

# How Do Plants Make Food?

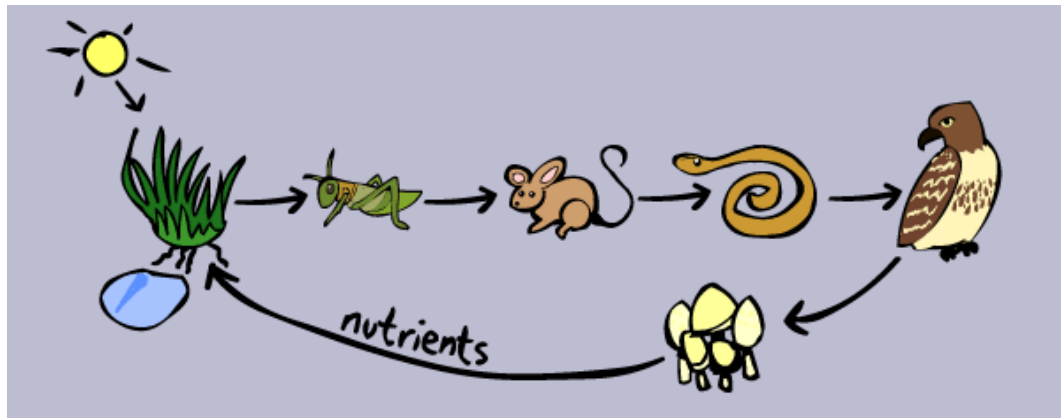
## Lesson 8a



# How do plants make food?

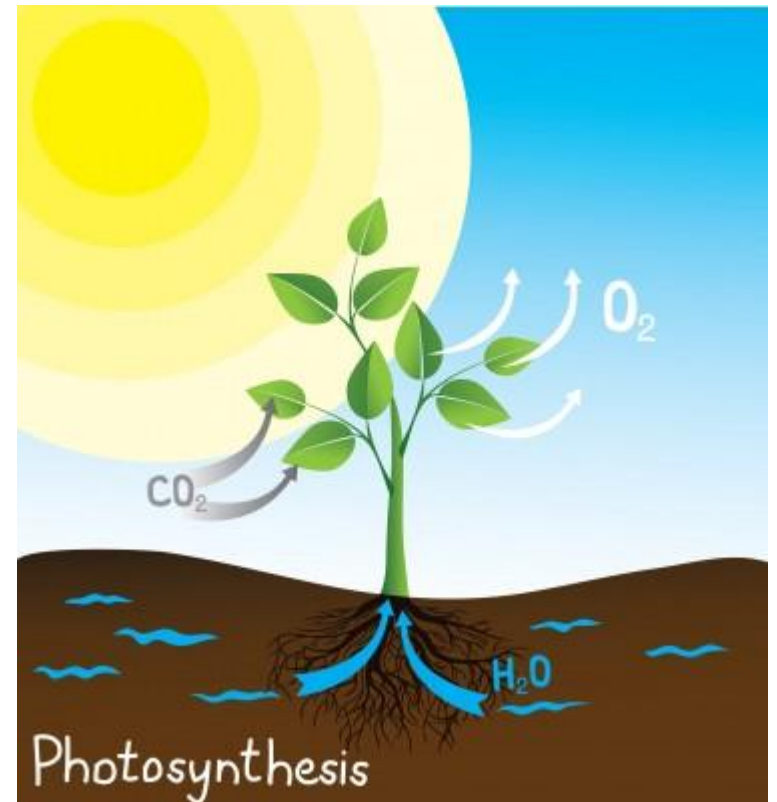
- All plants make food in a process called **photosynthesis**
  - Why is this important?
    - To live, people need the food that plants make
    - Much of the food we eat comes directly from plants
    - The rest comes from animals that eat plants or that feed on plant-eating animals

## The Food Chain



# The Process of Photosynthesis

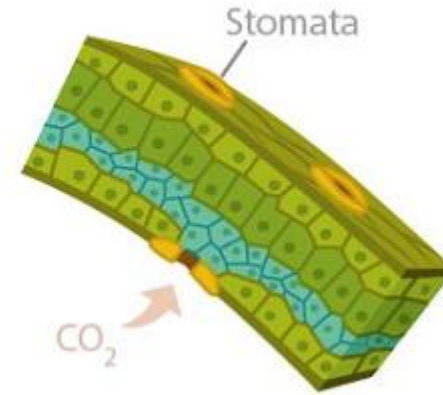
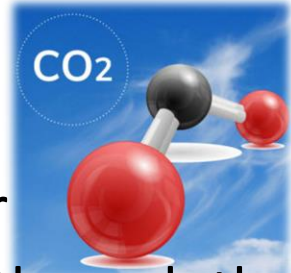
- During photosynthesis, plants use sunlight to turn carbon dioxide ( $\text{CO}_2$ ) and water ( $\text{H}_2\text{O}$ ) into simple sugars (food) and oxygen ( $\text{O}_2$ )



# Where does the energy, CO<sub>2</sub>, H<sub>2</sub>O come from?

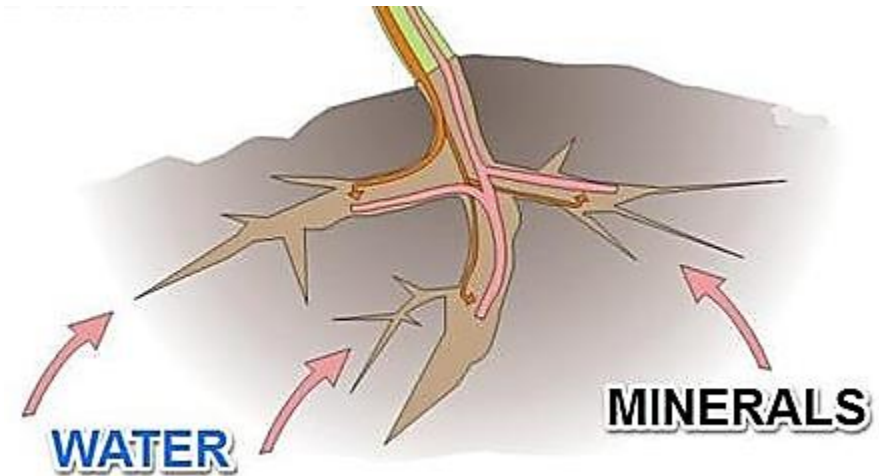
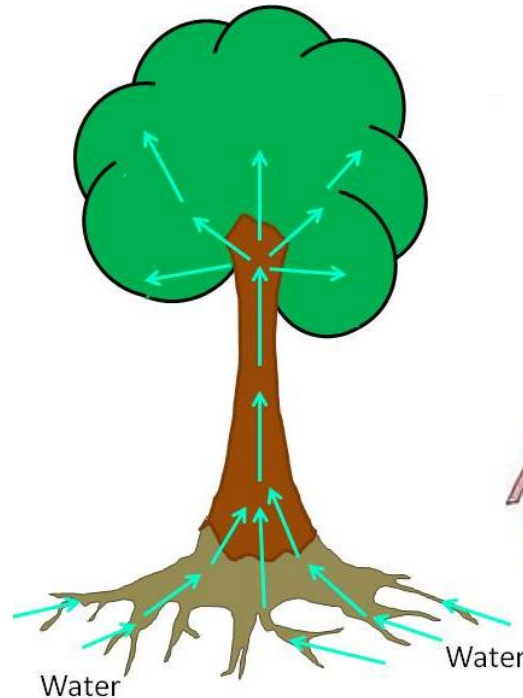
- Carbon dioxide

- Come from the air
- Enters the leaves through the **stomata**



- Water

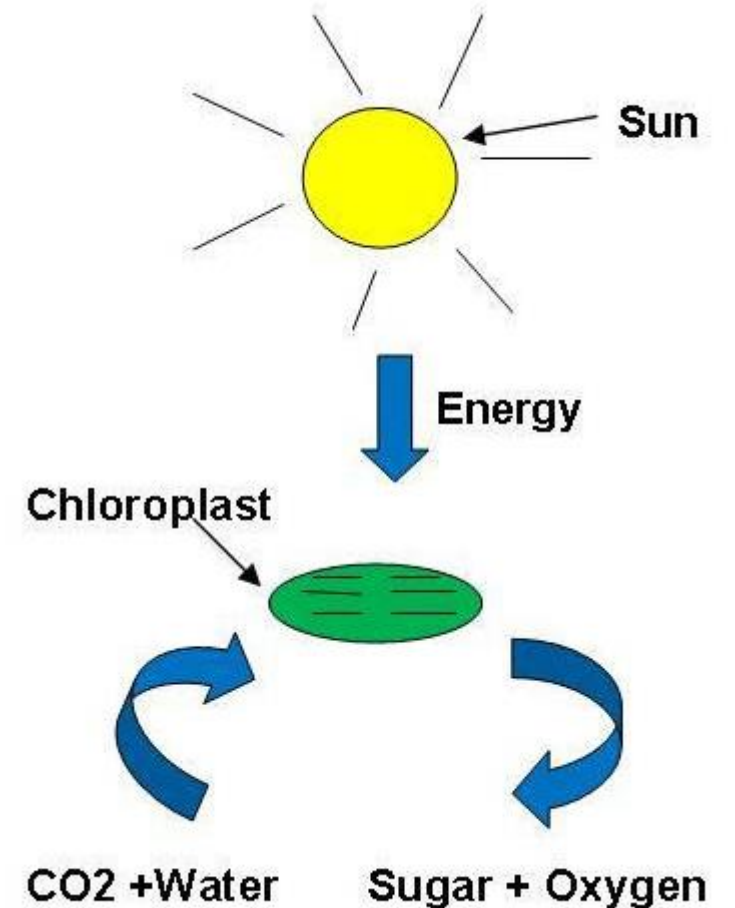
- Comes from the roots through the **xylem**
- Minerals absorbed by the roots also help the plant make food



# Where does the energy, CO<sub>2</sub>, H<sub>2</sub>O come from?

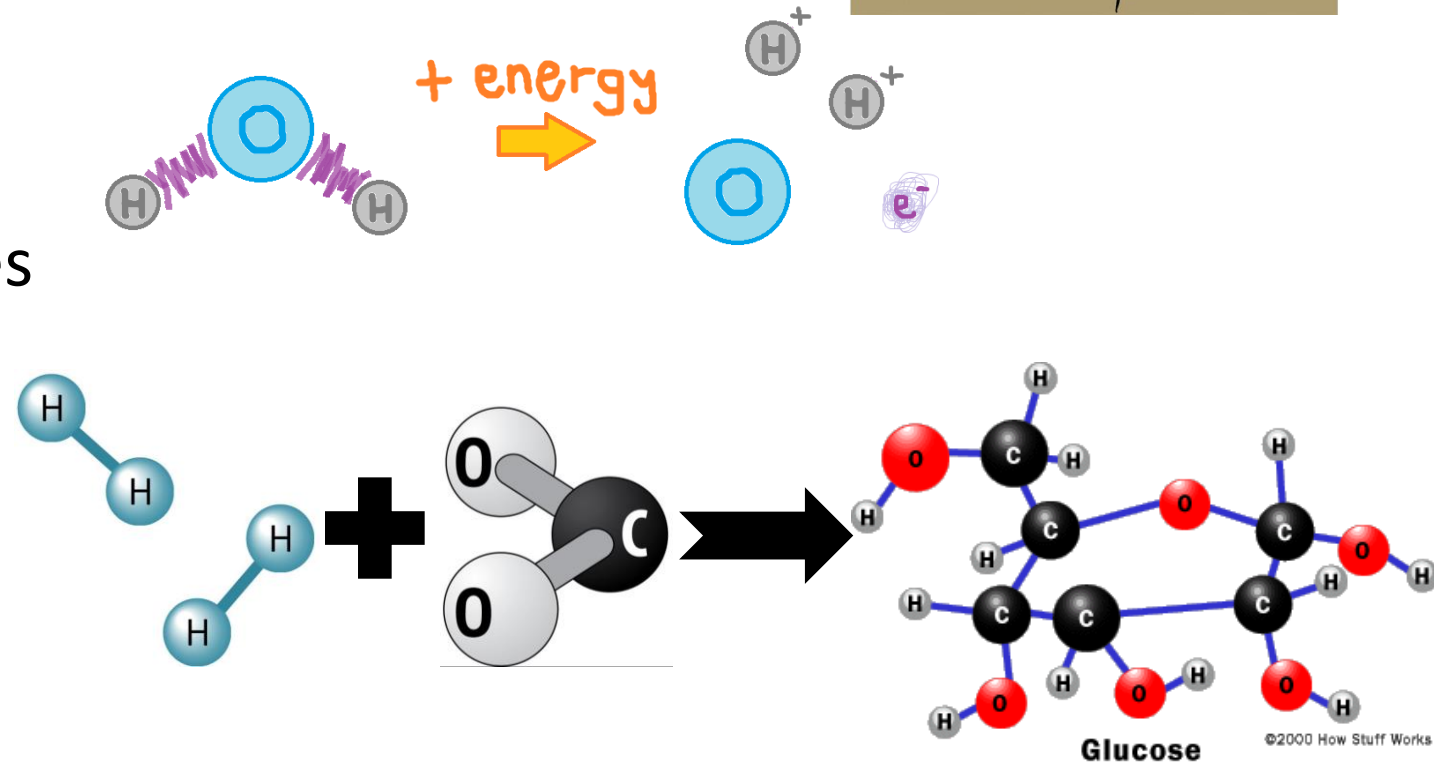
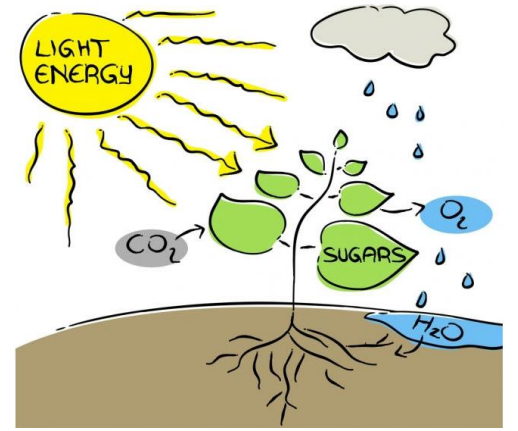
- Energy

- The sunlight supplies the energy for **photosynthesis**
- Plants get the energy they need when light shines on their **chloroplasts**
- **Chloroplasts** are organelles in plant cells where **photosynthesis** takes place
- **Chloroplasts** contain a green pigment called **chlorophyll**
- The green parts of plants, especially the **leaves**, contain many **chloroplasts**
- When **sunlight** hits **chloroplasts** in the leaves, the **chlorophyll** absorbs the light



# What do plants use the energy for?

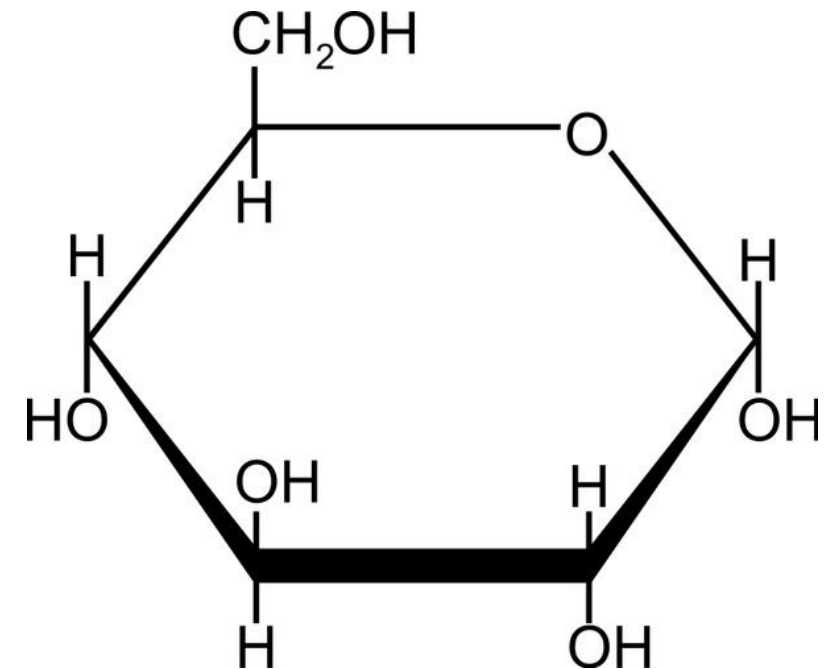
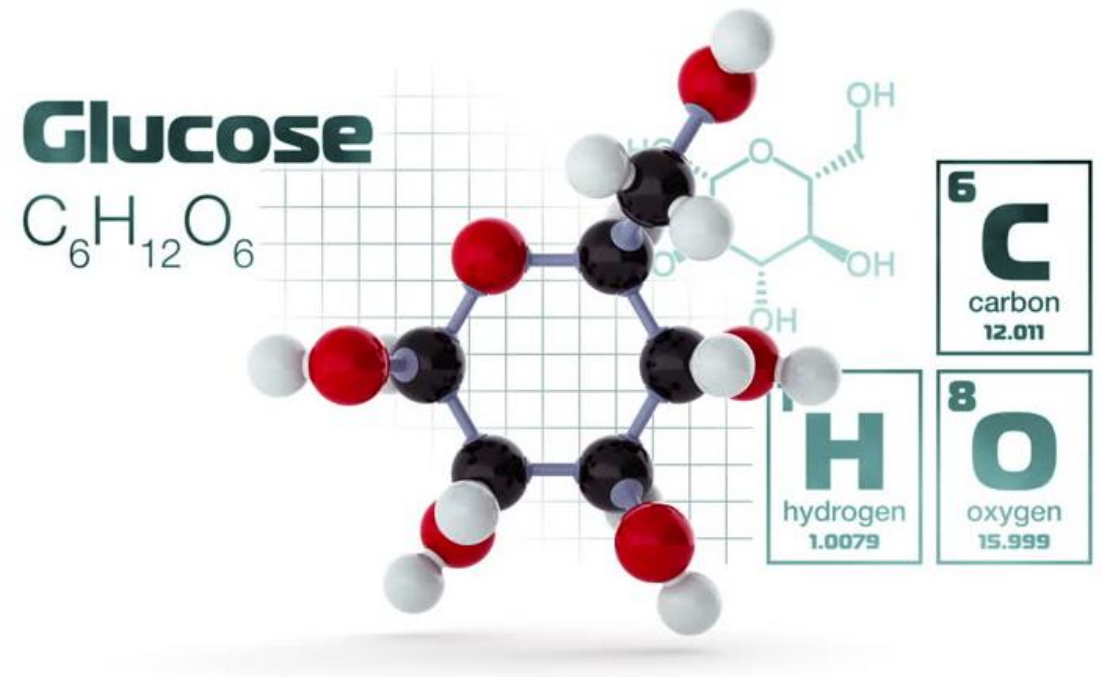
- Plants use the energy to split water into hydrogen ( $H_2$ ) and oxygen ( $O_2$ )
- The oxygen leaves the plant through the **stomata** and goes into the air
- The hydrogen combines with the carbon dioxide to make simple sugar
- Plants store the energy of sunlight in the sugar as chemical energy





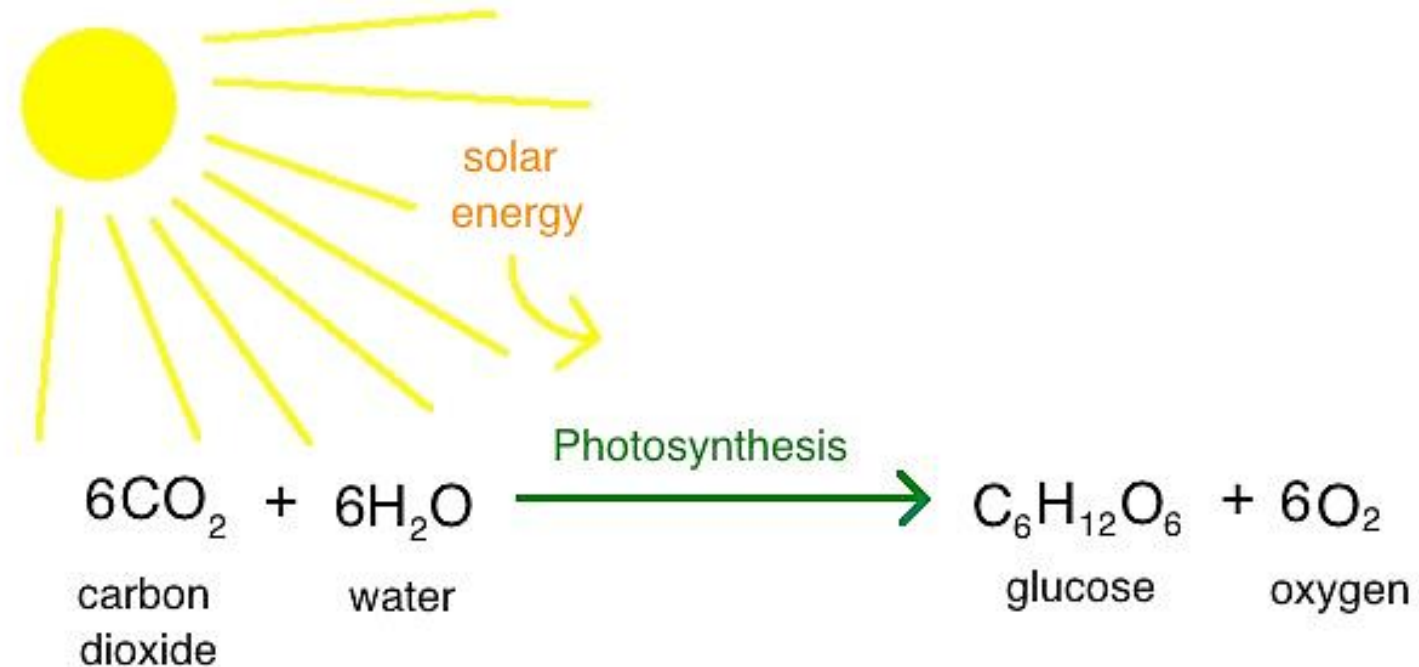
# Chemical Energy

- Energy that is stored in the bonds that hold a chemical's molecules together
- When the chemical breaks apart, the energy is released
- **Glucose** is the **simple sugar** that plants make during **photosynthesis**
- **Glucose** contains **stored chemical energy**
- Plants and animals that eat plants use that **stored energy**



# The Chemical Equation for Photosynthesis

- A chemical equation can be written to show how photosynthesis works
- In an equation, the left side and the right side are equal





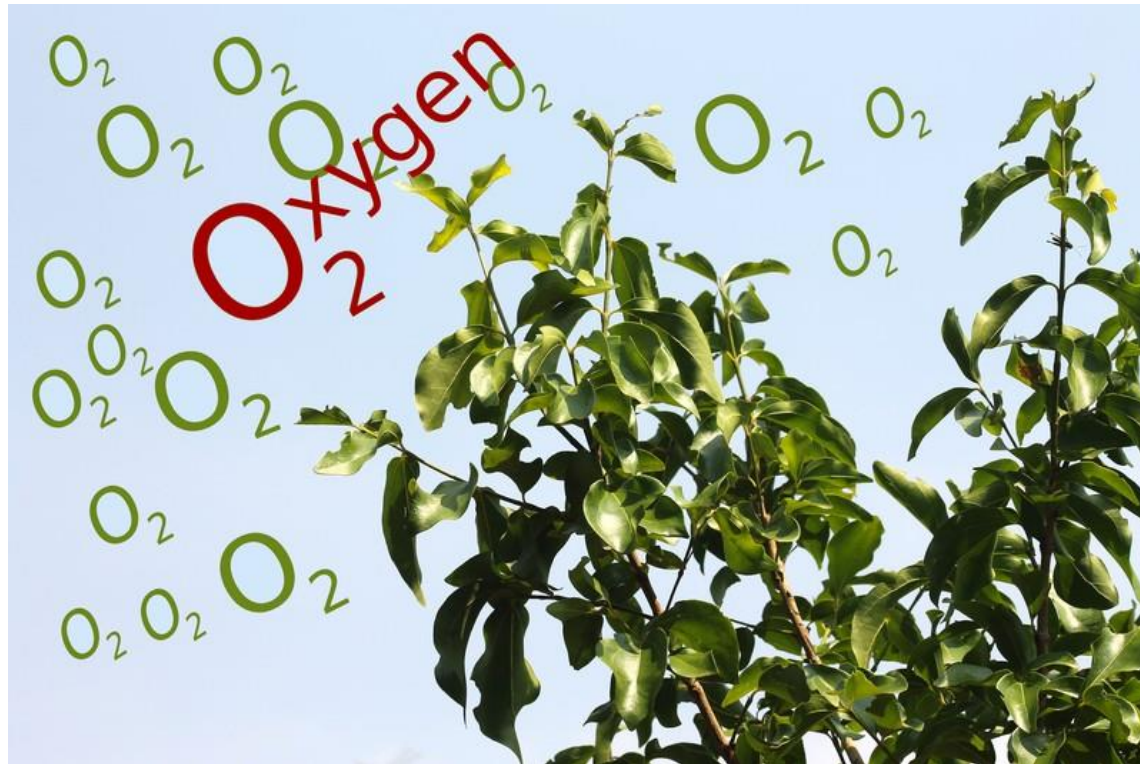
# Chemical Equation for Photosynthesis



- The substances to the left of the arrow are those needed (**reactants**) for photosynthesis
  - Carbon dioxide, water, and sunlight
- The substances to the right of the arrow are the **products** of photosynthesis
  - Glucose (simple sugar), oxygen

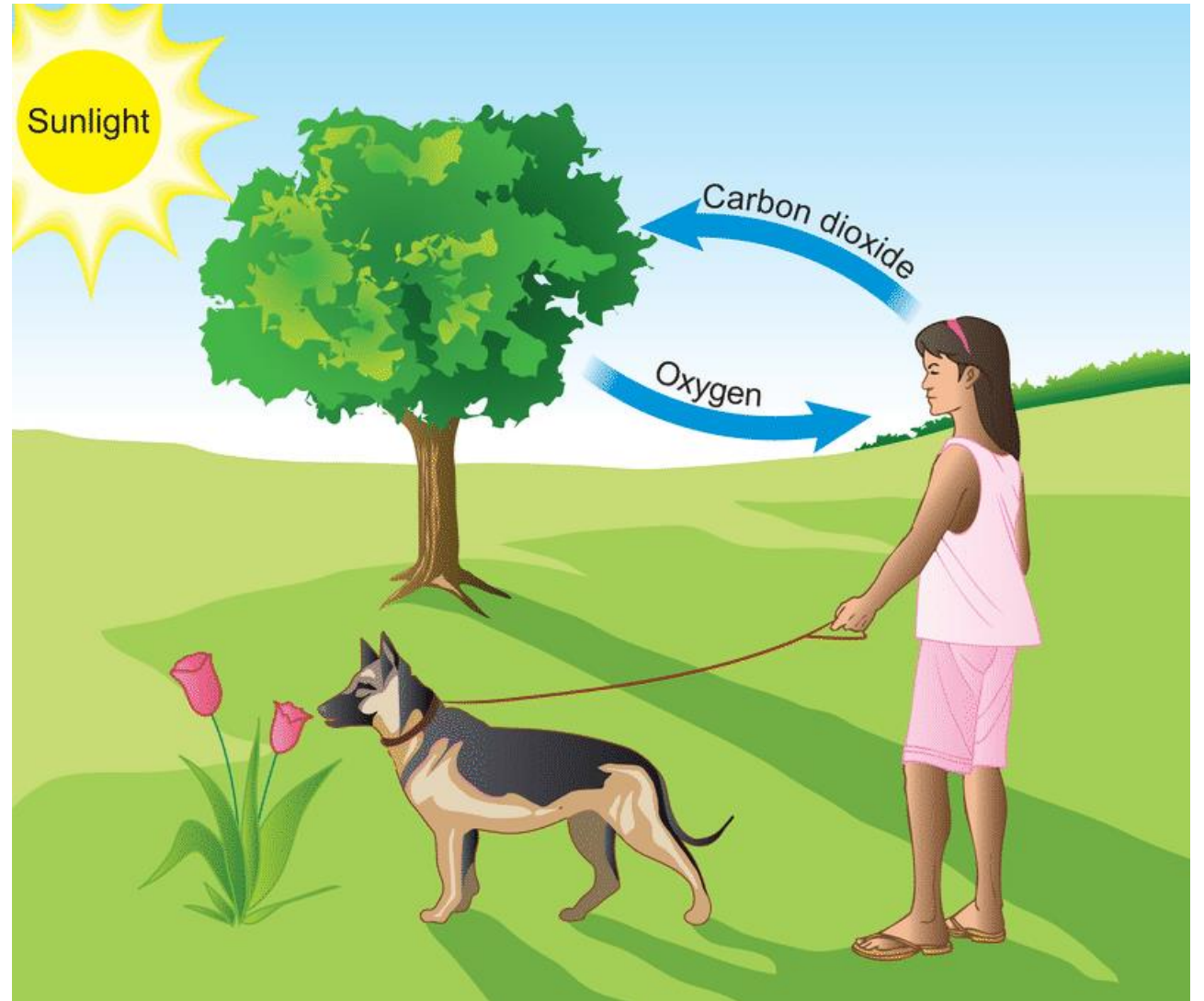
# How Do Plants Give Off Oxygen?

Lesson 8b



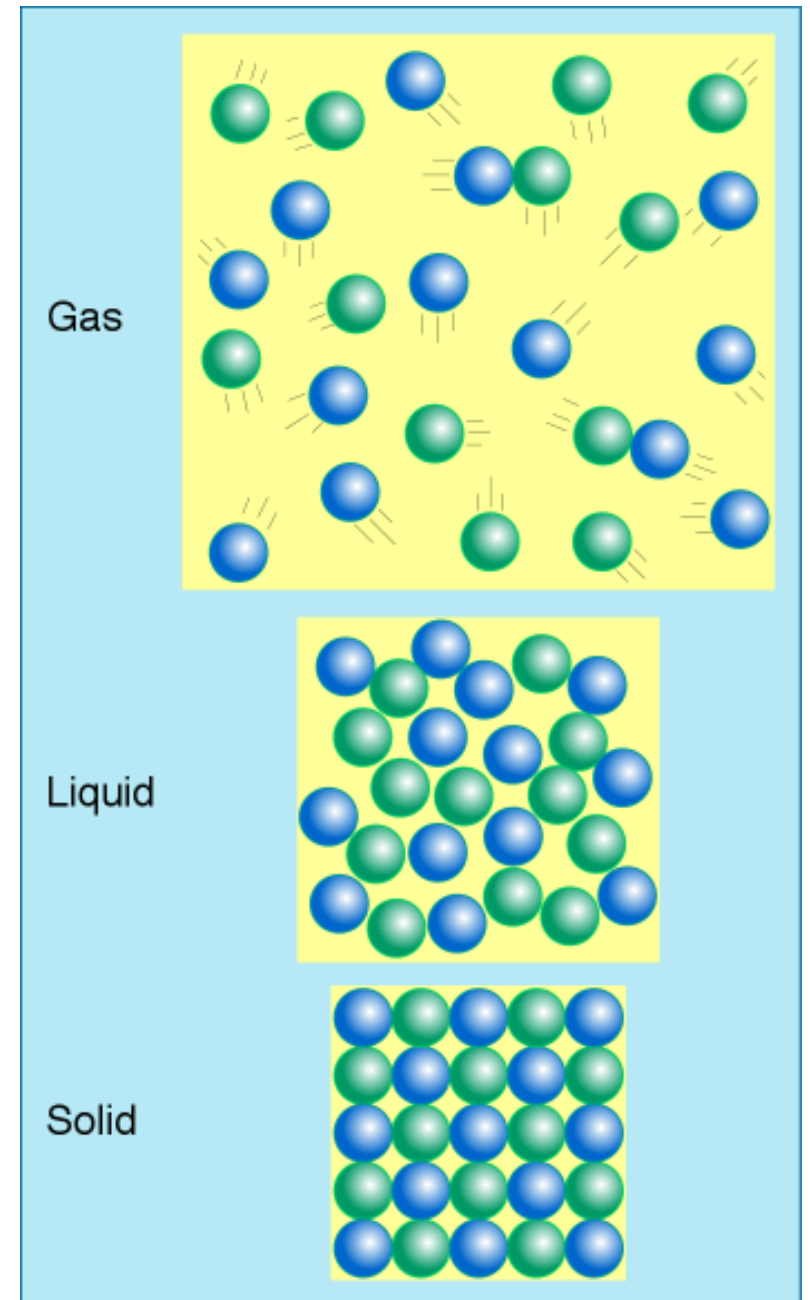
# How do plants give off oxygen?

- Oxygen ( $O_2$ ) is a gas that all living things need
- We breathe in oxygen thousands of times each day
- Most of that oxygen was released by plants during photosynthesis



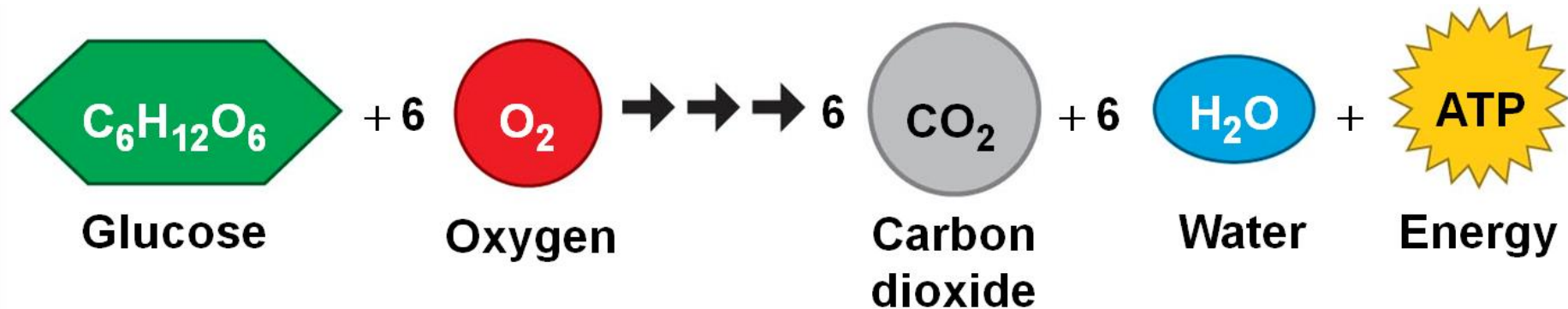
# Properties of a Gas

- Gases make up the air around you
- Why can you not see or hold air?
  - The tiny, invisible particles of the gases in air are far apart
  - There is a lot of space between them
  - The particles move around quickly
  - You cannot hold or touch a gas such as air
  - In a solid, such as your desk, the particles are packed tightly together
    - They hardly move which is why you can touch your desk



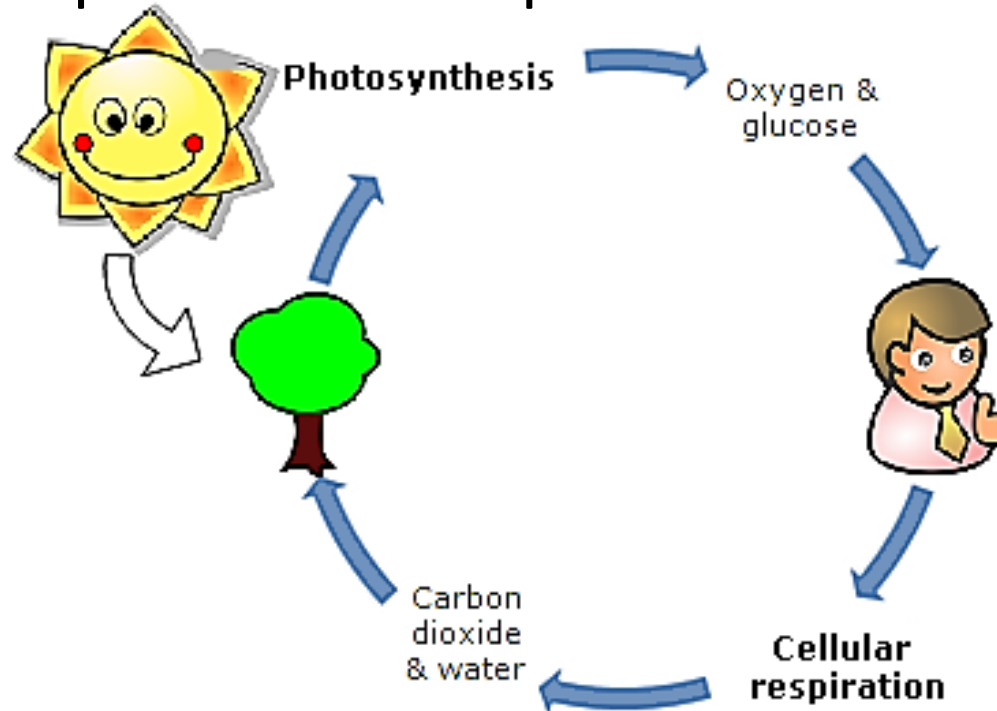
# The Importance of Oxygen

- Two of the most important gases in the air that we breathe are carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>)
- Oxygen is important to most living things
  - Used to break down food to release the chemical energy stored in it (cellular respiration)



# The Importance of Oxygen cont'd

- **Photosynthesis** happens only in plants
- **Respiration** happens in both plants and animals
- **Cellular respiration** is a special low-temperature kind of burning that breaks down glucose

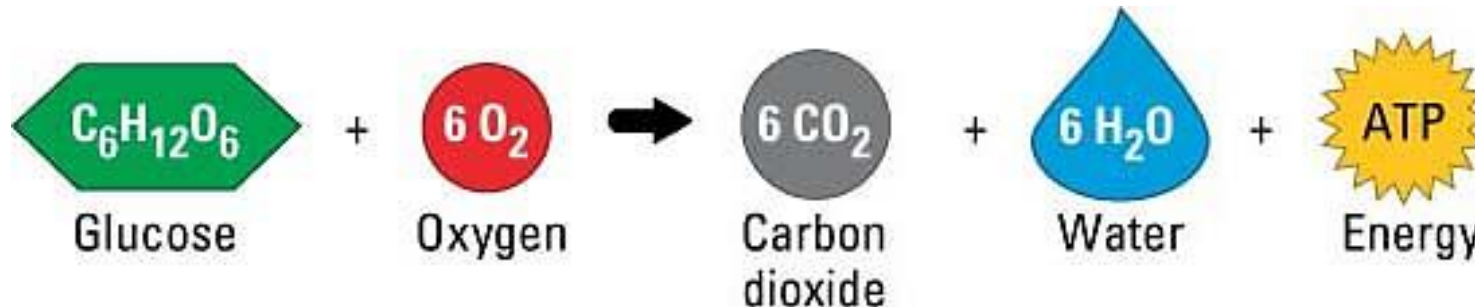




# Glucose & Cellular Respiration

## The Importance of Oxygen

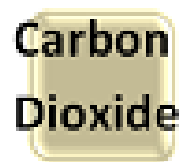
- Glucose is the simple sugar that plants make during photosynthesis
- Glucose is also our body's main source of energy
- We get that energy when our cells burn sugars and starches that come from plants we eat
- Our body cells use oxygen to break apart the sugar molecules
- During cellular respiration, oxygen combines with hydrogen to make water and carbon dioxide is released as a waste product



# Cellular Respiration vs Photosynthesis

What do you notice about the two equations?

## Cellular Respiration Equation:

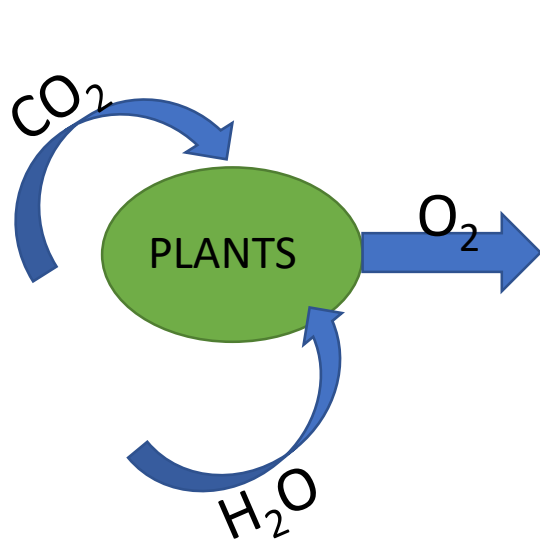


## Photosynthesis Equation:

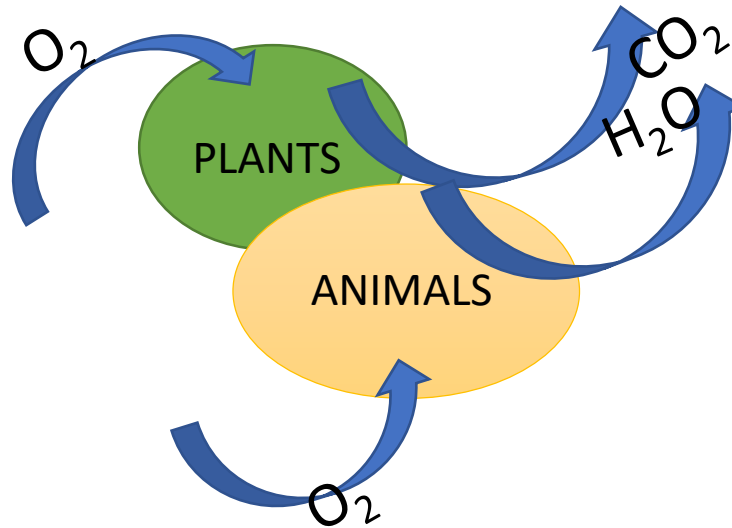


# Cellular Respiration & Photosynthesis

- Photosynthesis and cellular respiration are part of the carbon-oxygen cycle
- The cycle is necessary for life on Earth

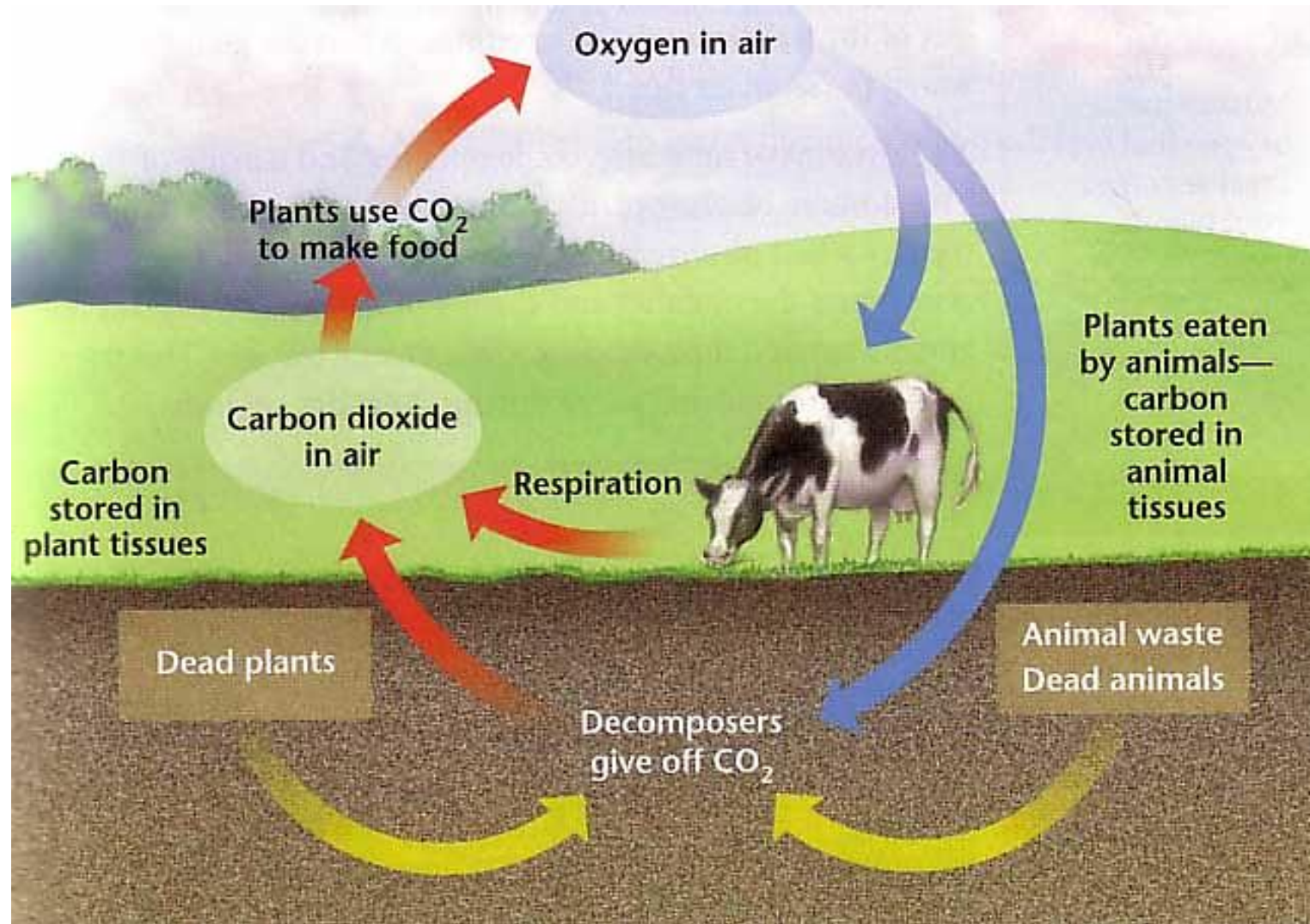


- Plants take in carbon dioxide and water and give off oxygen during photosynthesis

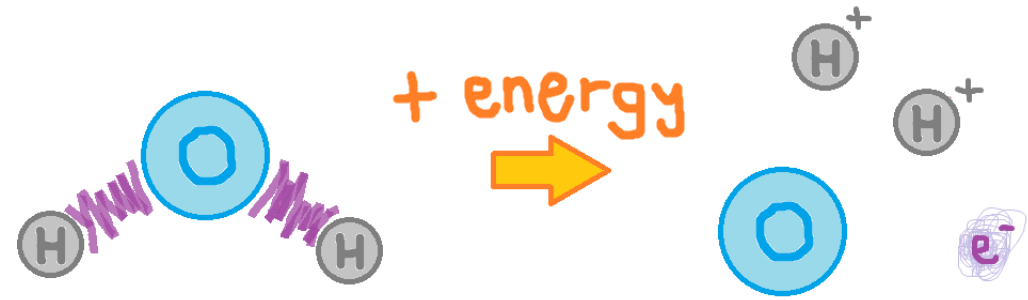


- Plants and animals take in oxygen and give off carbon dioxide and water during cellular respiration

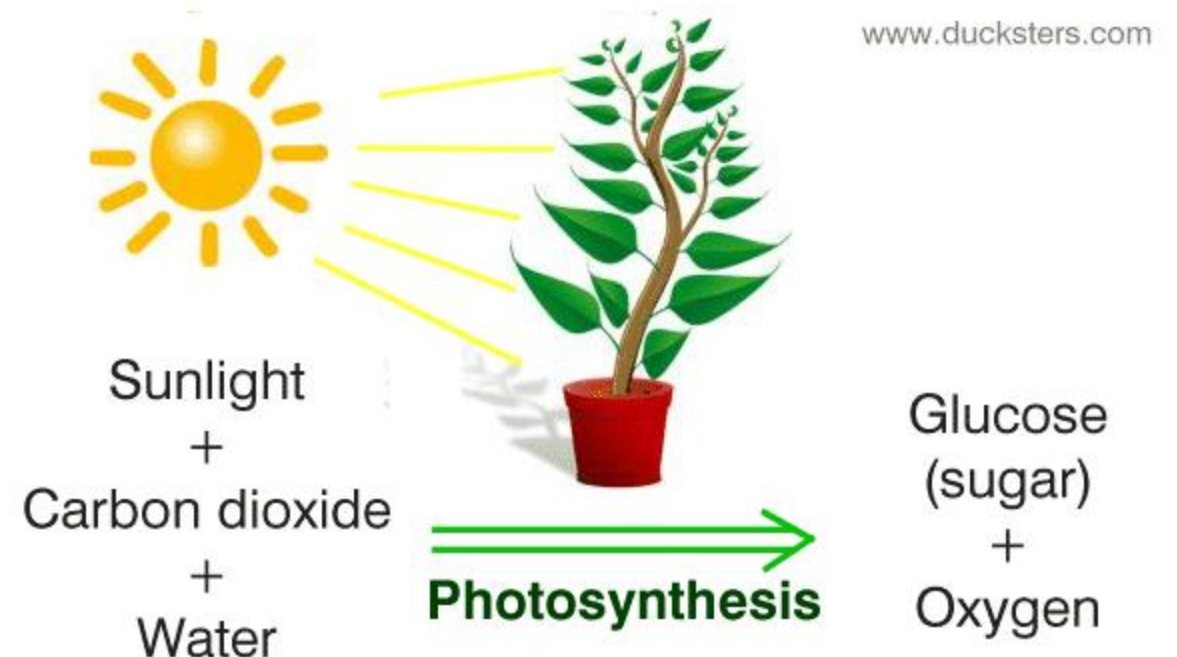
# Carbon Dioxide and Oxygen Cycle Between Plants and Animals



# Producing Oxygen



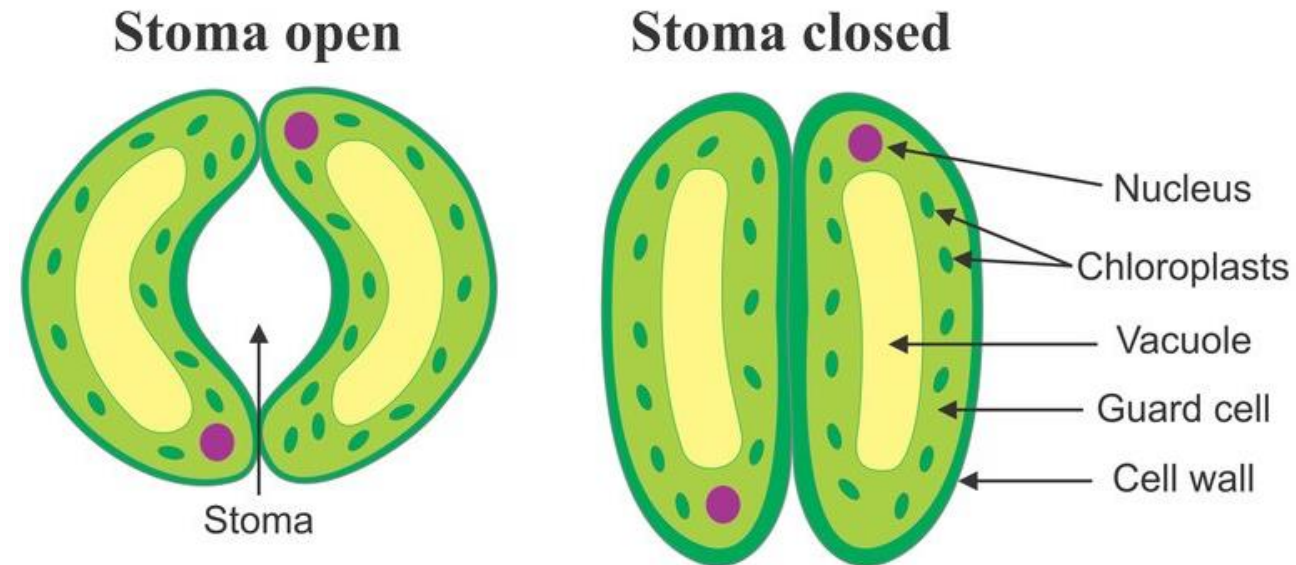
- During photosynthesis, oxygen is produced when the water molecules are split into separate hydrogen and oxygen molecules
- Plants use some of the oxygen for cellular respiration
- Plants however, make more oxygen than they need
  - The rest of the oxygen leaves the plant via the **stomata** and goes into the air





# Releasing Oxygen

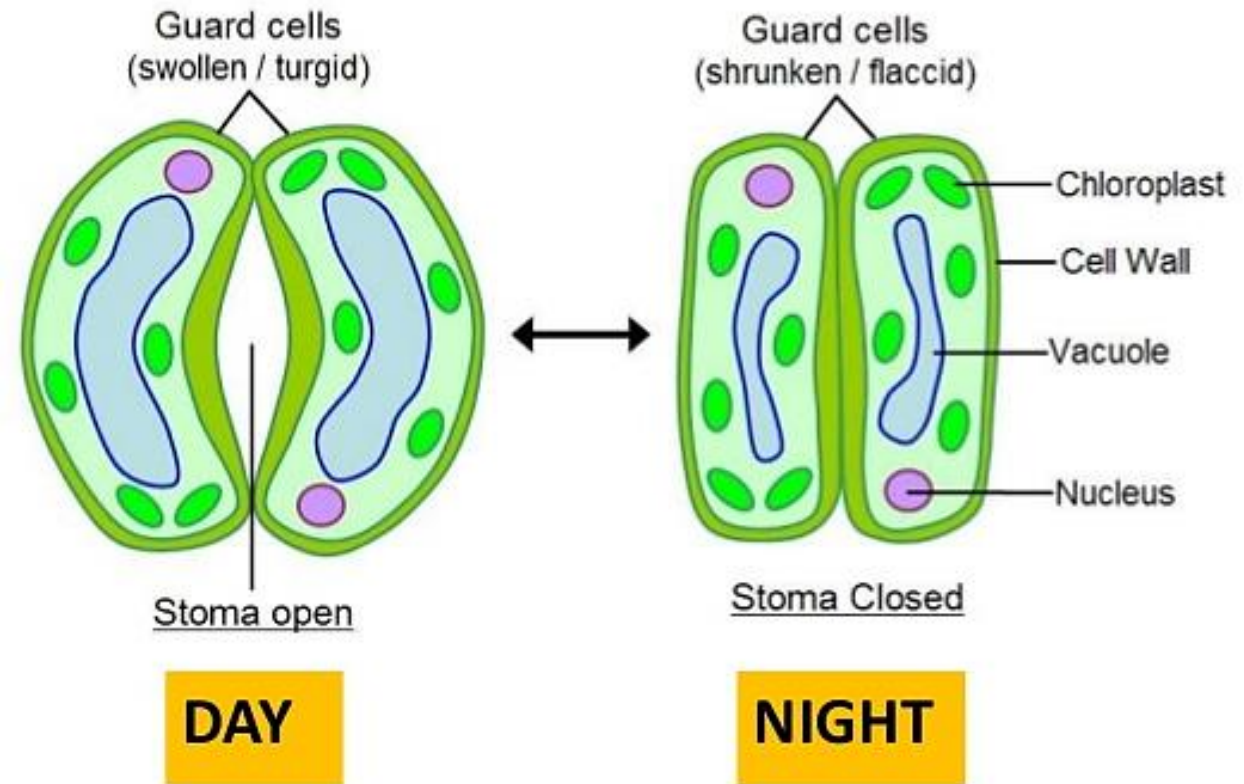
- Oxygen that goes out of the plant and into the air leaves through the **stomata**
- Each stoma has two special cells called **guard cells**
- The size and shape of the **guard cells** change as they take up and release water
- When the **guard cells** take up water and swell, the **stomata** open
  - Oxygen, carbon dioxide, and water vapor can move in and out of the leaf through the openings
  - When the **guard cells** lose water, the **stomata** close





# Releasing Oxygen cont'd

- The amount of light affects the opening and closing of stomata
- The stomata of most plants close at night
- They open during the day when photosynthesis takes place
- The amount of water also affects the opening and closing of stomata
- When the soil and air are dry, stomata close, even during the day
  - This prevents the plant from losing water during short dry periods

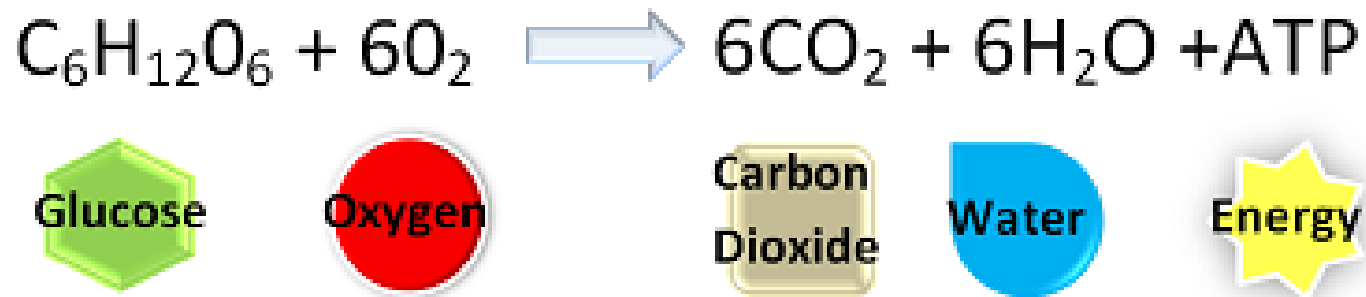


# Summary

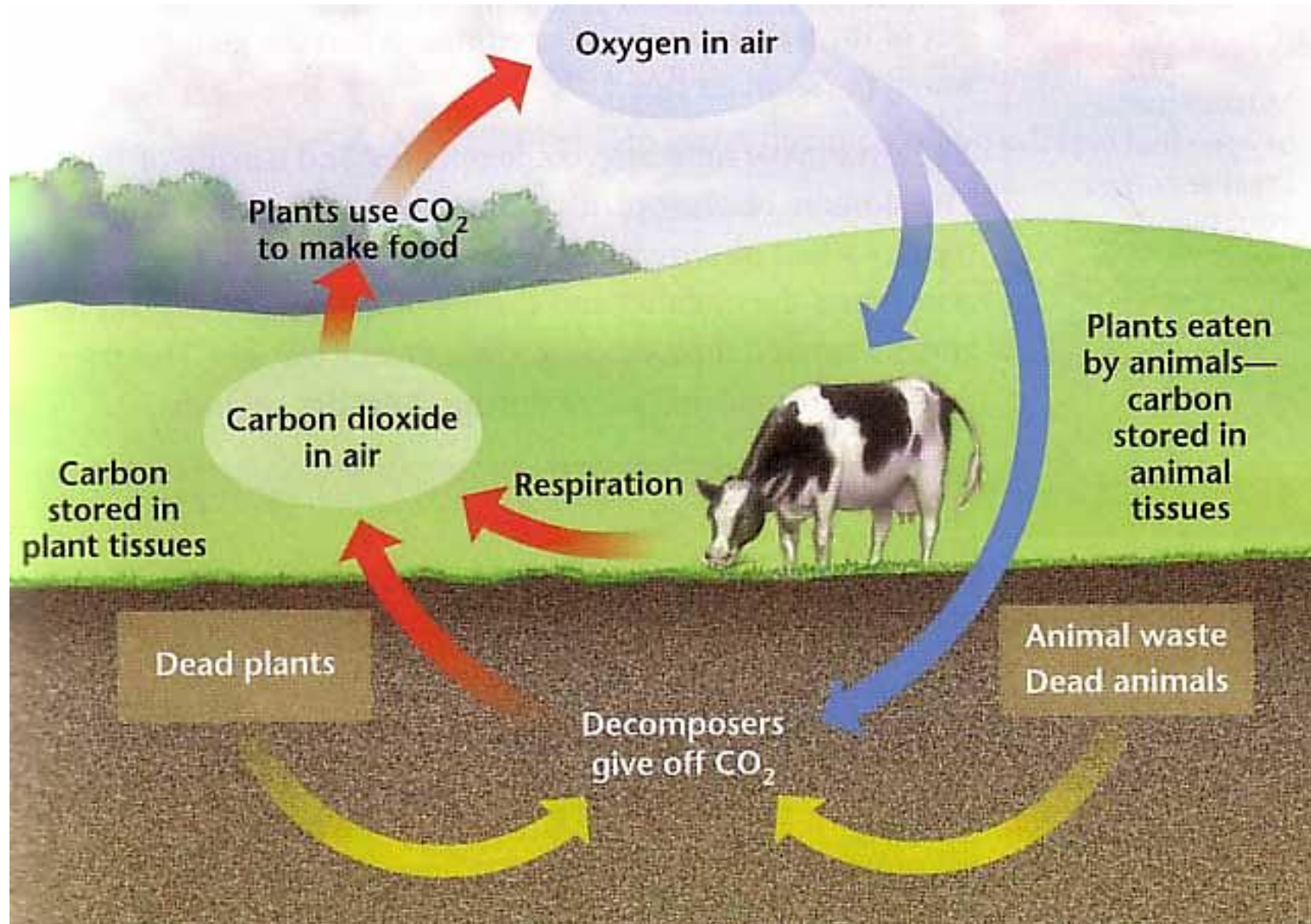
- **Photosynthesis** is the process where plants make their own food using carbon dioxide, water, and sunlight
  - Photosynthesis produce the energy in the form of glucose



- **Cellular respiration** is the opposite of photosynthesis where we take the glucose and break it down to make a form of energy that we can use to perform our daily activities



# Summary



# Video Links

## **Photosynthesis:**

<https://www.youtube.com/watch?v=D1Ymc311XS8>

<https://www.youtube.com/watch?v=yHVhM-pLRXk>