

## Mass changes in chemical reactions – teacher notes

In this experiment, students measure the mass of various reactant solutions before and after reaction to see whether there has been any change in mass.

### Topic

The nature of chemical reactions, scientific investigation

### Timing

10 minutes

### Equipment

#### Apparatus

- Eye protection
- Student worksheet
- Part of a well-plate (see note 3 below)
- Access to a balance that reads to 0.01 g

#### Chemicals

Solutions should be contained in plastic pipettes. See the accompanying guidance on apparatus and techniques for microscale chemistry (<https://rsc.li/3tpLao1>).

- Sodium carbonate,  $0.5 \text{ mol dm}^{-3}$
- Calcium nitrate,  $0.5 \text{ mol dm}^{-3}$
- Hydrochloric acid,  $1 \text{ mol dm}^{-3}$
- Magnesium ribbon
- Marble chips (small)

#### Health, safety and technical notes

1. Read our standard health and safety guidance (<https://rsc.li/3aZZM7d>).
2. Wear eye protection throughout.
3. Cut a three-well plate from the standard 24-well plate using a hacksaw. A class set can be cut from a single well-plate.
4. Sodium carbonate,  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ ,  $0.5 \text{ mol dm}^{-3}$  is of low hazard at this concentration. See CLEAPSS Hazcard HC095A and CLEAPSS Recipe Book RB080.
5. Calcium nitrate,  $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ ,  $0.5 \text{ mol dm}^{-3}$  is of low hazard. See CLEAPSS Hazcard HC019B and CLEAPSS Recipe Book RB019.
6. Hydrochloric acid,  $\text{HCl}(\text{aq})$ ,  $1 \text{ mol dm}^{-3}$  is of low hazard. See CLEAPSS Hazcard HC047a and CLEAPSS Recipe Book RB043.

## Notes and expected observations

Students should find that there is a negligible difference in mass before and after mixing the sodium carbonate/calcium nitrate solution but there is some difference in mass in the magnesium or marble chip reaction with hydrochloric acid.

The success of this experiment depends on careful working by students and on the reliability of the balance and its proper use. Other combinations of substances could be examined and the experiment could be used as an investigation.

As an outcome of this experiment students should appreciate that matter is neither created nor destroyed in chemical reactions and that this is a very fundamental aspect of chemistry. It should also help them in balancing chemical equations!