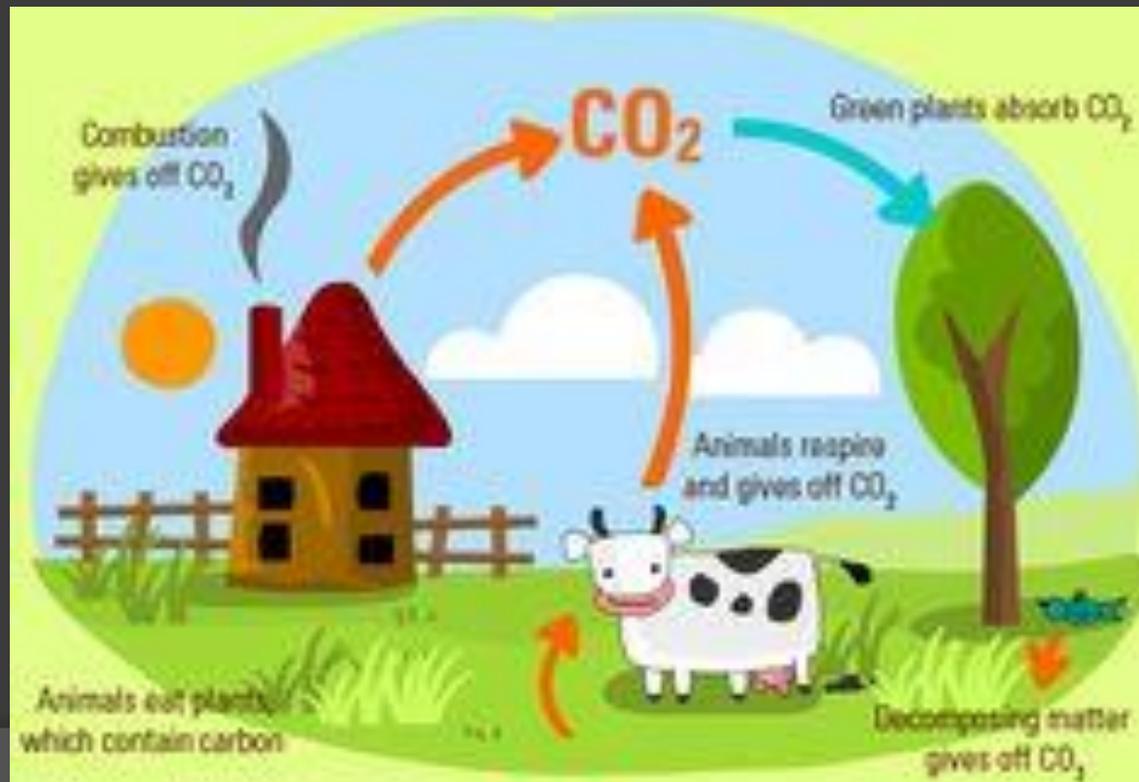


# Law of Conservation of Mass & Energy & The Carbon Cycle

SC.8.L.18.4 Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

- **Essential Question:** How do living systems obey the Law of Conservation of Mass?

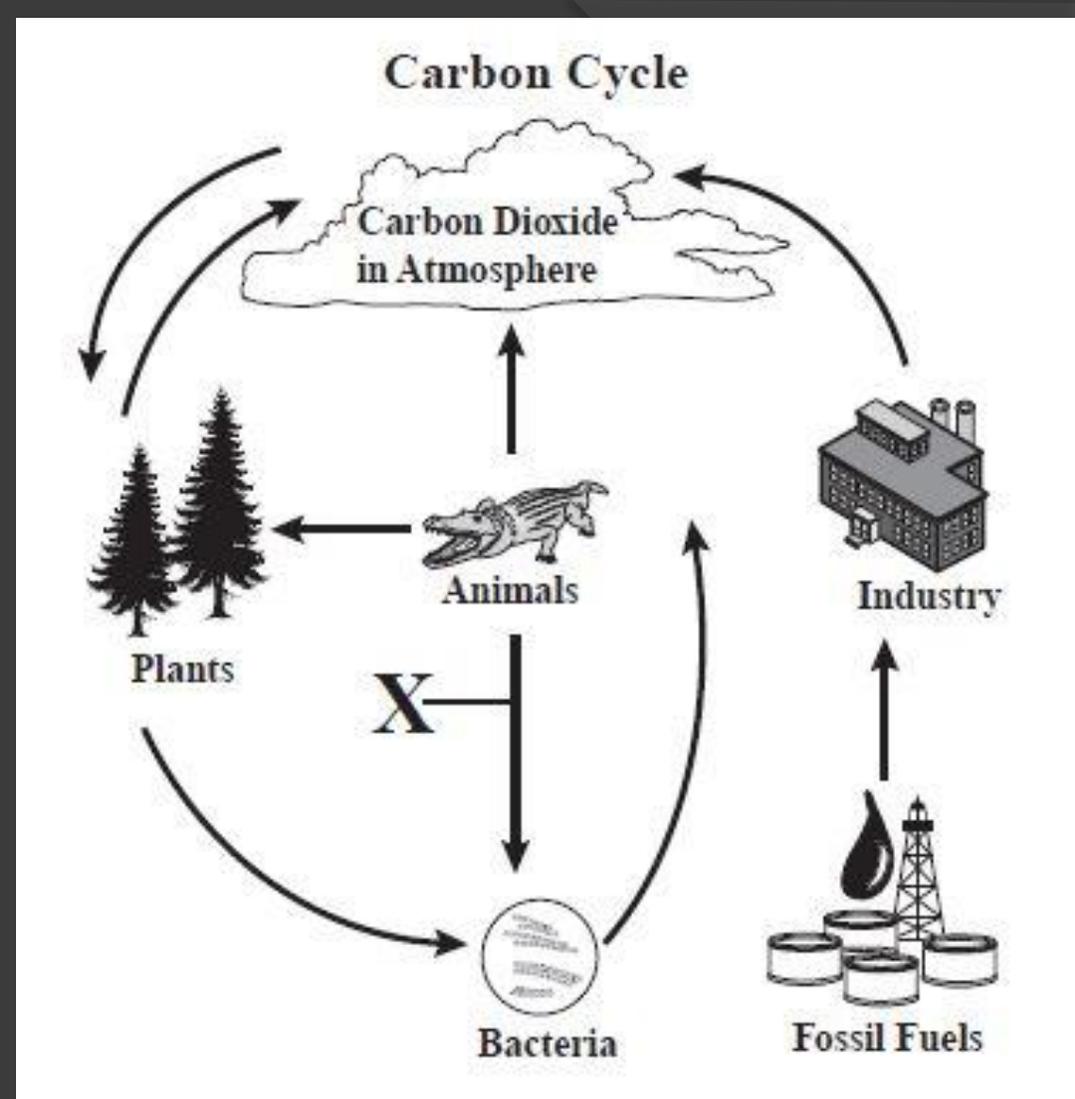


# Bell Ringer

A diagram of the carbon cycle is shown to the right. Each arrow represents a process in the cycle.

Which of the following **best** describes the process that occurs at arrow X?

- A. Bacteria break down molecules in animals into carbon-based soil nutrients.
- B. Animals release oxygen that is used by bacteria to produce carbon dioxide.
- C. Animals release carbon dioxide that is used by bacteria for growth and reproduction.
- D. Bacteria combine carbon-based nutrients from plants and animals to produce glucose.



# I Do Guided Notes

## Conservation of Mass/Energy I Do:

- **The Law of Conservation of Matter:**

- Matter is \_\_\_\_ created or destroyed, only \_\_\_\_\_ or recycled.

- **The Law of Conservation of Energy:**

- Energy is \_\_\_\_ created or destroyed, only \_\_\_\_\_ or recycled.
- Energy may \_\_\_\_\_ form but the total amount remains the same.

- **Photosynthesis**

\_\_\_\_\_ + Water  $\longrightarrow$  glucose + \_\_\_\_\_

- Carbon Dioxide (CO<sub>2</sub>) is taken out of the \_\_\_\_\_ by plants through photosynthesis.
- Plants take in \_\_\_\_\_ and release \_\_\_\_\_
- Chlorophyll \_\_\_\_\_ sunlight for photosynthesis.

- **Cellular Respiration**

\_\_\_\_\_ + Oxygen  $\longrightarrow$  Carbon Dioxide + \_\_\_\_\_ + Energy

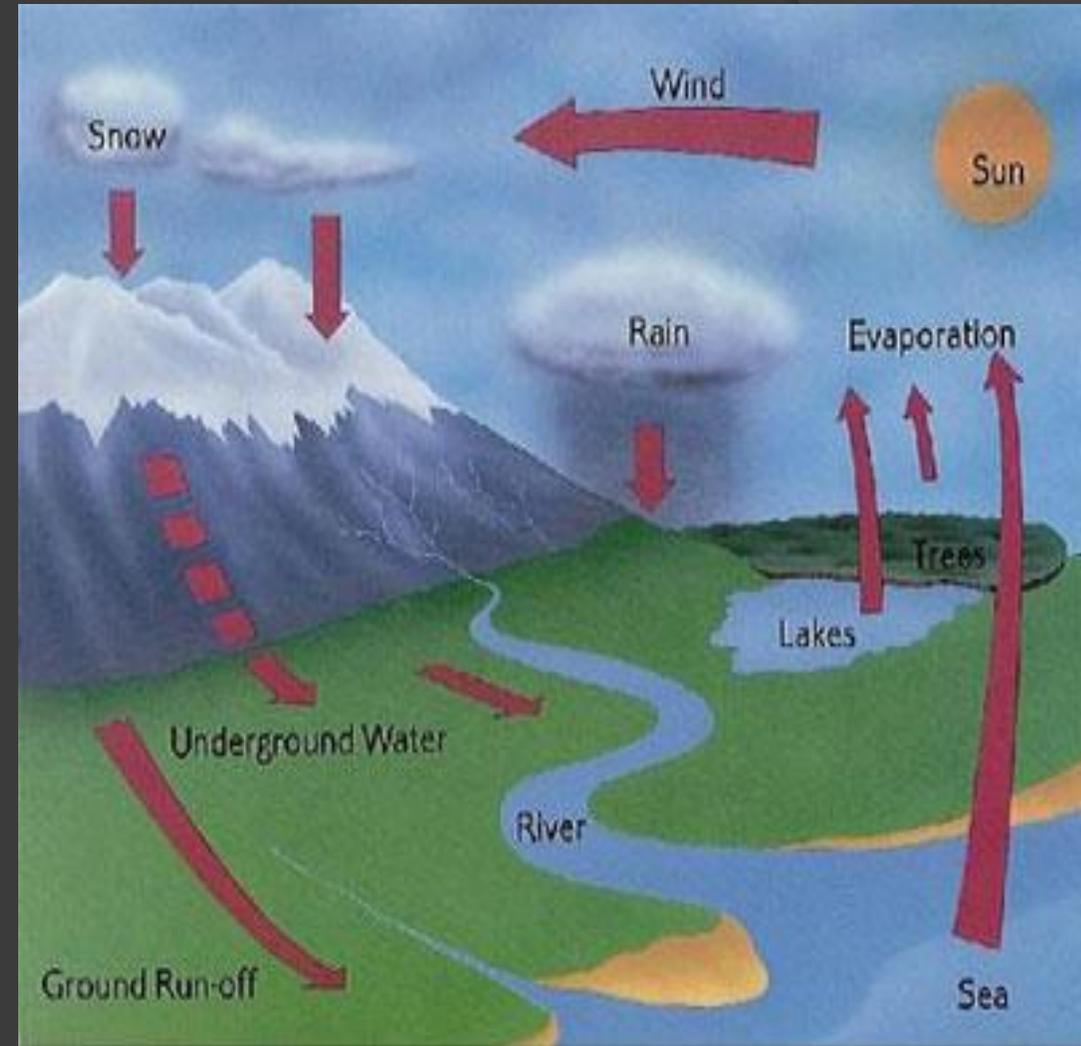
- Both plants and animals release \_\_\_\_\_ (CO<sub>2</sub>) into the air through cellular respiration (in the mitochondria)
- For example: Humans and other animals breathe in \_\_\_\_\_ and breathe out \_\_\_\_\_ ( )

- **The Carbon Cycle**

- The carbon cycle is a complex series of processes through which all of the \_\_\_\_\_ atoms in the world \_\_\_\_\_.
- Carbon can be found in carbon \_\_\_\_\_.
  - Atmosphere
  - \_\_\_\_\_
  - Fossil Fuels & Rocks
  - \_\_\_\_\_
  - Organisms
- Photosynthesis and cellular respiration help move carbon through the \_\_\_\_\_ cycle.
- \_\_\_\_\_ break down dead organisms.
- Millions of year old plants, animals and waste \_\_\_\_\_ and turn in to \_\_\_\_\_.
- \_\_\_\_\_ can be burned by planes, automobiles, and power electricity plants releasing carbon back into the atmosphere.
- \_\_\_\_\_ removes trees that \_\_\_\_\_ carbon dioxide from the atmosphere. Fewer trees means less carbon dioxide is being absorbed.

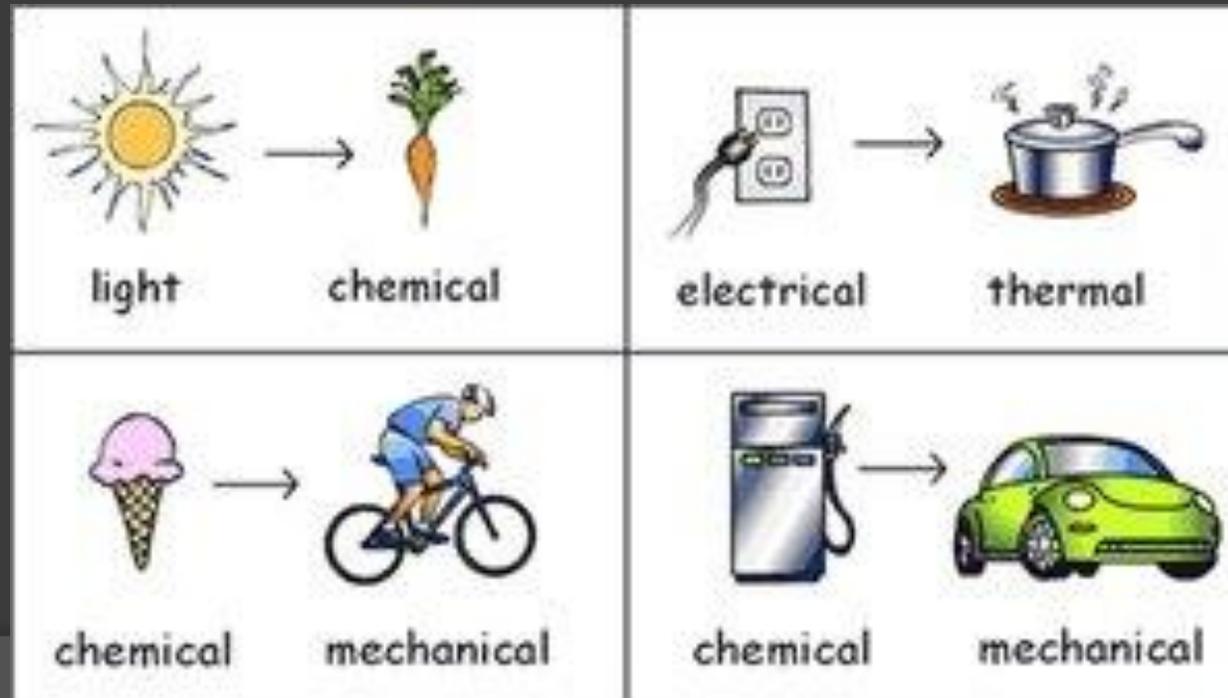
# Law of Conservation of Matter

- ◎ The Law of Conservation of Matter states that matter is **not** created or destroyed, only **rearranged** or recycled.

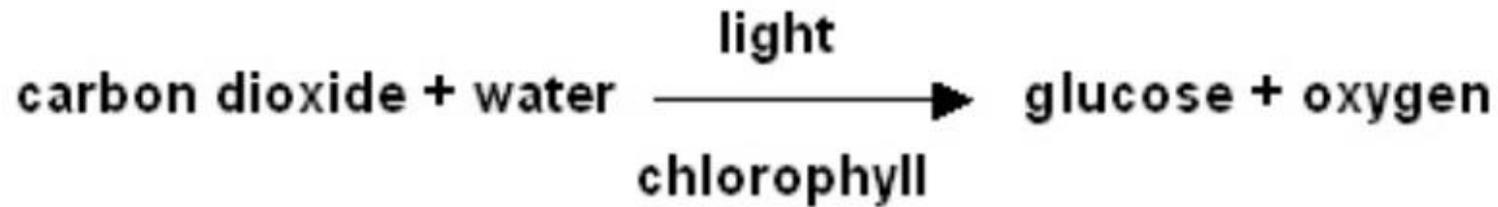


# Law of Conservation of Energy

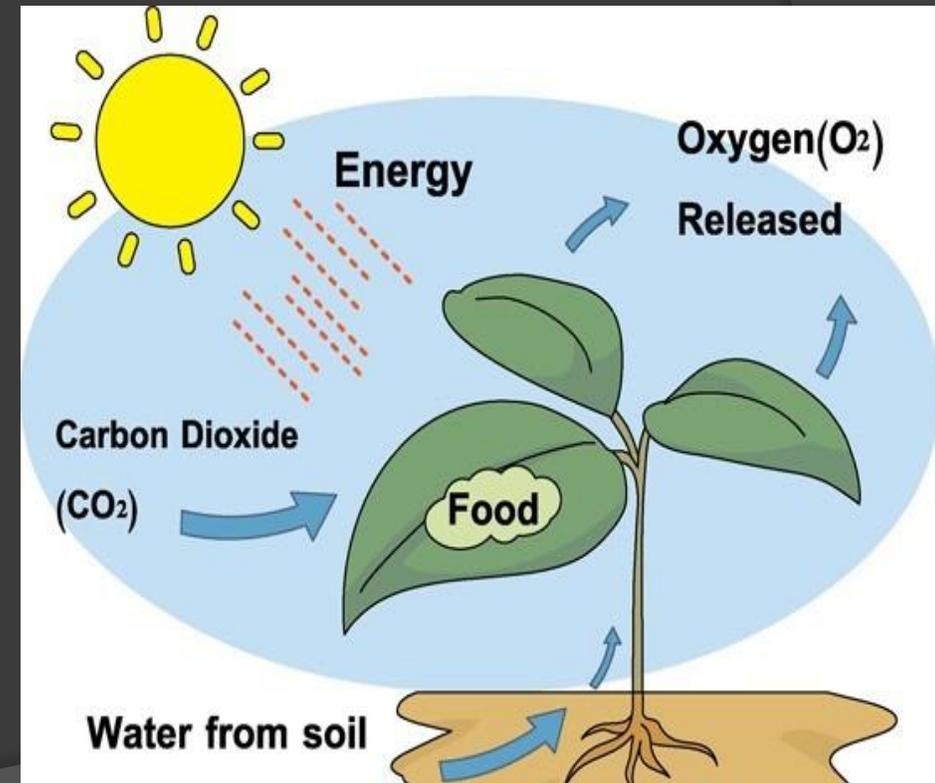
- ⦿ The Law of Conservation of Energy states that energy is **not** created or destroyed, only **rearranged** or recycled.
- ⦿ Energy may **change** form but the total amount remains the same.



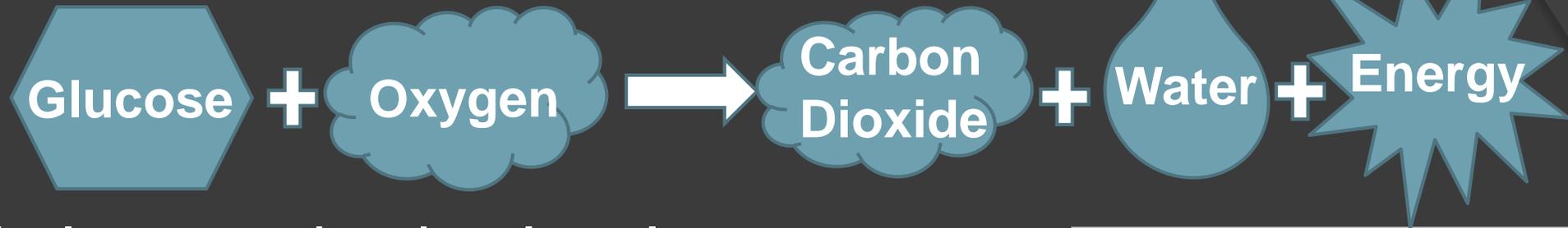
# Photosynthesis



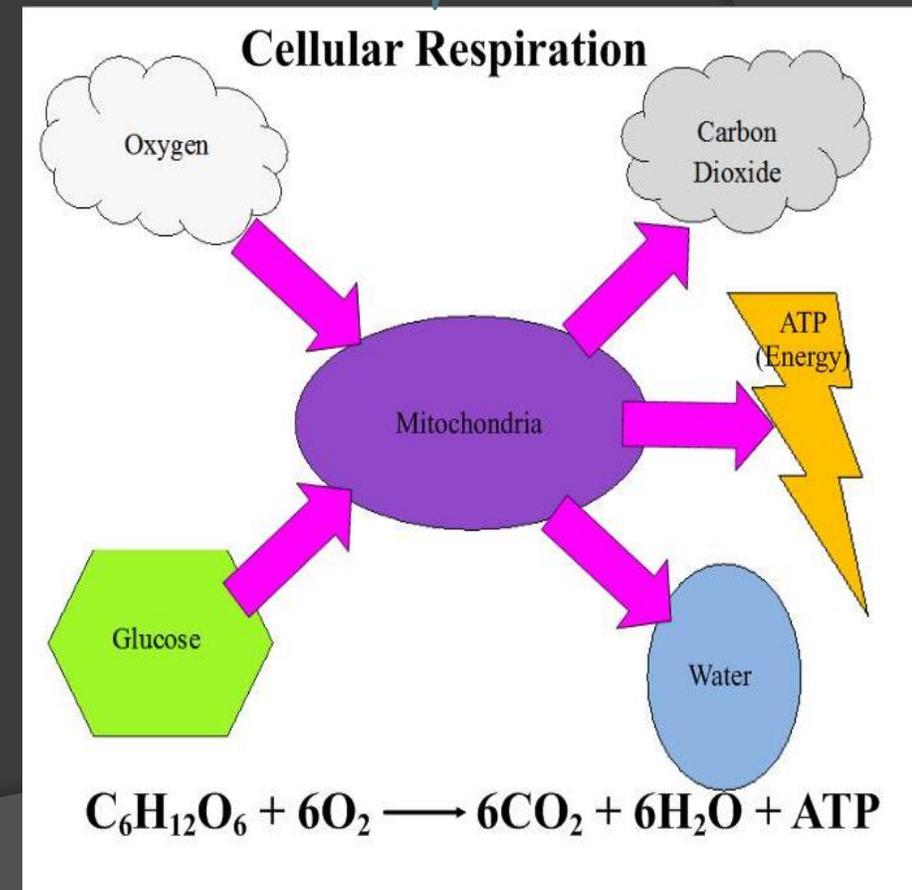
- Carbon Dioxide ( $\text{CO}_2$ ) is taken out of the air by plants through **photosynthesis**.
- Plants take in carbon dioxide ( $\text{CO}_2$ ) and release oxygen ( $\text{O}_2$ ).
- Chlorophyll absorbs sunlight for photosynthesis.



# Cellular Respiration



- BOTH plants and animals release **carbon dioxide** (CO<sub>2</sub>) into the air through cellular respiration (in mitochondria)
- For example: Humans and other animals breathe **in oxygen** and breathe **out carbon dioxide** (CO<sub>2</sub>)

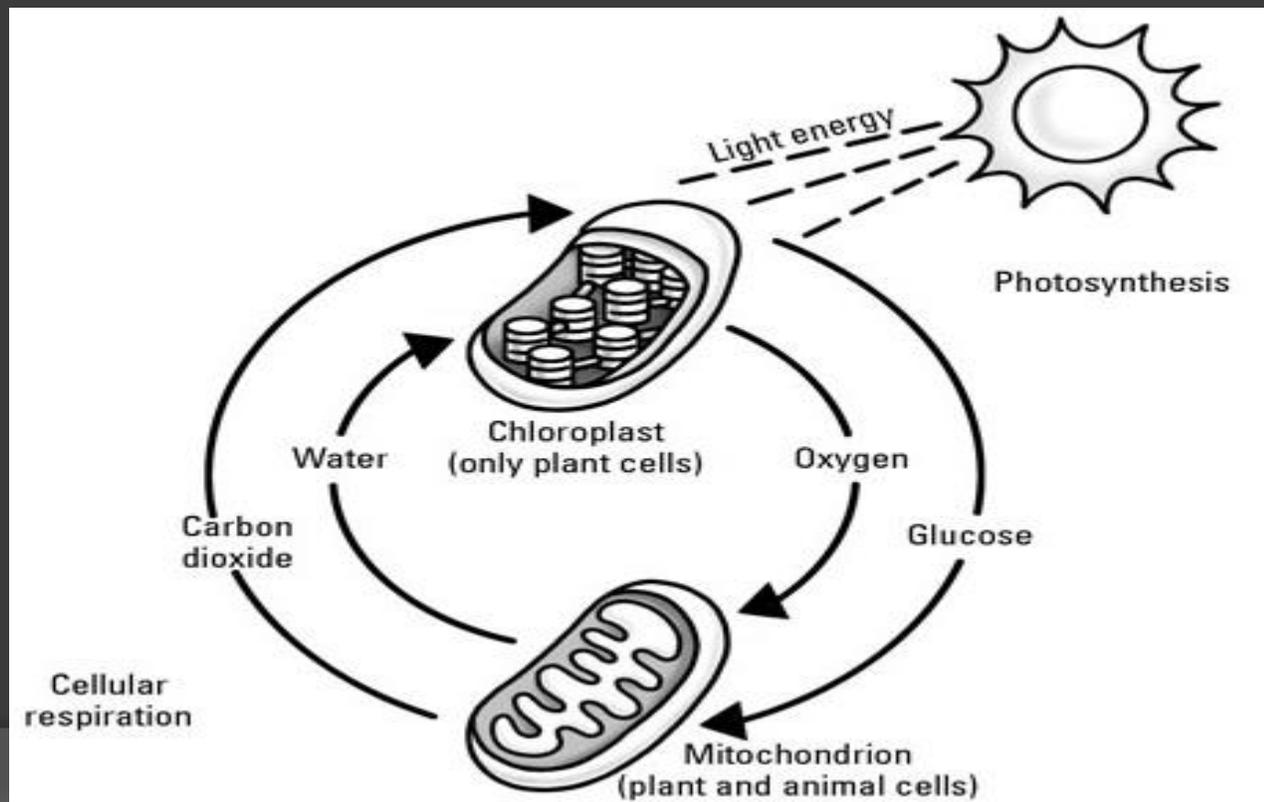


# Think Pair Share

## Photosynthesis & Cellular Respiration

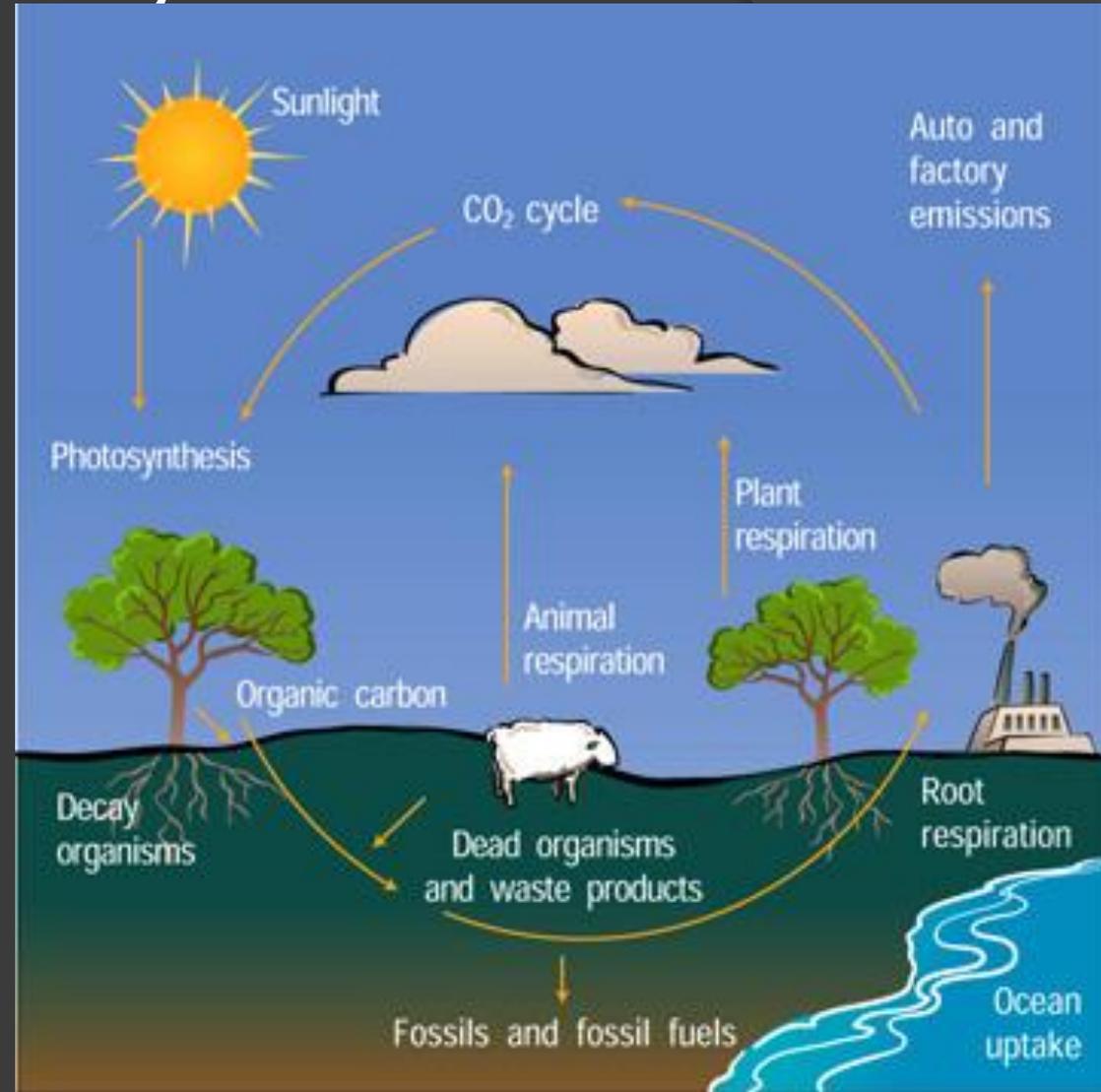
### Interrelatedness

- How are the two processes related?
- How do the processes demonstrate the law of conservation of matter / energy?



# The Carbon Cycle

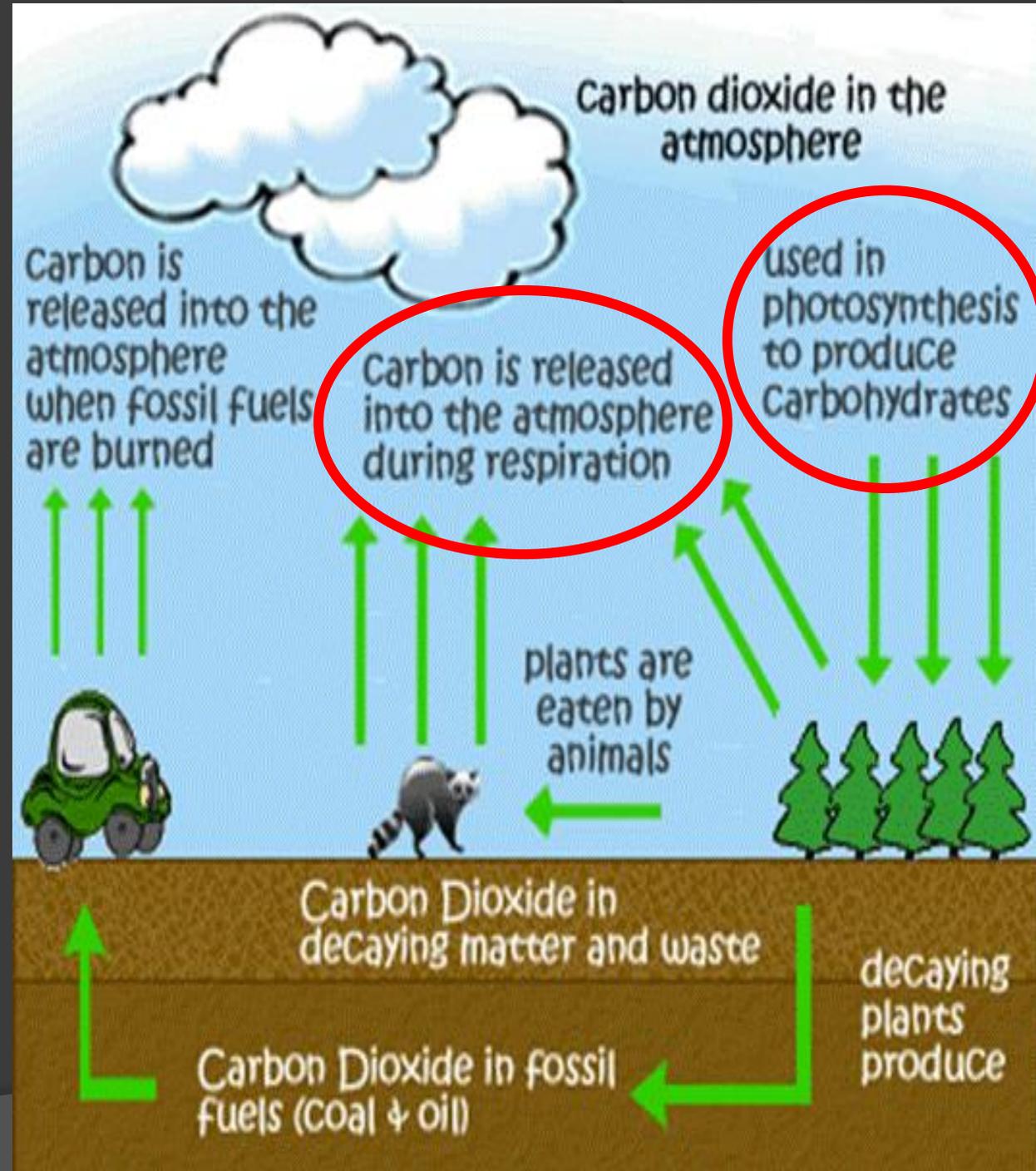
- The Carbon Cycle is a complex series of processes through which all of the **carbon** atoms in the world **recycle**.
- Carbon can be found in carbon **reservoirs**:
  - Atmosphere
  - Oceans/Water
  - Fossil Fuels & rocks
  - Sediments
  - Organisms



\*All life on earth is based on carbon

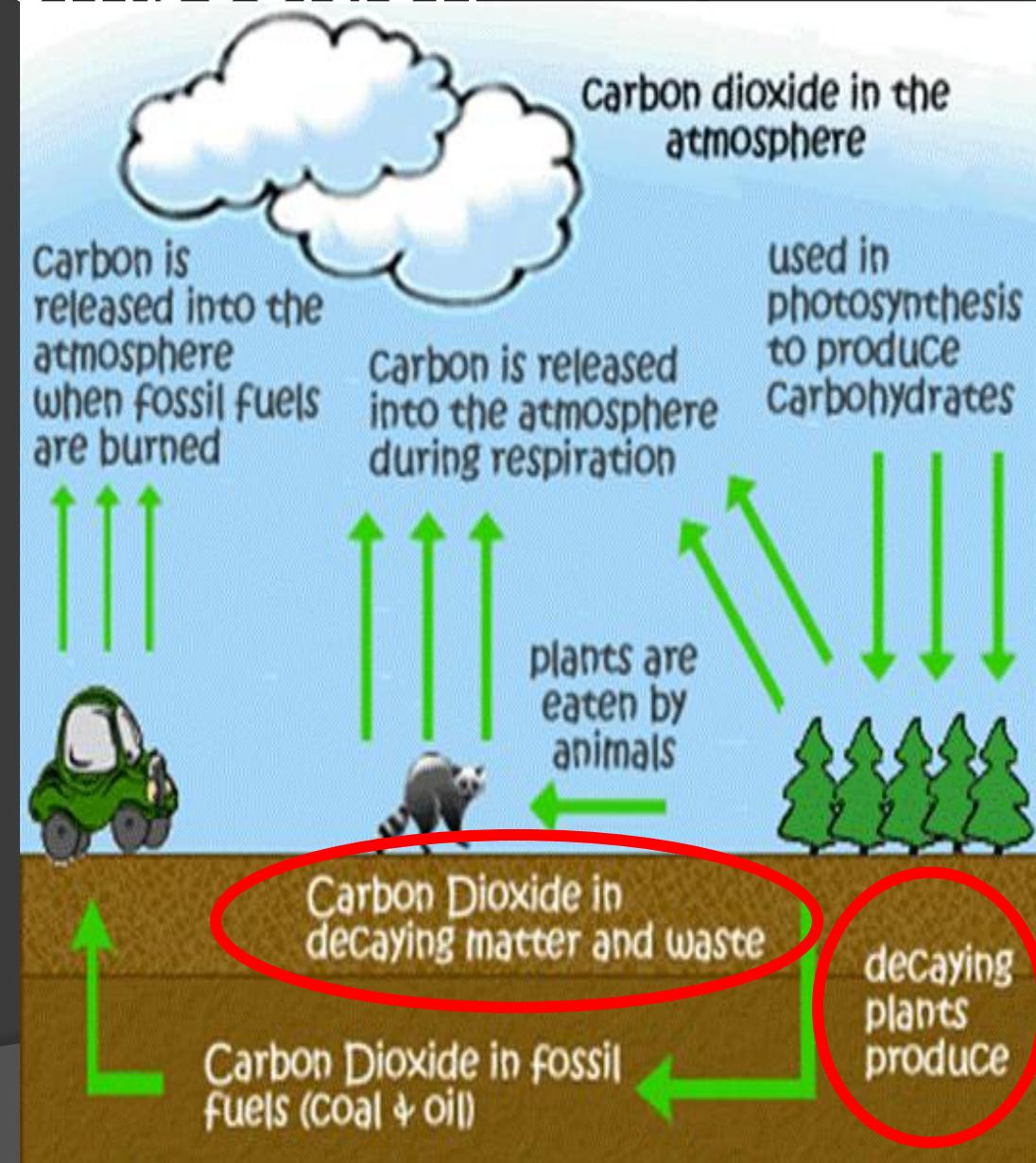
# The Carbon Cycle

- Photosynthesis and Cellular respiration help move carbon through the **carbon** cycle



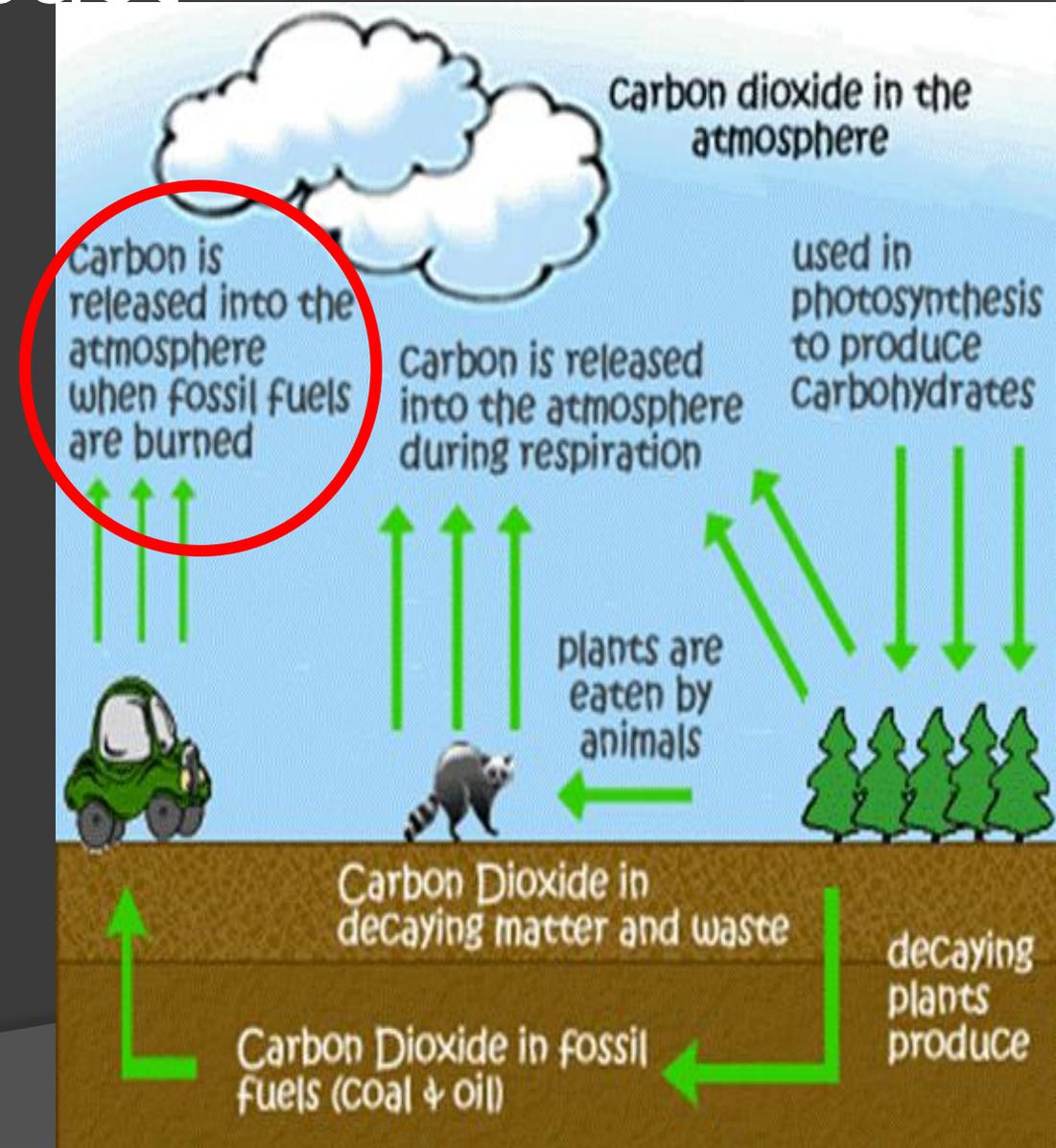
# The Carbon Cycle: Decomposition

- **Decomposers** break down dead organisms.
- Millions of years old plants, animals, and waste **decompose** and turn into **fossil fuels**.



# Carbon Cycle: Human Impact

- ◎ **Fossil fuels** can be burned by planes, automobiles, and power electricity plants releasing carbon back into the atmosphere.
- ◎ **Deforestation** removes trees that **absorb** carbon dioxide from the atmosphere. Fewer trees means less carbon dioxide is being absorbed.



## Carbon dioxide

**1 Atmosphere** Carbon dioxide gas is one form of carbon in the air.

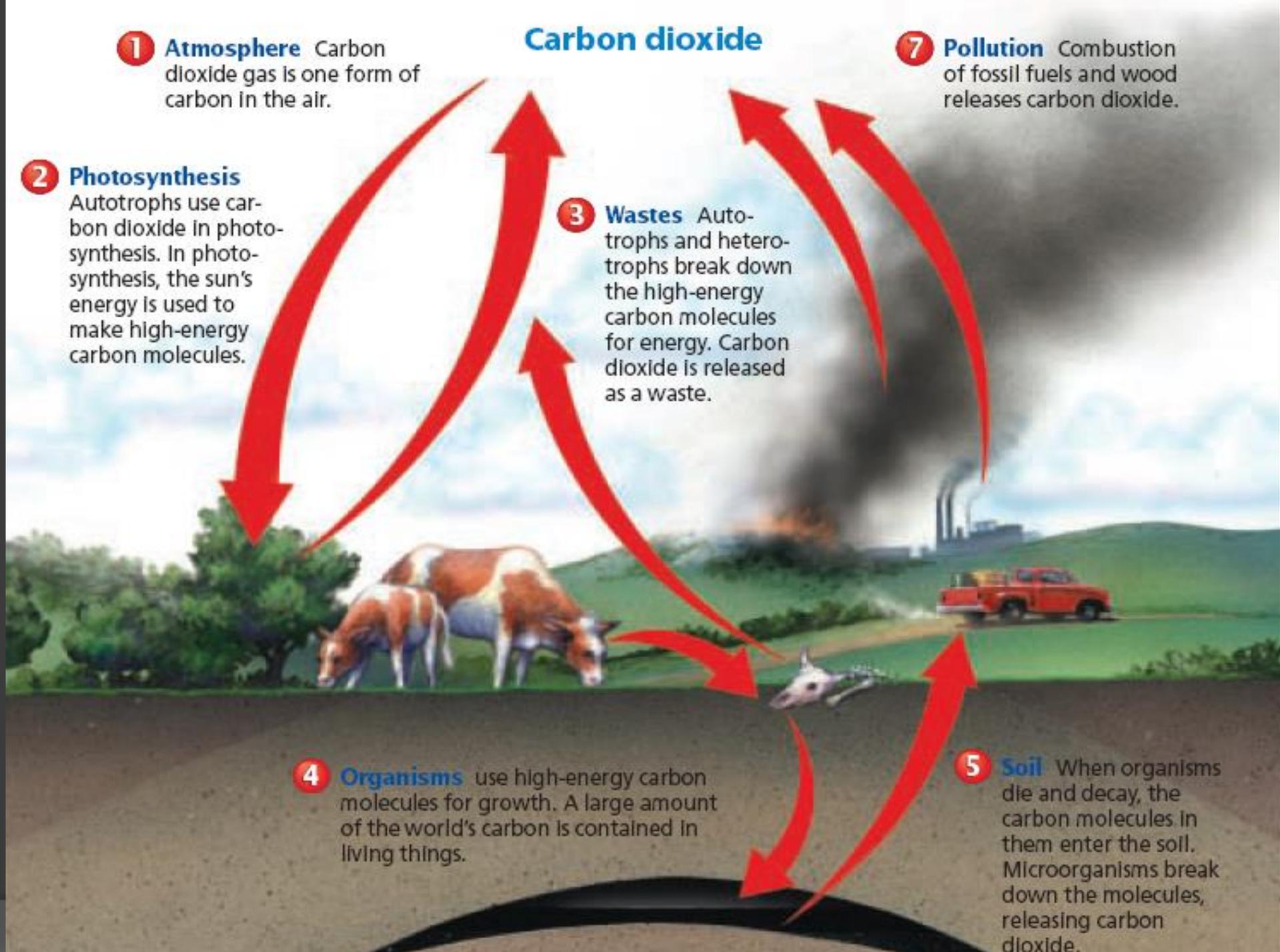
**2 Photosynthesis** Autotrophs use carbon dioxide in photosynthesis. In photosynthesis, the sun's energy is used to make high-energy carbon molecules.

**3 Wastes** Autotrophs and heterotrophs break down the high-energy carbon molecules for energy. Carbon dioxide is released as a waste.

**7 Pollution** Combustion of fossil fuels and wood releases carbon dioxide.

**4 Organisms** use high-energy carbon molecules for growth. A large amount of the world's carbon is contained in living things.

**5 Soil** When organisms die and decay, the carbon molecules in them enter the soil. Microorganisms break down the molecules, releasing carbon dioxide.



# We do

## Conservation of Mass/Energy We Do:

1. How are processes of photosynthesis and cellular respiration related?

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2. How do the processes of photosynthesis and cellular respiration obey the law of conservation of matter and energy?

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3. How does the process of photosynthesis help move carbon through the carbon cycle?

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4. How does the process of cellular respiration help move carbon through the carbon cycle?

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5. Explain how the carbon cycle follows the law of conservation of matter and energy.

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## **Cellular Respiration:**

6. While working out, you notice that you are breathing heavily? Why would you need more oxygen after a workout?

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7. How does the amount of energy released in cellular respiration compare to the amount of energy needed to make glucose in photosynthesis?

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8. Where does the glucose necessary for cellular respiration to occur come from?

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**EXIT Ticket (Closing):** How do living systems obey the Law of Conservation of Mass?

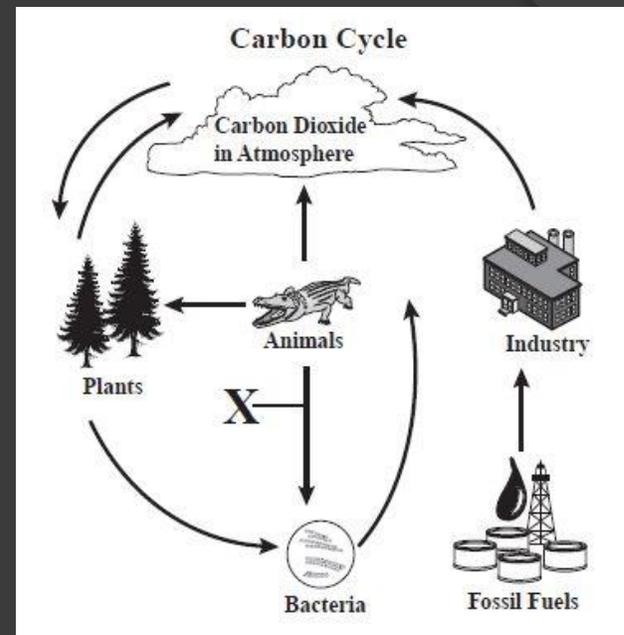
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# Bell Ringer Revisit

A diagram of the carbon cycle is shown to the right. Each arrow represents a process in the cycle.



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