2. What is gas?

2 hours

Identifying gases in everyday settings and the creation of canister rockets to understand how gas expands when it is produced.

OBJECTIVES

- To understand that, although we cannot see most gases, their presence can be demonstrated.
- To recognise the differences between solids, liquids and gases.
- To observe and explore the production of a gas when a drinks bottle is opened, or certain materials are mixed.

RESOURCES

(Per group of 4 children unless otherwise stated)

- Balloon
- Adhesive tape
- Pin
- Film canister with lid (available from TTS) or similar
- Effervescent vitamin C tablets, Alka-Seltzer tablets[1] or similar
- Pipette
- Spoon
- Funnel
- Timer
- Shallow tray e.g. baking tray
- Post it notes or white board and marker
- Safety glasses (per child)
- Activity sheet 5

Safety note

Use safety glasses whenever there may be risk of injury to eyes. Children should not swallow tablets used during this investigation.

For teacher demonstrations only:

- Tea light candle
- Matches or safety lighter
- 2 litre plastic container, e.g. ice cream tub, transparent fish tank
- Coffee lid or small saucer
- Clear plastic pop bottle
- Plastic bottle of any fizzy drink
- Tubing which will fit tightly over the funnel Bung
- Plasticine or blu-tac

1 For further information regarding classroom use of Alka-Seltzer see Be Safe – Health and Safety in School Science and Technology, available from the Association for Science Education.

ADVANCE PREPARATION

Try the experiment in advance, as some lidded pots do not provide a strong enough seal for the pressure to build up inside.

INTRODUCING THE ACTIVITY

Referring to the display from the previous lesson, discuss the finding and storing of gas. Continue by asking:

- What is a gas?
- Where do we find gases?
- How do gases differ from solids and liquids? What are gases used for?
- Talk cards (see Appendix 2) may help to organise discussion groups. Ask different groups to focus on different questions which can then be shared via jigsawing.

Using their previous knowledge and earlier discussion, the children collate their ideas and descriptions of gases (e.g. gas will fill a container of any shape or size; the vapour that comes from a kettle is a gas; gases are all around us; gases can be found everywhere including in our bodies as we breathe in and out).

Pose the questions:

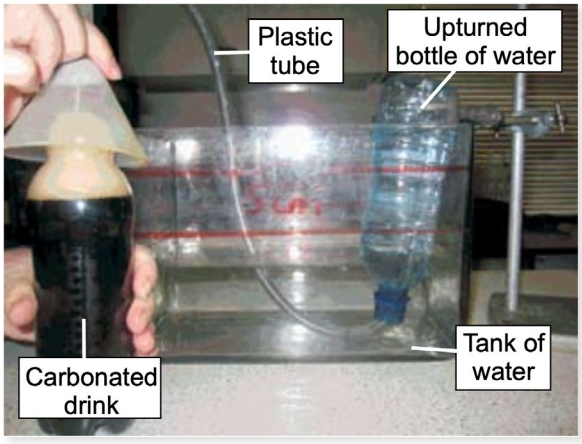
- How do we know gas is around us?
- Can we see it?
- Can we feel it?

The Administration Officer writes the group responses on a white board or post it note and the Communications Manager shares these with the class. Practical ideas suggested by the children can be tried, in addition to those outlined below.

By blowing a balloon up, the children can observe that gas fills the balloon evenly and changes the shape of the balloon. By sticking a piece of adhesive tape to the balloon and then piercing the tape carefully with a sharp point, the air will be released in a controlled manner. The children will be able to feel the gas leaving the balloon and see the balloon change shape.

TEACHER DEMONSTRATION

To show how much gas is in a fizzy drink, set up the demonstration resources as shown in the photograph below.



An opened bottle of carbonated drink is attached firmly to a tube and funnel with blu-tac. The tube leads to a bottle filled with water held upside down in a tank of water. Ask the children to observe closely when you shake the fizzy drink, and tell you what they see. They should see bubbles appearing in the upturned bottle of water, as the released gas is collected. If left in the classroom for several hours or days the gas from the fizzy drink will slowly displace the water contained in the other bottle. This activity could be photographed over a period of time (stop frame animation) to show how the water and drink levels change.

MAIN ACTIVITY

In order to explore the production and properties of gases for themselves, challenge the children to make a timer using a film canister, Alka-Seltzer or other effervescent tablet, and water.

The children begin by observing the effervescence ! of the tablets added to water. If these are put into a closed container such as a film canister, after a while the lid will pop off as the pressure increases and more and more gas is produced.

Safety note

Direct the shaken film canister away from everyone.

Varying the ratios of material that are combined will result in differing amounts of gases being produced. This will result in the lid popping off the canister after varying lengths of time. Measuring the amounts of the tablet and water, and the resulting popping times, will allow children to calculate the quantities of each ingredient to create a 30 second or 1- minute timer.

The children's exploration may include:

- Ratios and quantities of materials required (larger containers may require more of the tablet)
- Ways to measure the amount of water and tablet
- Effect of using crushed or 'chopped' tablets
- Creating a fair test and controlling variables.

Ensure that the children consider the risks there may be in carrying out this investigation, and precautions they should take to reduce the risks. For example, as the canister lid may come off with some force, an open area with a high ceiling should be used. If the weather conditions allow, this activity may be carried out outside. The children may also consider using a shallow tray to carry out the investigations, to prevent spillages becoming a slip hazard.

Activity sheet 5 can be used to record results. A sample data set is provided below as a guide. Results will vary with the equipment and tablets used:

Quantity of tablet	Quantity of water (ml)	Time taken to 'pop' (secs)
1	5	10
1/2	5	28
1/4	5	59

PLENARY

A class set of results is tabulated using all the group data. This can then be presented as a bar chart (using the mean data) or scatter graph. The results are discussed using some of the following questions:

- What does the information tell us?
- Is there any information that doesn't fit with the rest? Why?
- How much water and tablet do you think we'd need for a 45 second or 2 minute timer?
- Is there anything we could do to improve our investigations?
- What could the next investigation be?

Discuss the idea of repeating measurements to find out whether the test is reliable (i.e. are the results always similar, regardless of how often we carry out the test).

BACKGROUND INFORMATION

The focus for this resource is natural gas which is formed by the decomposition of sea animals and plants. The remains of the plants and animals are covered in layers of silt and sand. As the plants and animals are buried deeper and deeper and over thousands of years, the heat and pressure changes the plant and animal material into oil and gas. The gas is then released via drilling through the sand, silt and rock.

Appendix 2: Discussion Strategies

The following strategies are used extensively as part of the Discussions in Primary Science (DiPS[1]) project, and have been proven to be successful when developing children's independent thinking and discussion skills.

Use of these strategies is strongly recommended during the activities in this resource. A description of each strategy is provided below, suggesting the type of discussions best suited to each activity.

Talk cards

Talk cards support the teacher in facilitating these discussions, with the letters, numbers, pictures and shapes enabling the teacher to group children in a variety of ways. The role badges described in Appendix 1 can also be used for this purpose.

The example provided here shows one set for use with four children. The set can be copied onto a different colour of card and talk groups are formed by children joining with others who have the same coloured card.

Children can then pair up by finding a partner with the same animal or a different letter eg. elephant, rhino or a + b pair. Each TALK pair would then have a card with a different number or shape.

The numbers or shapes may then similarly be used to form alternative groupings and pairings.

ITT (Individual Think Time)

Each child is given time to think about the task individually before moving into paired or group work.

Talk Partners

Each child has a partner with whom she/he can share ideas and express opinions or plan. This increases confidence and is particularly useful where children have had little experience of talk in groups.

1 For more information go to www.azteachscience.co.uk