Carbon dioxide in the breath and in the classroom – information for teachers

1 Ideas for teaching

Neutralization and solubility are topics in chemistry classes which can be practically developed very well using the greenhouse gas carbon dioxide. The experiment on carbon dioxide in the breath and in the classroom, is also interesting for biology classes.

2 Previous knowledge and qualifications

Students should be familiar with the following terms: In chemistry: solubility of gases and solids, acids, alkalis, neutralization, salts. In biology: breathing, respiratory chain, energy conversion in the body.

3 Notes on conducting the experiment

3.1 Facilities

The first choice would be the chemistry room, but in principle the experiment can be conducted in any classroom.

3.2 Time required

Approx. 45 min. to carry out.

3.3 Safety aspects

The students may conduct the experiments only in the presence and under the supervision of the teacher. The teacher is to point out to the students that the provided materials may be used only according to the respective instructions.

Restrictions on activity: Activity is restricted for students up to grade 4.

© Siemens Stiftung 2017. Content licensed under CC BY-SA 4.0 international

Calcium hydroxide; hydrated calcium	According to the international hazardous substance labeling (GHS): DANGER! Hazard Statements: H315, H318, H335 Causes skin irritation. Causes serious eye damage. May cause respiratory irritation. Precautionary Statements: P260, P302, P352, P304, P340, P305, P351, P338, P313 Do not breathe dust / fume / gas / mist / vapours / spray.

Disposal: Container 4: Inorganic waste (acids and bases) with heavy metals. Heed the alkaline pH value.

3.4 Apparatus and materials

- One 1-l laboratory bottle with screw top (not a beverage bottle)
- One washing cylinder (alternative: jam jar; see below)
- Tubes
- 10 g calcium hydroxide
- Distilled water
- 1 pair of safety goggles for each student
- For measuring the surrounding air: A water jet pump or an aquarium pump (cheap model, from approx. 20 euros); a balloon pump is also cheap and effective.

Jam jar as alternative to washing cylinder: First drill a hole in the lid of the jam jar so that the rubber tube can be inserted. Choose the drilling diameter so that the tube fits in exactly. Only insert the tube to a depth of approx. 0.5 cm and seal with hot-melt adhesive. Make a second hole, insert the tube down to the bottom of the jar and seal.
Preparation, production of a calcium hydroxide solution ("lime water"): For safety reasons, the teacher should prepare the calcium hydroxide solution a few days before the students conduct the experiment. For this, place 8 g CaOH into the screw-top bottle and fill the bottle with 1 l distilled water. Close tightly and shake. The solution will be cloudy at first, but it will have settled after a few days. Clear lime water can now be poured out.

© Siemens Stiftung 2017. Content licensed under CC BY-SA 4.0 international