



HANDS-ON QUALITATIVE INTRODUCTION TO THE CARBON CYCLE

OVERVIEW

This introduction to the carbon cycle helps students visualize and model global carbon pools in the environment. Students will identify the primary forms of carbon in global pools as well as the carbon transforming process associated with key global carbon fluxes (i.e. photosynthesis, respiration, combustion, etc). Note: this activity can serve as an introduction to the [Poker Chip Model of Global Carbon Pools and Fluxes](#) activity.

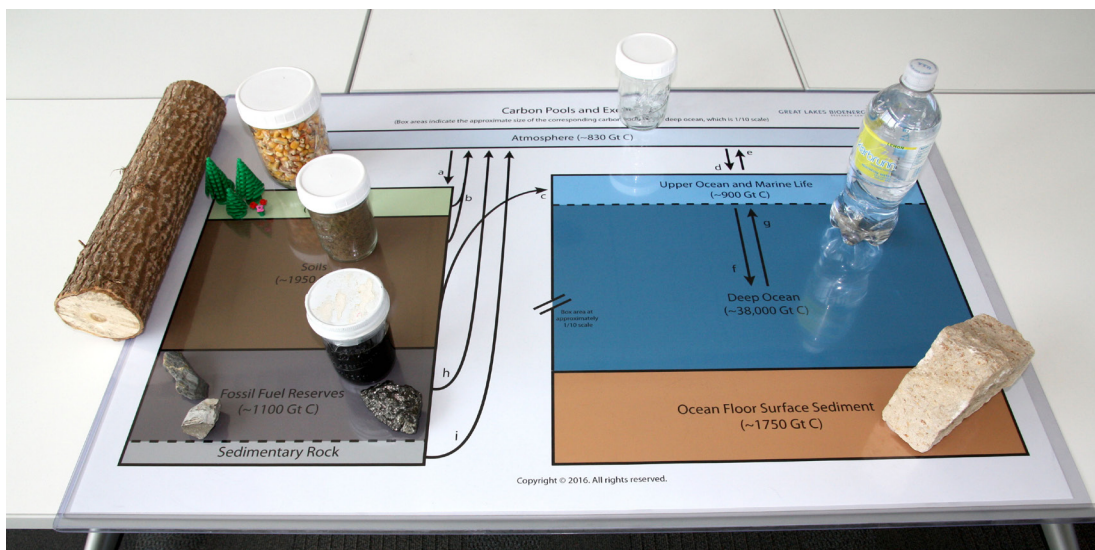
MATERIALS NEEDED

- Poster-size version of “Carbon Pools and Exchanges” diagram
- Physical representations of pools
 - 3 jars
 - Soil
 - Oil
 - Wood/plants to represent vegetation
 - Coal
 - Shale
 - Limestone
 - Bottle of carbonated water
- Molecular models of compounds (CO_2 , CH_4 , H_2CO_3 , $\text{C}_6\text{H}_{12}\text{O}_6$, C_8H_{18})
- Memo clips and cards with processes

SETUP

PHYSICAL REPRESENTATIONS OF POOLS

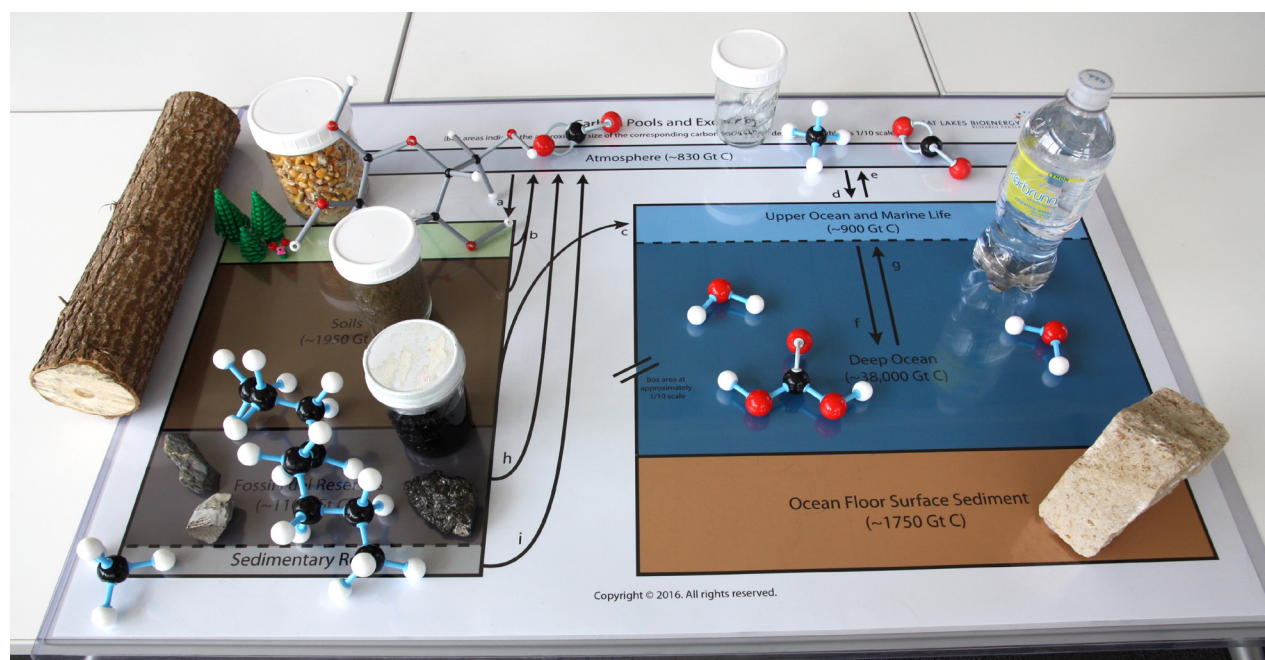
Discuss the different forms carbon can take and place the various representations of the carbon pools on the diagram.



- Jar of air: represents how carbon is in the atmosphere in its gaseous form (carbon dioxide)
- Trees/wood/corn in jar: represents vegetation that takes in carbon dioxide through photosynthesis during growth and releases carbon when burned
- Jar of soil: represents carbon stored in soil
- Jar of oil: represents crude oil that consists of hydrogen and carbon atoms
- Coal: represents carbon stored in sedimentary rock that is used as an energy source through combustion
- Shale: represents carbon stored as natural gas (methane, CH_4) that is within or extracted from shale for energy use
- Carbonated water: represents carbonic acid in oceans
- Limestone: represents sedimentary rocks on the ocean floor that are comprised of calcium carbonate

MOLECULES

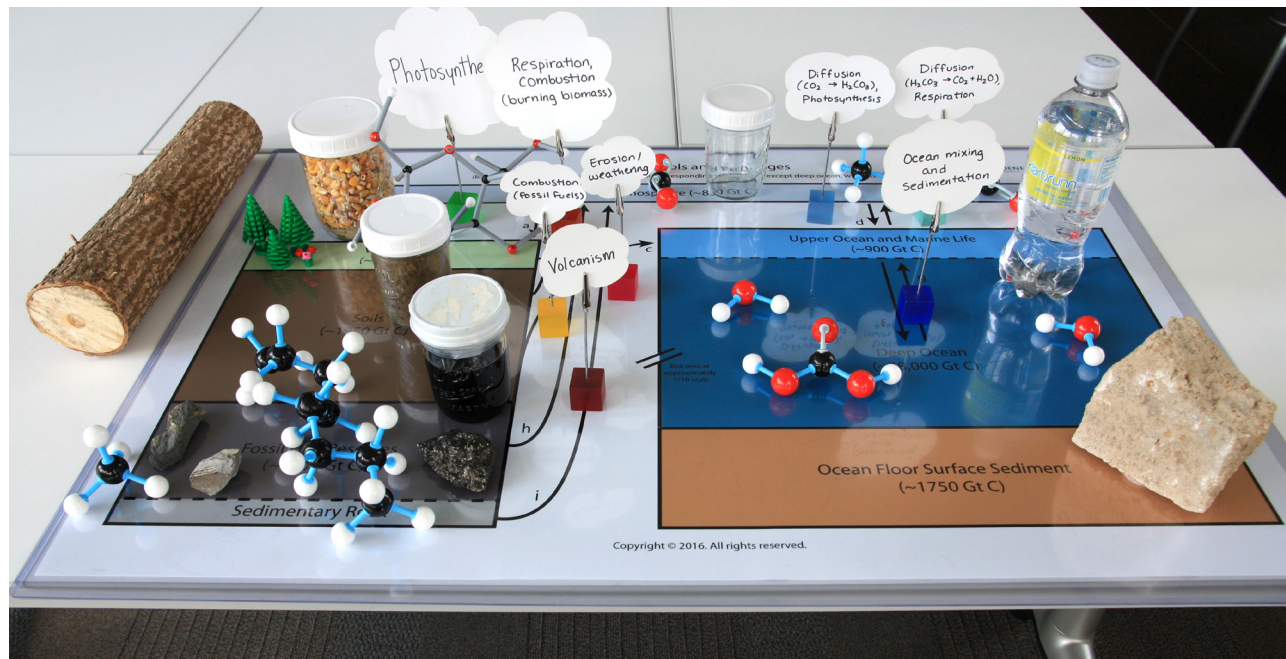
Next, add the molecular models of carbon and discuss what carbon pools they are found in and how they associate with the physical representations of carbon.



- CO_2 : greenhouse gas found in the atmosphere
- CH_4 : methane (greenhouse gas) found in the atmosphere and as natural gas within shale deposits
- $\text{C}_6\text{H}_{12}\text{O}_6$: glucose (sugar) stored in plants/animals that produces energy (carbon in the form of CO_2) when broken down
- H_2CO_3 : carbonic acid forms in oceans when CO_2 dissolves in water and undergoes a chemical reaction with H_2O
- C_8H_{18} : represents one of the many hydrocarbon chain lengths that make up fossil fuels such as coal and natural gas

PROCESSES

Finally, add in the processes that show how carbon is able to move to different sinks.



- Photosynthesis
- Respiration, combustion (burning biomass)
- Erosion/Weathering
- Diffusion ($\text{CO}_2 \rightarrow \text{H}_2\text{CO}_3$)
- Diffusion ($\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$)
- Ocean Mixing and Sedimentation
- Combustion (fossil fuels)
- Volcanism



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