**Name:**

**Date:**

**School:**

**Facilitator:**

4.05 Fossil Fuels Lab

**Part 1 Directions: Open** [**Annenberg Learner: Carbon Lab**](http://www.learner.org/courses/envsci/interactives/carbon/index.php) **and then carefully follow the steps below to complete the two data tables.**

1. Read the **Overview**.
2. Under **Carbon Cycle**, click on **Step 1** and read the information about the carbon cycle.
3. Click on **OPEN SIMULATOR**.
4. Record the amount of carbon in each area for the year 2010 on the Carbon Cycle Step 1 Data Table below. (Note – Look at the diagram on the right to pull the data.) We have inserted some data to get you started.
5. Click the **Run Decade** button found in the top left of the simulator. Notice how the carbon changes in each decade.
6. When you get to the year 2050, record the amount of carbon in each area on the Carbon Cycle Step 1 Data Table below.
7. Click the **Run Decade** button again and continue until you reach the year 2100.
8. Record the amount of carbon in each area for the year 2100 on the Carbon Cycle Step 1 Data Table below.

**Carbon Cycle Step 1 Data Table**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Step 1** | **Gaseous Carbon** | **Ocean Water** | | **Fossil Fuels** | | **Biosphere Gaseous Carbon** | |
| **to the year** | **Atmosphere** | **Ocean Surface** | **Deep Ocean** | **Oil and Gas** | **Coal** | **Soil** | **Terrestrial Plants** |
| **2010** | 720 | 1000 |  |  |  |  |  |
| **2050** | 941 | 1000 |  |  |  |  |  |
| **2100** |  |  |  |  |  |  |  |

1. Go back to the homepage of the lab (located in the upper left at Lab: Carbon). This will take you out of the simulator.
2. Under **Carbon Cycle**, click on **Step 2** and read the information.
3. Open the simulator, click Reset. You will begin again at the year 2010.
4. Record the amount of carbon in each area in the Carbon Cycle Step 2 Data Table below. We have inserted some data to get you started.
5. Click the **Run Decade** button and record the amount of carbon in each area for each decade from the year 2010 to the year 2100.

**Carbon Cycle Step 2 Data Table**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step 2** | **Total**  **Carbon Emissions** | | **Gaseous Carbon** | **Ocean Water** | | **Fossil Fuels** | | **Biosphere Gaseous Carbon** | |
| **to the year** | | Smokestack | Atmosphere | Ocean Surface | Deep Ocean | Oil and Gas | Coal | Soil | Terrestrial  Plants |
| **2010** | | 0 | 720 |  |  |  |  |  |  |
| **2020** | | 99 | 753 |  |  |  |  |  |  |
| **2030** | |  |  |  |  |  |  |  |  |
| **2040** | |  |  |  |  |  |  |  |  |
| **2050** | |  |  |  |  |  |  |  |  |
| **2060** | |  |  |  |  |  |  |  |  |
| **2070** | |  |  |  |  |  |  |  |  |
| **2080** | |  |  |  |  |  |  |  |  |
| **2090** | |  |  |  |  |  |  |  |  |
| **2100** | |  |  |  |  |  |  |  |  |

**Part 2 Directions: Answer the following questions based on the data you gathered in the Carbon Cycle Step 1 and Step 2 Data Tables.**

1. In what decade did the oil and gas reserves run out?

2. Look at your data in the Step 2 Data Table and explain how the levels carbon emitted from the smoke stack is related to the atmospheric carbon levels.

3. Where is most of the carbon found on earth according to the data from the simulation?

4. What happens to the amount of carbon located in plants as carbon levels in the atmosphere increase? From what you know about plants’ role in the carbon cycle, explain why this is happening.

**Part 3 Directions: Go back to the lab website and complete the steps below.**

1. From the homepage of the lab, click on **Curb Emissions** and read the information for **Step 1**.
2. Open the simulator again.
3. Click the **None** button to the right of **Change in Fossil Fuel Use per year**.
4. With this selected, run the simulator from the year 2010 to the year 2100.
5. Fill in the Curb Emission Step 1 Data Table below for the years 2010, 2050, and 2100.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Step 1** | **Gaseous Carbon** | **Ocean Water** | | **Biosphere Gaseous Carbon** | |
| **to the year** | **Atmosphere** | **Ocean Surface** | **Deep Ocean** | **Soil** | **Terrestrial Plants** |
| **2010** |  |  |  |  |  |
| **2050** |  |  |  |  |  |
| **2100** |  |  |  |  |  |

**Part 4 Directions: Answer the following questions based on the data you gathered in the Curb Emissions Step 1 Data Table.**

1. What is the one thing that has been changed between the first and second simulations?

2. How many parts per million (ppm) did atmospheric carbon dioxide levels reach in 2100? Even with this change in the Step 2 simulation, did atmospheric carbon dioxide levels return to their pre-Industrial Revolution levels (280 ppm)?

3. What does this simulation tell you about how long carbon emissions can affect the earth?