Carbon Cycle Sources & Sinks

Summary

Students will identify the sources of carbon in the carbon cycle.

Time Frame

3 class periods of 30 minutes each

Group Size

Small Groups

Materials

test tube rack
5 test tubes
one hole stopper with tubing attached
baking soda
vinegar
aluminum foil
cotton balls
bromothymol blue
straws
Elodea plant
overhead markers
balloons
manila file folder
oven mitt
plastic grocery bag with no holes

- student worksheet (attached)

Background for Teachers

A Brief Description:
Students will use the chemical indicator bromothymol blue to detect the presence of carbon in different sources.

Experiment 1: students will gain experience in detecting CO_2 through the BTB reaction by using a pure CO_2 gas made from the reaction of baking soda and vinegar
Experiment 2: students will determine if animals are a source of CO_2
Experiment 3: students will determine if plants are a source of CO_2 (through respiration)
Experiment 4: students will determine if plants are a sink for CO_2 (through photosynthesis)
Experiment 5: students will determine if fossil fuels are a source of CO_2 (this is an extremely effective demonstration when done correctly)

Time Needed: Materials preparation: 30 minutes. Class time: 40 minutes (with one observation 24 hours later). Discussion & review: 30 minutes
Safety/Security Issues: Carbon monoxide is an odorless, moderately toxic, poisonous, and flammable gas. In a well-ventilated room, students could do this activity. In that case, teachers should provide students with balloons full of car exhaust. It is not recommended that students participate in filling the balloons with car exhaust. An adult assistant (or two) is necessary, however.

Instructional Procedures

Gather materials. You can choose to make stations for each experiment, or to provide materials for each lab group in your classroom.
Hand out the student sheets and go over the directions with students.
Give students an opportunity to work.
At some point, do the teacher demonstration for Experiment 5.
After the experiments & demonstration are done, give students time to work on analysis & conclusion.

Preparations for Experiment 5, Teacher Demonstration

Automobile exhaust collection

Get a plastic grocery bag, rubber band and oven mitts.
Place the rubber bag around the mouth of the bag but do not tighten it.
Using the heat resistant mitts, approach the exhaust pipe from the side. Place the opening of the bag over the tail pipe. Use the gloved hand to help form a seal between the it and the exhaust pipe. The bag should fill quickly when an assistant starts the car. When the bag is filled pull the bag off and use the rubber band up to seal the bag.

Experiment 5, Teacher Demonstration Procedures:

Fill test tube E approximately 1/3 full of bromothymol blue.
Take the exhaust filled bag, carefully place a straw in the rubber band so that the gas does not escape.
Insert the straw into test tube E.
Gently release air from the bag by slowly pressing on the sides. Allow the gas to bubble out at a steady rate until the balloon is empty.
Have students record observations.

Bibliography

Lesson Design by Jordan School District Teachers and Staff.

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