Student Sheet 1

LAB ACTIVITY: GETTING TO KNOW CO_2

The Earth's atmosphere is made up of sixteen different gases, each of which plays an important role in supporting life on Earth. While nitrogen is Earth's most abundant gas and used by every living organism to generate proteins, the one that is causing the most concern for scientists is carbon dioxide.

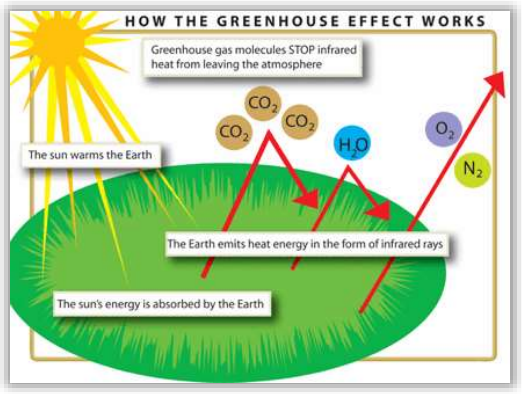
Carbon dioxide is a chemical compound composed of one carbon atom (*C*) and two oxygen atoms (O_2). It is a colorless, odorless gas that is found in very small amounts in the atmosphere and accounts for only 0.035% of the total mass of the atmosphere, but is essential for our survival. Carbon dioxide gas is released during the combustion (burning) process and is naturally released by volcanoes and hot springs, as well as from man-made furnaces and combustion engines. Deforestation and changes in land use also contribute large amounts. It is also released into the air by living organisms, including humans, when they breathe.

While mammals breathe in oxygen and breathe out carbon dioxide, plants perform the opposite process. Plants and algae absorb carbon dioxide in a process called ***photosynthesis*** which they use to produce food. This process also needs energy from the Sun. In addition to absorbing carbon dioxide, photosynthesis releases oxygen as a "waste" product, which helps clean the air for mammals and produces more oxygen for us to breathe.

Unfortunately there are times when the quantity of carbon dioxide produced is greater than that which can be disposed of through photosynthesis. In this situation, the carbon dioxide accumulates in the upper layers of the atmosphere which, if left unchecked, can greatly change the environment in a way that impacts all life on Earth.

Student Sheet 2

The Earth is heated by energy from the Sun. In a normal environment, most of the Sun's rays bounce off of the upper layers of the atmosphere and never reach the Earth's surface. The rest warm the Earth and then rise, with most leaving the atmosphere. This is similar to how the glass in a greenhouse warms the interior of the greenhouse.



With an increased level of carbon dioxide however, that rising heat cannot leave and is forced to stay in the atmosphere, slowly increasing the average temperature of the planet. CO_2 is expected to account for 50% of the increase in the Earth's global average temperature as a result of human activity.

Although too much carbon dioxide is often harmful, there are times when its properties can be put to good use. A perfect example of this is the fire extinguisher. Carbon dioxide gas is heavier than oxygen and sinks, displacing any oxygen that may be below it. When sprayed onto a fire, the carbon dioxide gas displaces the oxygen (which is required for a fire to burn), smothering the burning object and stopping the fire.

Student Sheet 3

DEMO 1: OBSERVATIONS

DEMO 2 OBSERVATIONS

Student Sheet 4

DEMO 3 OBSERVATIONS

DEMO 4 OBSERVATIONS

Student Sheet 5

ANALYSIS

DEMO 1:

1. What are 2 properties of CO_2?
2. What is the chemical formula for carbon dioxide?
3. Name 2 natural sources of CO_2.
4. Name 2 sources resulting from human activity.
5. Which 2 substances were used to produce the CO_2 for the first demo?
6. What happened when the vinegar and baking soda were put together?
7. What type of an event was this? What did it produce?
8. If you had poured the gas onto a flame what would have happened? Why?

DEMO 2

9. What process in animals adds CO_2 to the atmosphere?
10. As the population of humans and domestic animals like cows and sheep increase, what will happen to the amount of CO_2 in the atmosphere?
11. What was used as an indicator for CO_2 in the second demo?
12. How did the limewater appear when first mixed? Why?
13. How did the limewater look after it was shaken? Why?
14. What happened when air was blown into the liquid through the straw? Why?
15. What was present in the jar at the end of the demo that wasn't there at the beginning?
16. What does that tell you about the air exhaled by humans and other animals?
17. Name 2 decomposers.

DEMO 3

18. How do they get their energy?
19. What is the equal process in plants? Why can't decomposers do it?
20. Name 2 locations where decomposition occurs.

Student Sheet 6

21. What effect does human activity have on decomposition in in natural ecosystems?
22. What type of decomposer was used in Demo #3?
23. What was necessary for the decomposers to become active?
24. How do they produce CO_2? What is the other byproduct?
25. If a match were held to the surface of the mixture, what would happen? Why?
26. What does what happened in #25 tell you?

DEMO 4

27. What happened to the indicator in the tube with the Elodea?
28. What does this mean?
29. How do you know it was because of the Elodea?
30. What caused this to happen?
31. State two ways in which this carbon can be returned to the atmosphere.