Students are often very surprised by the results of this experiment – that magnesium will continue to burn when placed in carbon dioxide.

**Equipment and materials**

Eye protection

*For fire extinguisher demonstration:*
Carbon dioxide cylinder with regulator or carbon dioxide generator (see notes 1 and 2)
Limewater
Candles (short 1-2 cm pieces or tea lights), 2
Gas jar
Beakers (100 cm³), 2
Test tube
Pipette
Heat resistant mat
Matches or lighter
Wooden splints
*Optional: Flexicam linked to data projector*

*For burning magnesium demonstration:*
Magnesium ribbon, about 5-10 cm (Refer to CLEAPSS Hazcard)
Bunsen burner
Heat resistant mat
Tongs
Matches or lighter
*Optional: Polaroid or blue filters for students. See Hazcard 59A*

*For magnesium and carbon dioxide demonstration:*
*Students may want to see the demonstration more than once so it is best to have enough magnesium and gas jars for at least 2 attempts*
Magnesium ribbon, pre-cut strips about 10 cm in length (Refer to CLEAPSS Hazcard)
Gas jars and lids – the gas jars should be full of carbon dioxide
Bunsen burner
Heat resistant mat
Tongs
Matches or lighter

**Health & Safety and Technical notes**

Before carrying out these practical activities, users are reminded that it is their responsibility to carry out a risk assessment in accordance with their employer’s requirements, making use of up-to-date information.

Read our standard health & safety guidance.

1 Carbon dioxide cylinder - see CLEAPSS Hazcard and also Laboratory Handbook Section 9.9 about the safe storage and use of gas cylinders
Magnesium and carbon dioxide – Practical guidance

2 Carbon dioxide generator - If a carbon dioxide cylinder is not available, carbon dioxide gas may be generated chemically – see Standard Techniques: Generating collecting and testing gases. Replace the thistle funnel with a tap funnel or unstoppered separating funnel. Add the hydrochloric acid (100 cm$^3$, 2M) a few cm$^3$ at a time to the marble chips (10 g) to generate a steady stream of carbon dioxide, and allow the heavier gas to displace the air from the gas jar. This can be checked by sampling the gas emerging from the neck of the flask using a dropping pipette to suck up a sample of gas, then bubbling it through fresh limewater in a test-tube. Immediate and dense milkiness of the limewater should indicate the flask is full of carbon dioxide, which may then be sealed with a greased gas jar lid until required for the demonstration. Refer to CLEAPSS Recipe Sheet 21 for more information.

3 For burning magnesium in carbon dioxide refer to CLEAPSS Hazcard 20.

4 Warn students not to look directly at the burning magnesium. See Hazcard 59A.

Procedure

Fire extinguisher demonstration

A flexicam or similar can help with the visibility of this quick demonstration.

1 In advance, fill a gas jar with carbon dioxide using either a cylinder or a gas generator.

2 Place the two beakers side by side on the bench and place a short candle or tealight in each.

3 Light the candles with a splint. They will continue to burn.

4 Pour carbon dioxide from the gas jar into one of the beakers and the candle will go out while the candle in the other beaker continues to burn. The second candle is a control.

5 Attempt to relight the first candle with a splint. This will fail and the splint will go out.

6 You may want to test the gas to show it is carbon dioxide. To do this use a pipette to suck up some of the gas and then bubble it through a small amount of limewater in a test tube. The limewater should go milky.

7 Now pour the carbon dioxide out of the beaker, and try again to relight the candle. This should now succeed.

Burning magnesium demonstration

Wear eye protection (teacher and students)

1 Hold a piece of magnesium ribbon in tongs

2 Place the end of the magnesium in a hot Bunsen flame to set fire to it.
Reaction of magnesium with carbon dioxide

Wear eye protection (teacher and students)

1 In advance, fill a gas jar with carbon dioxide using either a cylinder or a gas generator.

2 Using scissors cut a 10 cm piece of magnesium ribbon

3 Light a Bunsen burner.

4 Hold the piece of magnesium ribbon in tongs, and place one end in the Bunsen burner flame. As soon as it ignites, remove the lid from the gas jar and quickly plunge the ribbon into the carbon dioxide – but keep hold of it with the tongs. The magnesium continues to burn in the carbon dioxide, forming some black specs of carbon and white magnesium oxide.