# Some reactions of sulfur dioxide – teacher notes

## Topic

Gases

## Timing

20 minutes.

## Apparatus

* Eye protection
* Student worksheet
* Clear plastic sheet (eg OHP sheet)
* Plastic Petri dish (base + lid), 9 cm
* Plastic pipette
* Scissors

## Chemicals

Solutions should be contained in plastic pipettes. See the accompanying guidance on apparatus and techniques for microscale chemistry, which includes instructions for preparing a variety of solutions here <https://rsc.li/3SG8VG3>

* Hydrochloric acid, 1 mol m–3
* Potassium iodide, 0.2 mol dm–3
* Potassium iodate(V), 0.1 mol dm–3
* Potassium manganate(VII), 0.01 mol dm–3
* Full-range indicator solution diluted 1:1 with deionised water
* Sulfuric acid, 1 mol dm–3
* Sodium sulfite powder

## Method

Sodium sulfite + hydrochloric acid generates sulfur dioxide:

Na2SO3(s) + 2HCl(aq) → 2NaCl(s) + SO2(g) + H2O(l)

## Results

The iodide/iodate mixture turns black due to liberation of iodine:

IO3–(aq) + 5I–(aq) + 6H+(aq) → 3I2(g) + 3H2O(l)

If sufficient sulfur dioxide is produced and the solution contains excess acid, the potassium manganate(VII) solution is decolorised:

8H+(aq)+ 5e– + MnO4–(aq) → Mn2+(aq) + 4H2O(l)

However, with less sulfur dioxide and therefore less acid, the brown manganese(IV) oxide is formed:

4H+(aq) + MnO4–(aq) + 3e– → MnO2(s) + 2H2O(l)

Full-range indicator turns from green to yellow, indicating that sulfur dioxide is an acidic gas.

## Health, safety and technical notes

* Read our standard health and safety guidance here <https://rsc.li/3eeAKq4>
* Students must wear eye protection.
* Sulfur dioxide is toxic and is a particular problem for asthmatics. Only use a very small amount of sulfite and acid to keep the sulfur dioxide production to a minimum. A risk-assessment should include any individual sensitivities (see CLEAPSS Hazcard [HC097](https://science.cleapss.org.uk/Resource-Info/HC097-Sulfur-dioxide.aspx)).
* Hydrochloric acid 1 mol m–3, potassium iodide 0.2 mol dm–3, potassium iodate(V) 0.1 mol dm–3 and potassium manganate(VII) 0.01 mol dm–3 are all of low hazard (see CLEAPSS Hazcards [HC047a](https://science.cleapss.org.uk/Resource-Info/HC047a-Hydrochloric-acid.aspx), [HC047b](https://science.cleapss.org.uk/Resource-Info/HC047b-Halide-salts-Group-1-chlorides-bromides-iodides.aspx), [HC080](https://science.cleapss.org.uk/Resource-Info/HC080-Potassium-bromate-V-and-iodate-V.aspx), [HC081](https://science.cleapss.org.uk/Resource-Info/HC081-Potassium-manganate-VII.aspx)).
* Sulfuric acid 1 mol dm–3 is a skin/eye irritant (see CLEAPSS Hazcard [HC098a](https://science.cleapss.org.uk/Resource-Info/HC098a-Sulfuric-VI-acid.aspx)).
* Sodium sulfite powder is a skin, eye and respiratory irritant. Depending on its formulation, full range indicator can still be flammable when diluted 1:1 with water. Keep away from sources of ignition (see CLEAPSS Hazcard [HC092](https://science.cleapss.org.uk/Resource-Info/HC092-Sodium-and-potassium-metabisulfite.aspx)).