

Station A

Open-ended Exploration

Investigate the Interactive Carbon Cycle Diagram.

1. Go to: <http://mare.lawrencehallofscience.org/curriculum/ocean-science-sequence/oss68-overview/oss68-resources/unit2>
 - a. Scroll down to Session 2.7 & click on Simulation
2. Notice how the carbon cycle diagram changes as you click on the different views in the top navigation. Be sure to also click on the arrows within the diagram to see additional information.
3. Find a new way of looking at the carbon cycle, different from how you have viewed it before.
4. What are some of the things you discovered about the carbon cycle looking at it in this new way?
5. What are some questions that arose as you investigated the carbon cycle?

Station B

Structured Activity

Paper clip carbon cycle model

- Follow the directions on the Station B instructions sheet.
- After running each model, discuss your ideas as a group using the discussion prompts on the instructions sheet.
- Reminder - you may not have time to complete the entire activity; just keep moving through as much of it as possible as you discuss the content and discussion prompts with your group.

Instructions & Worksheet for Station B—Structured Activity

Paper Clip Carbon Cycle Model #1

1. Different-colored circles represent different carbon reservoirs (e.g. ocean). Arrows represent flows moving carbon between the reservoirs.
2. Carbon atoms that belong to each reservoir are represented by different-colored paper clips. All of the paper clips represent identical carbon atoms—the different colors help keep track of which reservoir each carbon atom started in. Each reservoir starts with 10 paperclips.
3. Run the model. Start with the ocean reservoir.
 - a. First person rolls the die. The number that comes up on the die will tell you where to move ONE carbon atom (paper clip) from the ocean reservoir. For example, if the first person rolls a five, she will move a single paper clip to the atmosphere reservoir.
 - b. Take turns rolling the die and moving one paper clip from the ocean reservoir. Once everyone has a turn in the ocean reservoir, move **clockwise** to the next reservoir. Continue until you have completed all five reservoirs.
 - c. Note: after completing the ocean reservoir, you might want to use 2 dice to speed up the activity and data collection.
4. Discussion prompts. After running this first model, discuss the following:
 - a. Which reservoirs increase? Which decrease?
 - b. Which reservoir(s) gained the most atoms from different reservoirs?
 - c. What happens to the total number of carbon atoms on Earth?

Paper Clip Carbon Cycle Model #2

1. Run the second model, *Paper Clip Carbon Cycle Model #2*. Since the start of the Industrial Revolution, fossil fuel use has increased significantly. This game board represents the present day carbon cycle and includes a “combustion” flow from the fossil fuel reservoir.
 - a. Set up the game board as before (10 paperclips in each reservoir of appropriate colors). Follow the directions from step 3 above.
2. Discussion prompts. After running the second model, discuss the following:
 - a. What difference(s) in results did you notice between the 1st and 2nd model?
 - b. What are the strengths and limitations of this model?

Station C

Guided Discovery

Tabletop carbon cycle diagram

- Follow the directions on the Station C instructions and worksheet.
- Discuss your ideas as you work together with your group to explore carbon cards and design a tabletop carbon cycle diagram.
- Reminder - you may not have time to complete the entire activity; just keep moving through as much of it as possible as you discuss the content and discussion prompts with your group.

Instructions and Worksheet for Station C—Guided Discovery

Simple definition of carbon cycle: The whole system of flows of carbon between different parts of Earth is called the carbon cycle.

1. Labels (3): Atmosphere, Ocean and Land. Place the three labels in three areas on your table to represent the atmosphere, ocean and land.

2. Reservoir Cards (11):
 - a. Discuss the Reservoir cards with your group. Note the info available on both sides of the card.
 - b. Place each card where your group thinks they belong in your tabletop diagram. Use all 11 cards and leave space between the cards.
 - c. Discussion prompts:
 - i. Which four reservoirs have the most carbon?
 - ii. Residence time: In which reservoir does carbon spend the most time? The least time?

3. Flow Cards (16) and Arrows (18): (to save time, pick 8-10 flow cards to use)
 - a. Place the Flow cards between the Reservoir cards to show how carbon flows. Use the arrows to show the direction of carbon flow.
 - b. Discussion prompts:
 - c. Which flow moves the most carbon each year?
 - d. Which reservoir is connected to the largest number of flows?

4. Human Industry Cards (3)
 - a. Add the Human Industry cards to your diagram.
 - b. Discussion prompts:
 - c. What do you think will happen to this extra carbon that human industry adds to the atmosphere?
 - d. Do you think the extra carbon will stay in the atmosphere reservoir? Are there other reservoirs where it might flow?