodies.

# Cellular Respiration

- The breakdown of glucose molecules to release energy
- Takes place in all organisms (though some organisms don't use oxygen. You will study those in high school biology.)
- Respiration, like photosynthesis, is a step-by-step process.



**What is the chemical equation for cellular respiration?**

**The chemical equation for respiration is:**



**Glucose + Oxygen  $\Rightarrow$  Carbon Dioxide + Water**

# Note Set #4

21. What is Cellular Respiration? The release of \_\_\_\_\_ for use by \_\_\_\_\_.
22. What is Cellular Respiration? Once the energy that was in sunlight is changed into chemical energy (\_\_\_\_\_) by \_\_\_\_\_, an organism has to transform the chemical energy into \_\_\_\_\_ that can be used by the organism.
23. This process is \_\_\_\_\_.
24. We need respiration because we can't use sunlight to move our cells and bodies.

# Note Set #4

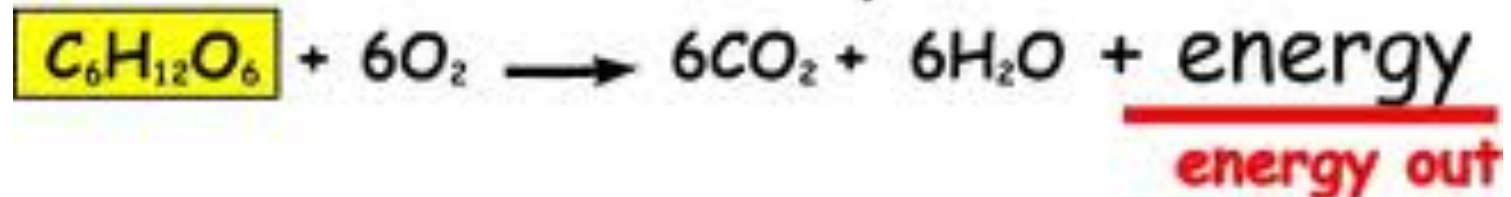
25. Cellular Respiration: The \_\_\_\_\_ of glucose molecules to \_\_\_\_\_ energy.
26. Cellular respiration takes place in \_\_\_\_\_ organisms (though some organisms don't use oxygen. You will study those in high school biology.)
27. Respiration, like \_\_\_\_\_, is a step-by-step process.
28. What is the chemical equation for cellular respiration? (Use words or chemical symbols.)

How do the chemical reactions of photosynthesis and respiration complement each other?

photosynthesis



aerobic respiration



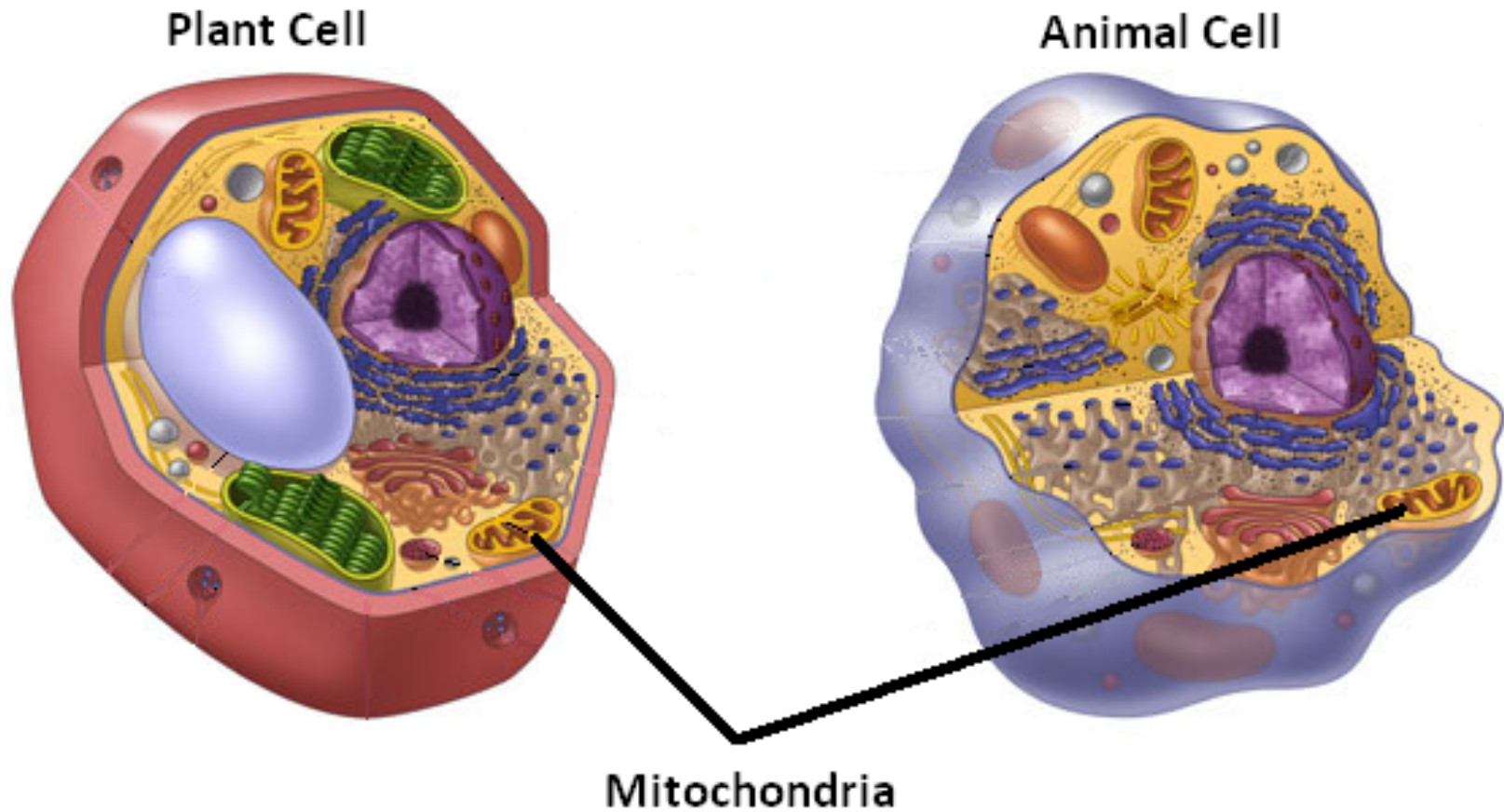
- The products of one process are the reactants of the other.
- Do you see the reversal?



# Note Set #5 –Review

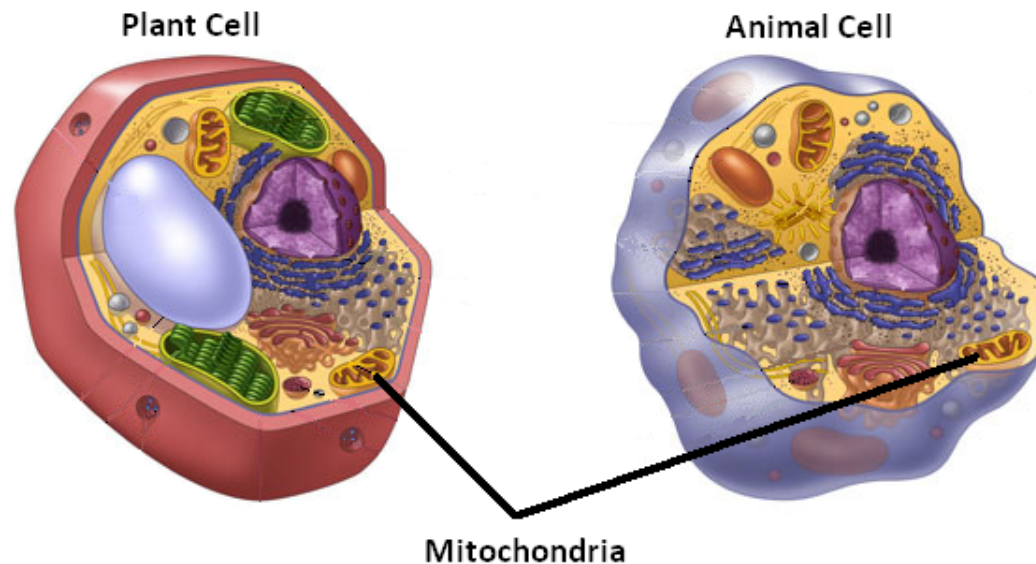
29. How do the chemical reactions of photosynthesis and respiration complement each other?
30. The \_\_\_\_\_ of one process are the \_\_\_\_\_ of the other.
31. Do you see the reversal?
32. What related questions do you still have?

- Respiration occurs in ALL cells and can take place either with or without oxygen present.

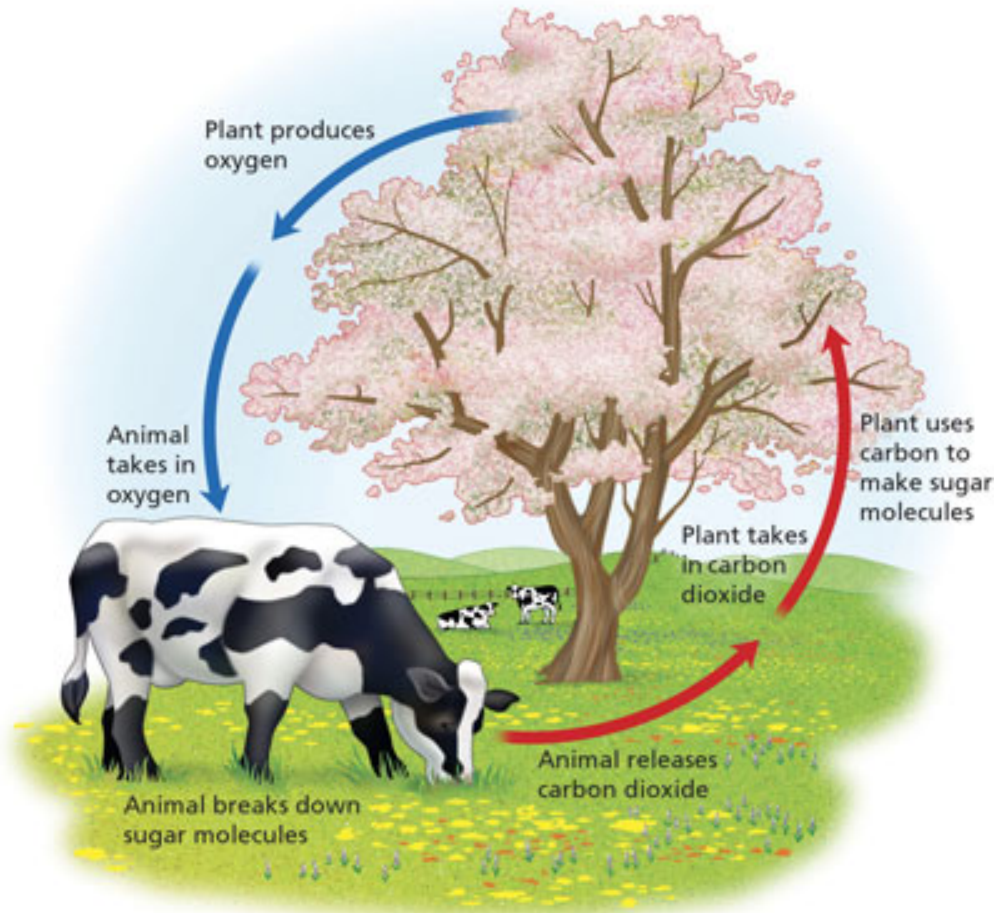


- **Energy Factory**

The main function of mitochondria is to produce energy for the cell. Cells use a special molecule for energy called **ATP**. ATP stands for *adenosine triphosphate*. The ATP for the cell is made within the mitochondria. You can think of the mitochondria as the **energy factory** or **power plant** of the cell.

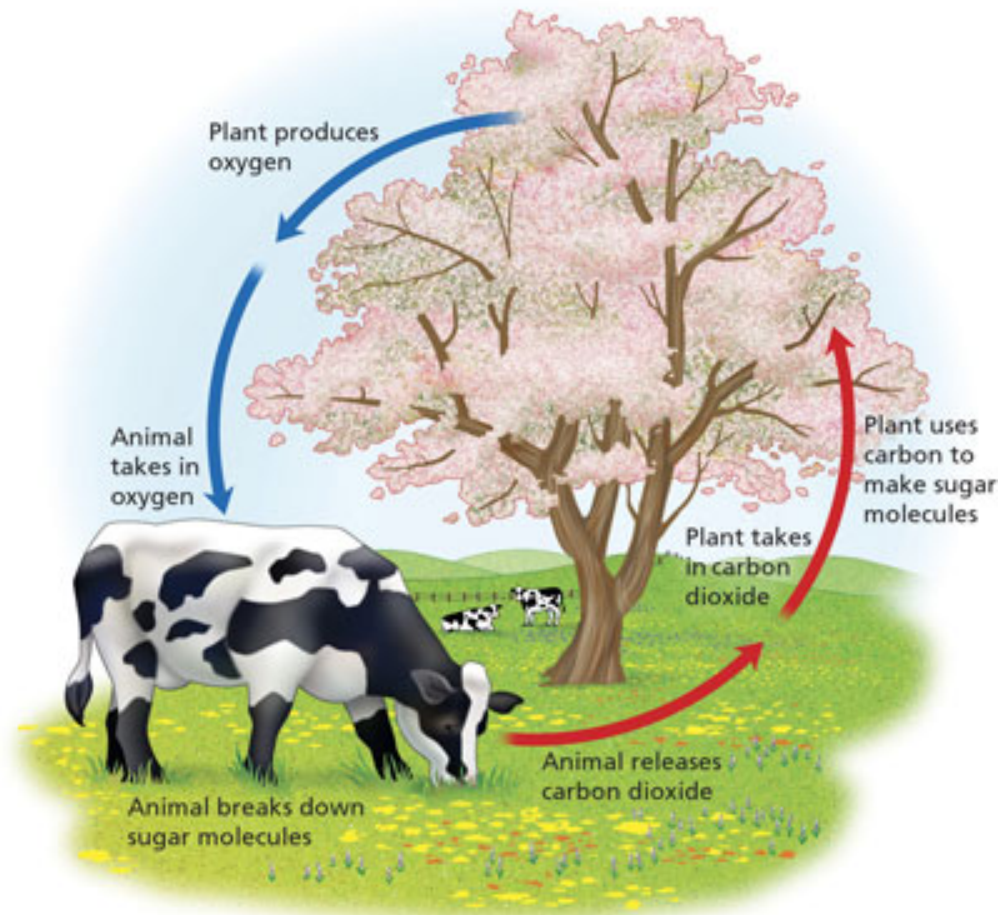


- Cells require a **constant source of energy** for life processes but keep only a **small amount** of **ATP** on hand. Cells can regenerate ATP as needed by using the **energy stored in foods** like glucose.



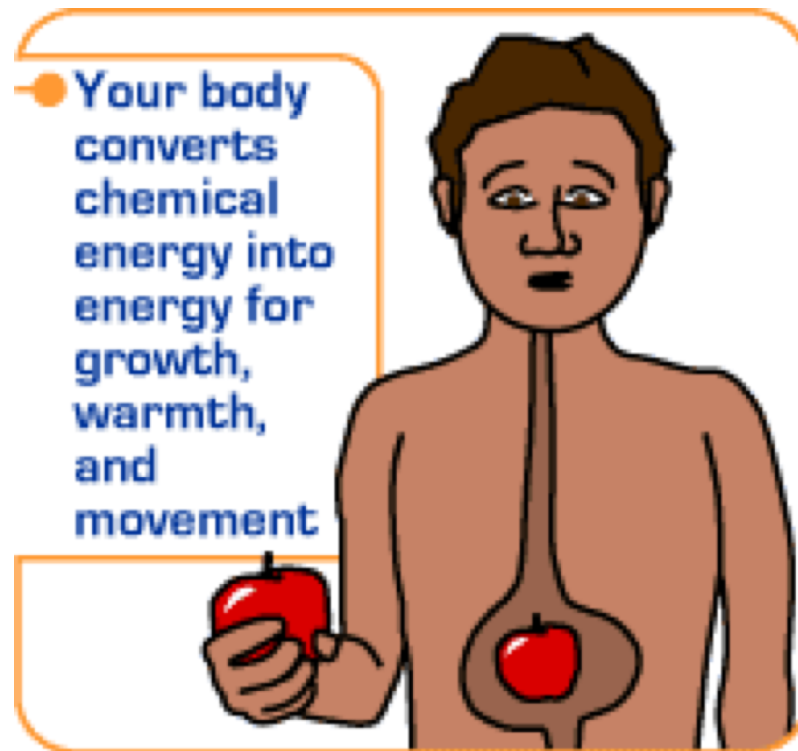


- The energy stored in glucose by photosynthesis is released by **cellular respiration** and repackaged into the energy of ATP.



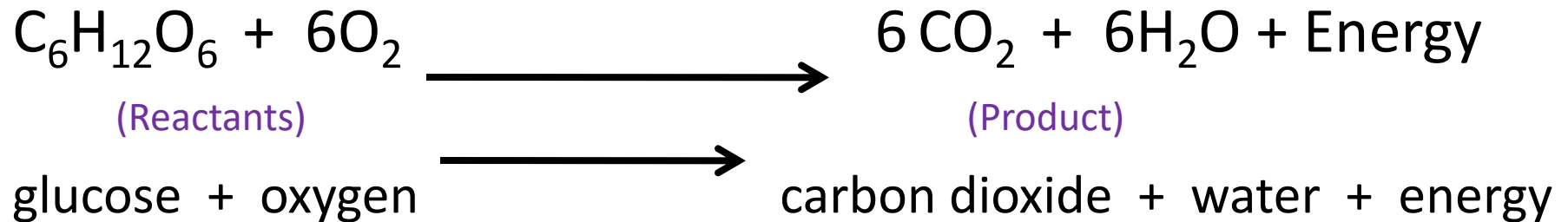
# Cellular Respiration: (2 kinds—Aerobic and Anaerobic)

- Cellular respiration is the process by which the energy of **glucose** is **released** in the cell to be used for life processes (**movement, breathing, blood circulation**, etc...)



# Aerobic Respiration: requires oxygen

- Occurs in the mitochondria of the cell
- General formula for aerobic respiration:



**Anaerobic Respiration:** occurs when no oxygen is available to the cell (2 kinds: Alcoholic and Lactic Acid)

- Also called fermentation which occurs when cells release energy from food without using oxygen.
- There are 2 types of fermentation: Alcohol and Lactic Acid

- Alcoholic fermentation—occurs in bacteria, yeast, and plants.
- It produces alcohol, carbon dioxide and a small amount of energy.



- **Lactic acid** fermentation—occurs in **muscle cells**

Lactic acid is produced in the muscles during rapid **exercise** when the body **cannot** supply enough **oxygen** to the **tissues**—causes **burning sensation** in muscles

