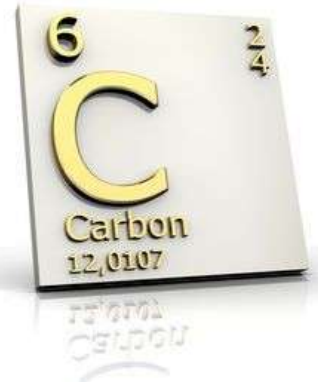


Recycling of Materials

- Earth is a closed system
 - Only energy can enter or leave
 - All other materials (matter) must be recycled
- Biogeochemical Cycles
 - The pathways by which matter is exchanged between the biotic and abiotic environments

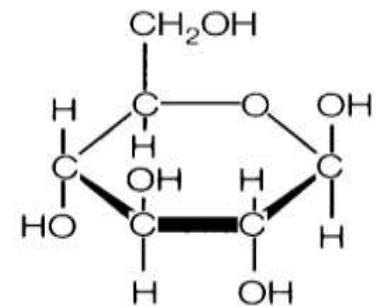
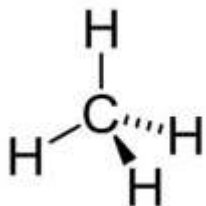


The Carbon Cycle



Carbon is stored on our planet in the following major pools or reservoirs:

- as organic molecules (carbohydrates, proteins, etc.) **in living and dead organisms**
- as the gas carbon dioxide in the atmosphere;
- as organic matter **in soils**;
- as **fossil fuels and sedimentary rock**, such as limestone
- **in the oceans** as dissolved carbon dioxide gas and as calcium carbonate shells in marine organisms.

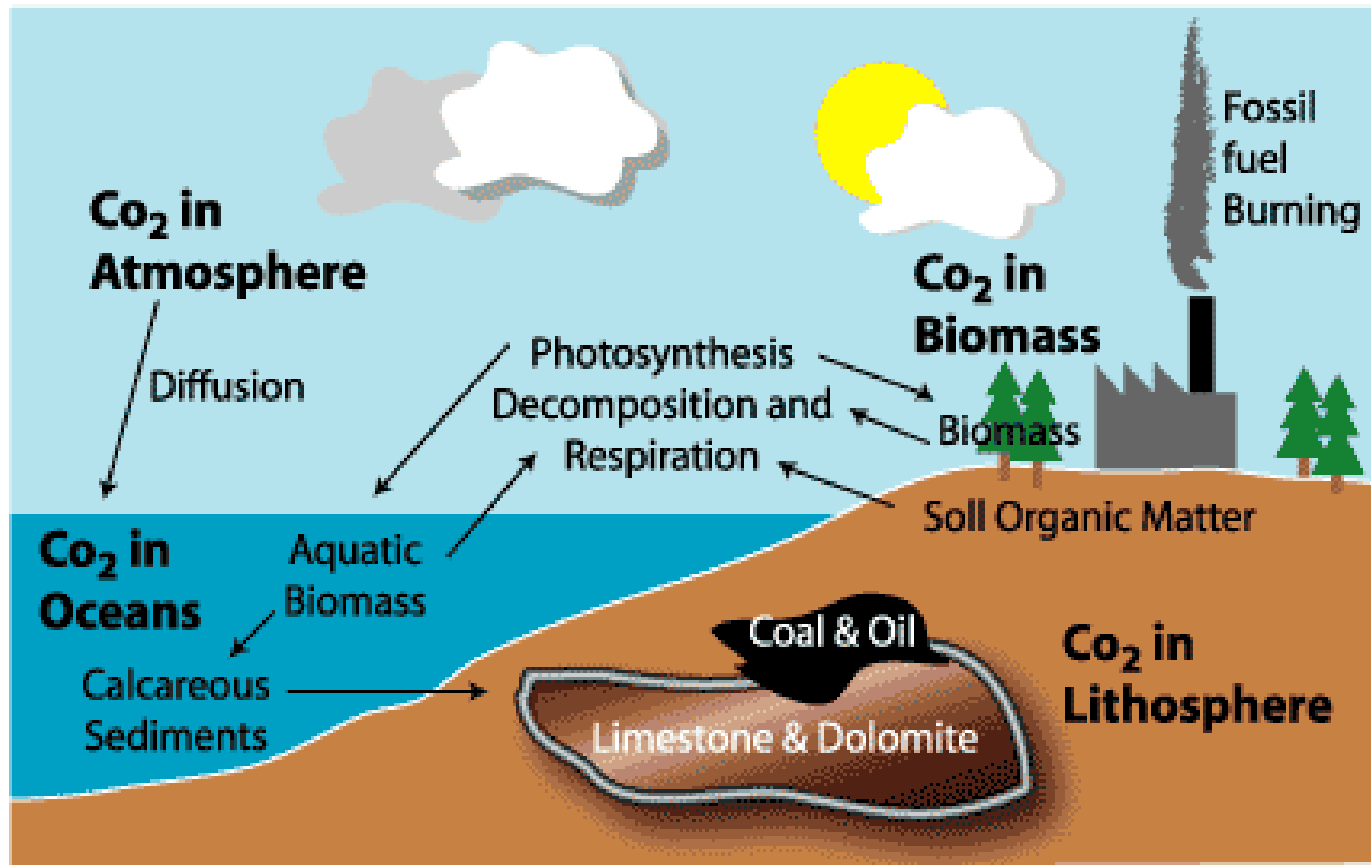


Carbon Reservoirs

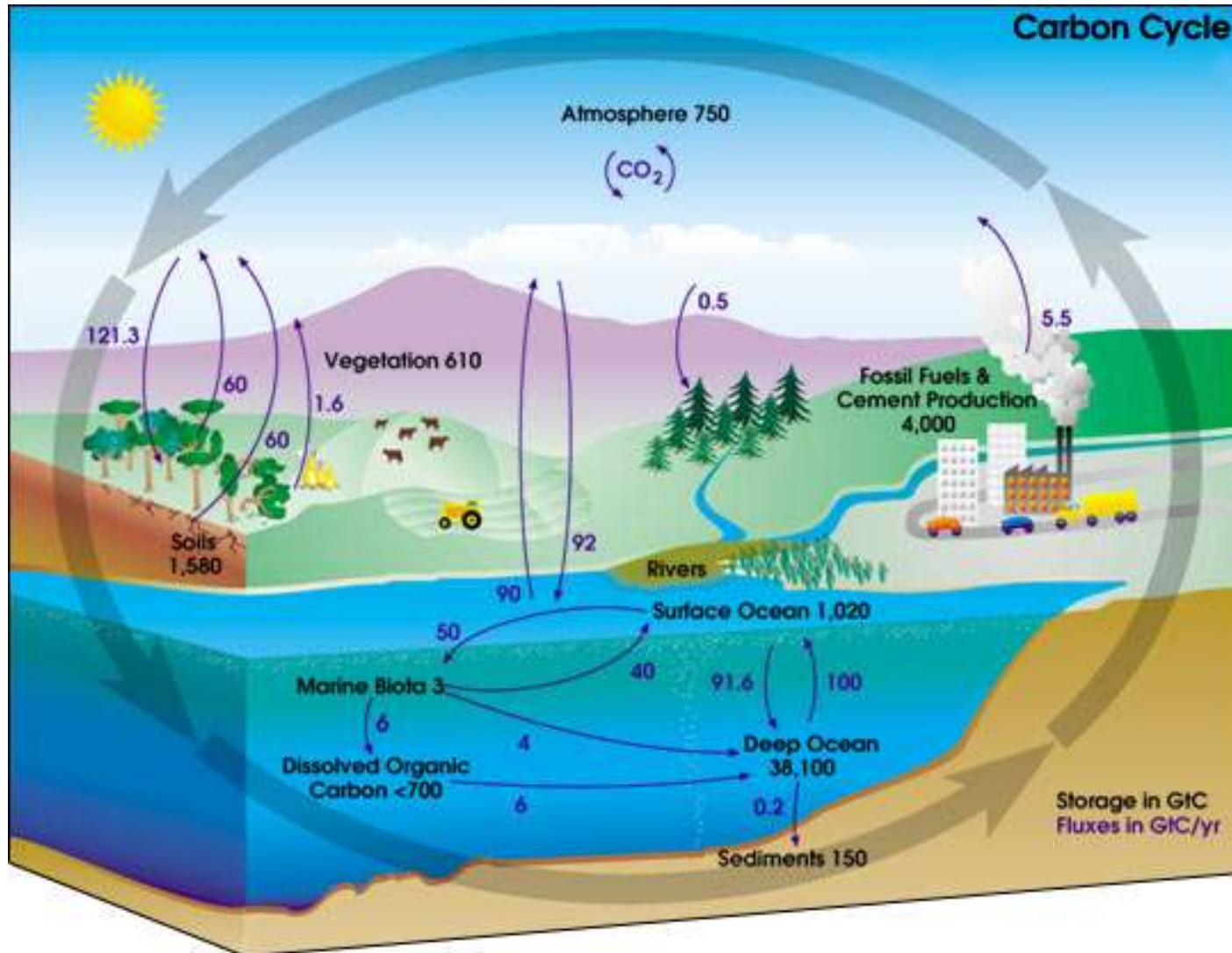
Pool	Amount in Billions of Metric Tons
Atmosphere	578 (as of 1700) - 766 (as of 1999)
Terrestrial Plants	540 to 610
Soil Organic matter	1500 to 1600
Ocean	38,000 to 40,000
Fossil Fuel Deposits	4000
Marine Sediments and Sedimentary Rocks	66,000,000 to 100,000,000

CARBON CYCLE

the movement of carbon within and between the biotic (living) and abiotic (non-living) environments.



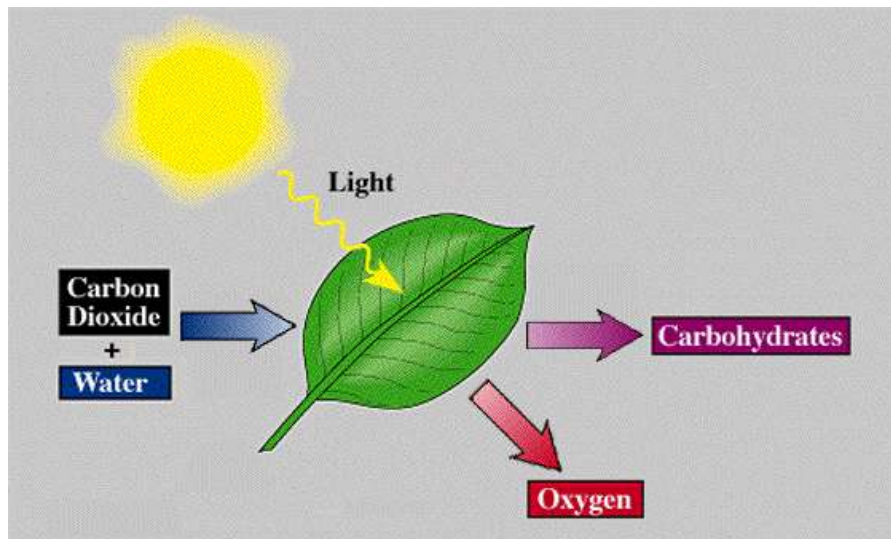
Global Carbon Cycle



Carbon is exchanged between the active pools due to various processes – photosynthesis and respiration between the land and the atmosphere, and diffusion between the ocean and the atmosphere.

PHOTOSYNTHESIS

- PLANTS ABSORB CARBON DIOXIDE (CO₂) FROM THE ATMOSPHERE, AND USE IT TO MAKE SUGARS (EG. GLUCOSE)



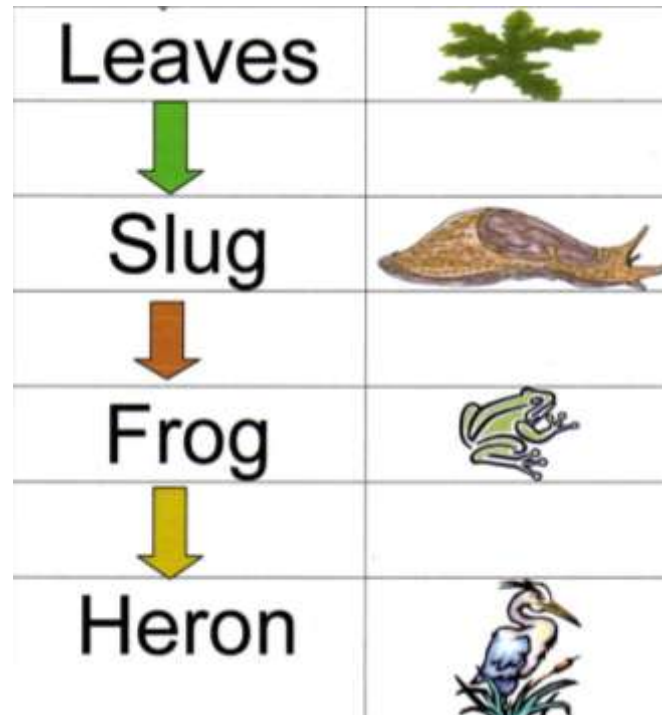
Carbon Dioxide in the Atmosphere

Photosynthesis

Organic Compounds
in Plants

The Food Chain

- ANIMALS EAT PLANTS OR OTHER ANIMALS AND USE CARBON TO BUILD TISSUE



Carbon Dioxide in the Atmosphere

Photosynthesis

Organic Compounds
in Plants

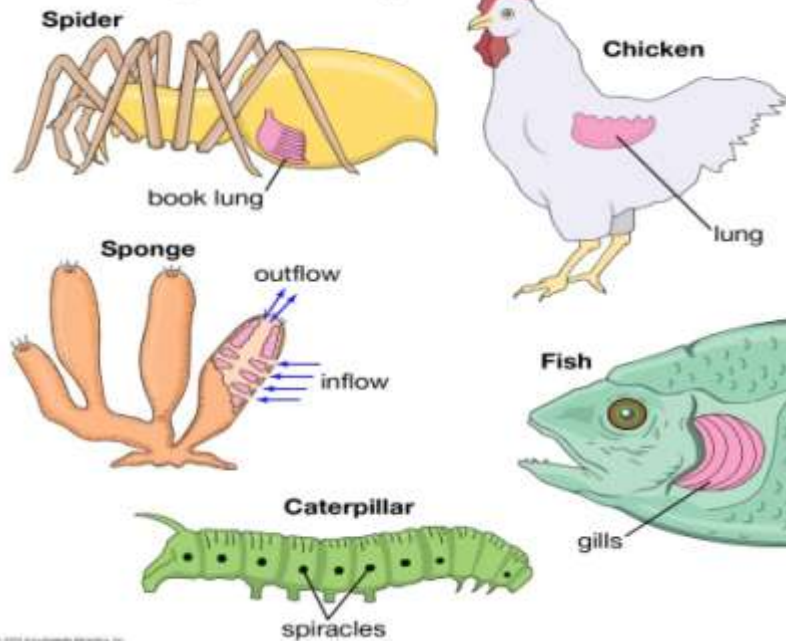
Food
Chain

Organic Compounds
in Animals

Respiration

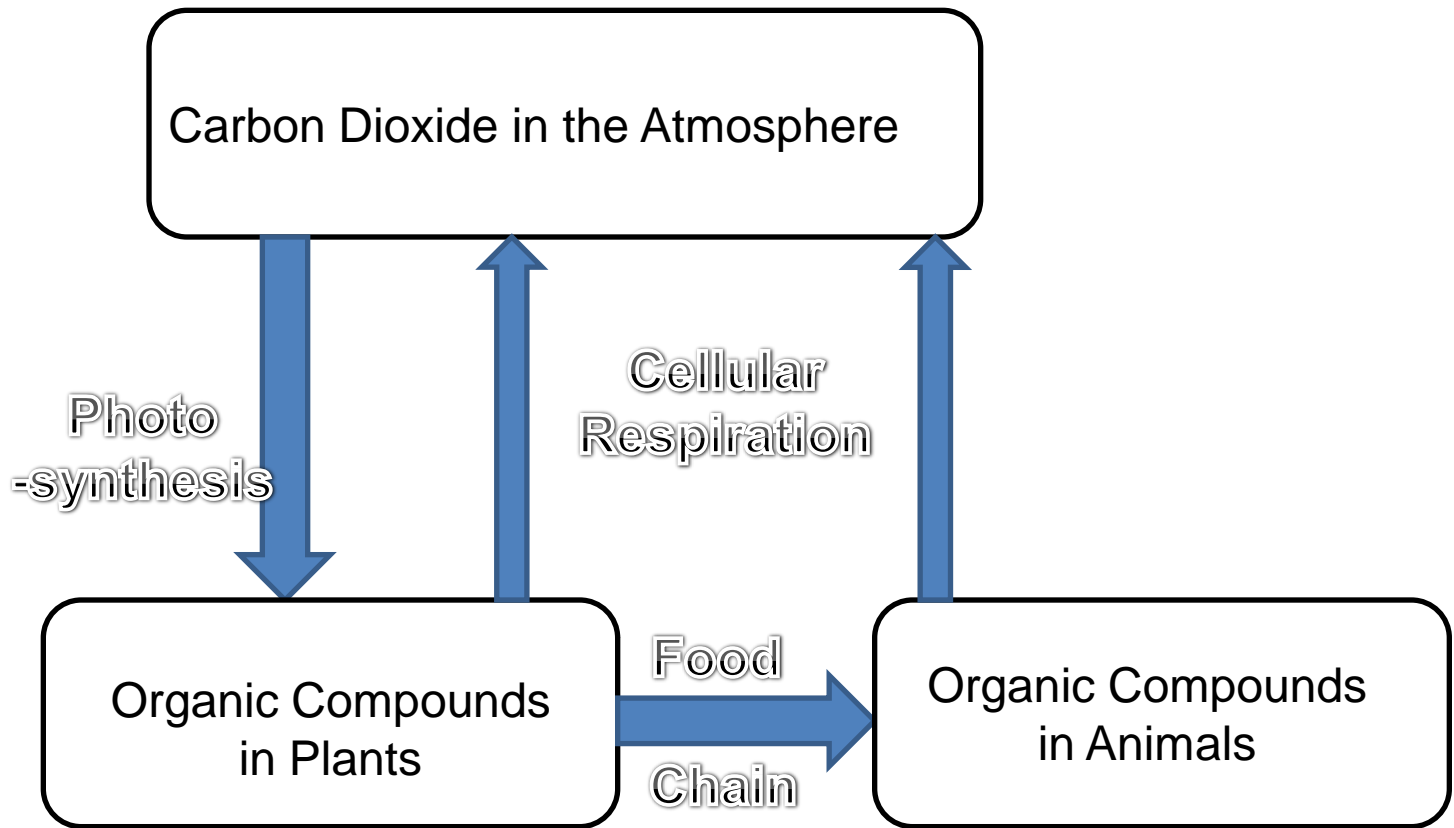
- ANIMALS (AND PLANTS) RETURN CO_2 INTO THE AIR WHEN THEY CARRY OUT CELLULAR RESPIRATION

Different ways of breathing



Plants Respire, too

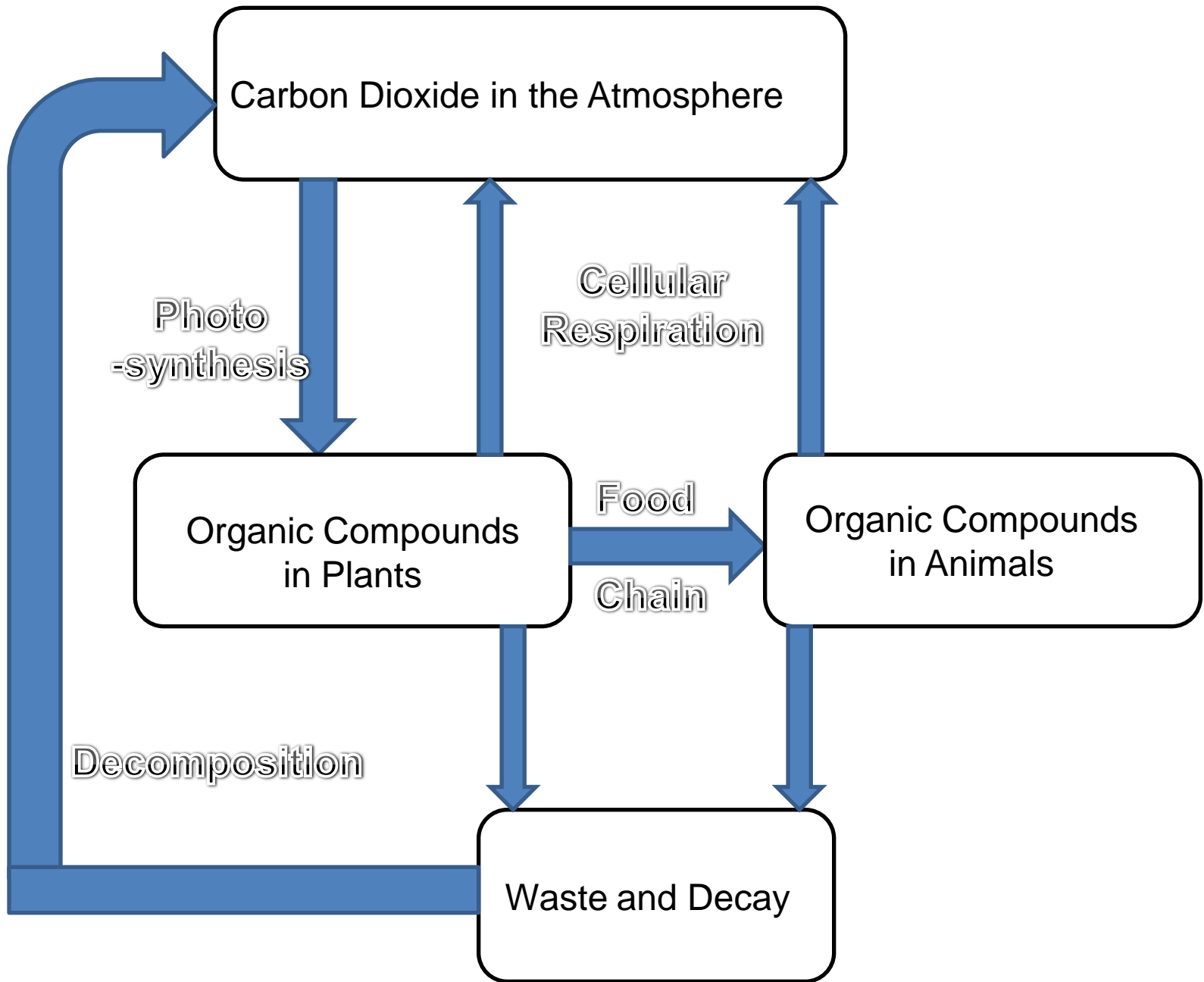




Decomposition

- DECAY ORGANISMS OR *SAPROBES*
(BACTERIA AND FUNGI) RETURN CO₂ INTO
THE ATMOSPHERE

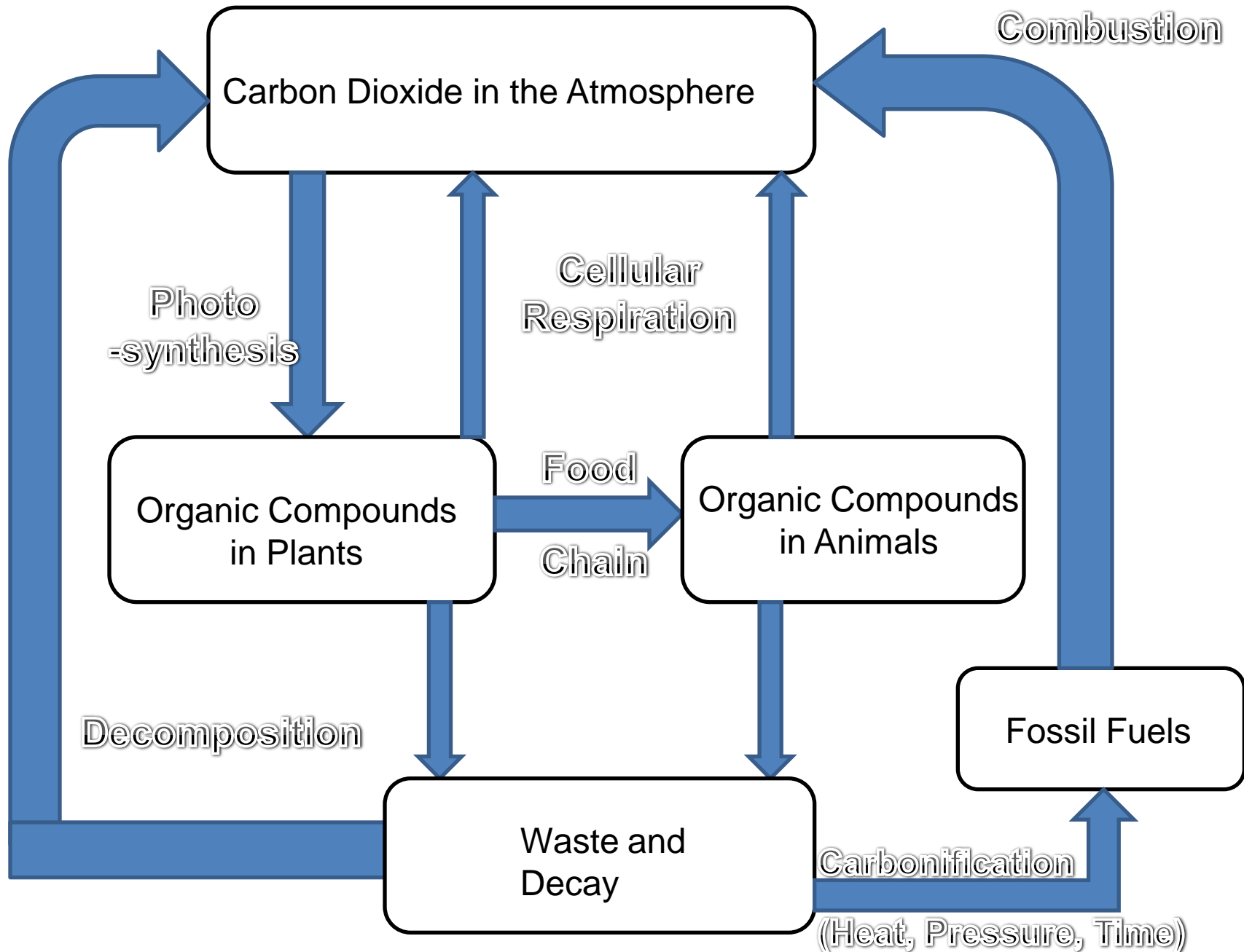




Combustion

- SOME DEAD ORGANIC MATERIAL CAN BE TURNED INTO FOSSIL FUELS OVER LONG PERIODS OF TIME
- DURING COMBUSTION OF ORGANIC MATERIAL (EG. FOSSIL FUELS) CARBON DIOXIDE IS PRODUCED AND RELEASED INTO THE ATMOSPHERE





Tracing Matter

Grandma Johnson

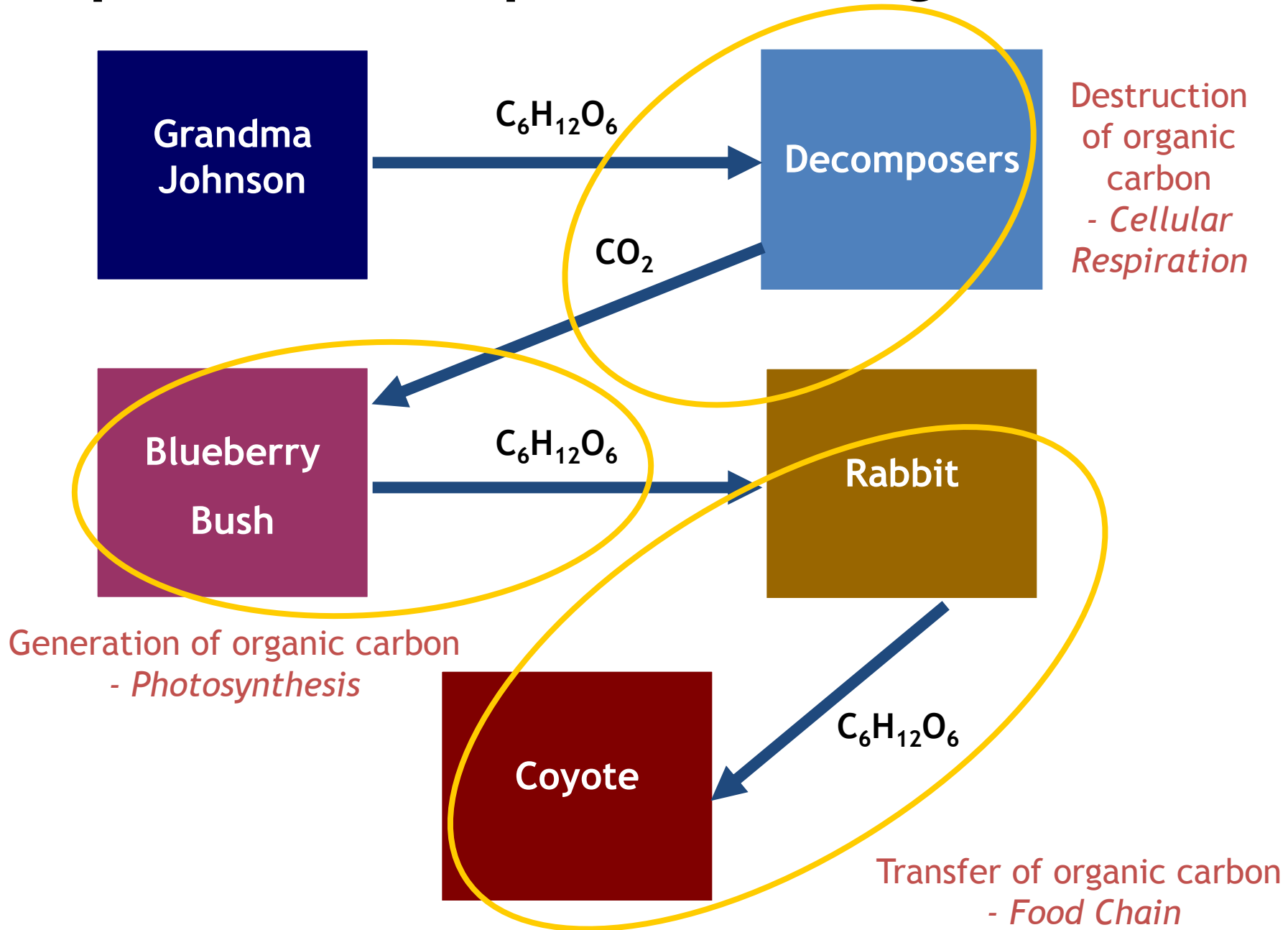


?



Describe the path of a carbon atom from Grandma Johnson's remains, to inside the leg muscle of a coyote.
NOTE: The coyote does not dig up and consume any part of Grandma Johnson's remains.

Inputs and Outputs - Tracing Carbon

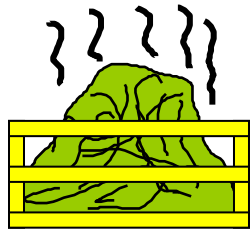
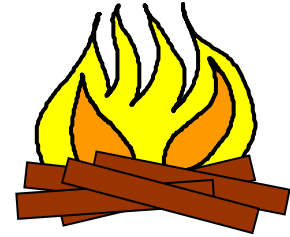


Deforestation

- Removing plants decreases the rate of photosynthesis
- less Carbon dioxide is taken from the atmosphere



- The removed trees are often burnt



Waste plant material can be left to rot

- The cleared land is often used to farm animals like cattle, increasing the rate of respiration



- Thus: Deforestation *increases* the amount of carbon dioxide in the atmosphere:

Man's Effect on the Carbon Cycle

- Deforestation
- Burning of Fossil Fuels

Burning of Fossil Fuels

- Increased industrial activity increases the use of fossil fuels
- Burning of fossil fuels increases CO_2 levels in the atmosphere
- CO_2 is a greenhouse gas - helps trap heat energy
- Increased levels of CO_2 may result in Global Warming

Global Warming

- Gradual increase in the average temperature of the earth
- Possible consequences:
 - Melting of polar ice caps
 - Raised ocean levels, resulting in flooding of costal areas
 - Changes in vegetation and animal life in an area
 - Possible extinction of certain species if unable to adapt and/or relocate elsewhere

What can be done??

- What can governments do?
- What can you do?