

## Oxidation states of iron – student sheet

In this experiment, you will compare the chemistry of the two main oxidation states of iron (a first row transition element) and consider explanations for any differences observed. Carefully follow the instructions below noting down all your observations and trying to give explanations.

You must wear eye protection.

### Instructions

1. Cover the table with a clear plastic sheet.
2. Put one drop of iron(II) solution in each box in the second row.
3. Put one drop of iron(III) solution in each box in the third row.
4. Add two drops of sodium hydroxide solution to each drop in the boxes in the second column. Observe and note whether there are any changes over the next 10 min.
5. Add one drop of potassium thiocyanate solution to each drop in the third column.
6. Add one drop of potassium iodide solution to each drop in the fourth column. After one minute, add one drop of starch solution to each.
7. Add one drop of potassium manganate(VII) solution to each drop in the fifth column. Observe changes over the next ten minutes.
8. Add one drop of silver nitrate solution to each drop in the sixth column. Observe closely using a magnifying glass.

### Table

Solutions of	Hydroxide ions	Thiocyanate ions	Iodide ions	Manganate (VII) ions	Silver(I) ions
Iron(II) ions					
Iron(III) ions					

### Questions

1. What explanations can you give for your observations?
2. Can you write equations for the reactions you observe?

### Health, safety and technical notes

- Wear eye protection throughout (splash-resistant goggles to BS EN166 3).
- Sodium hydroxide solution, NaOH(aq), 1 mol dm<sup>-3</sup> is CORROSIVE. [continued]

- Silver nitrate,  $\text{AgNO}_3(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$  is a skin/eye irritant. Keep separate from organic waste containers.
- The following chemicals are of low hazard:
  - Potassium iodide,  $\text{KI}(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$
  - Iron(II) sulfate,  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$
  - Iron(III) nitrate,  $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$
  - Potassium thiocyanate,  $\text{KSCN}(\text{aq})$ ,  $0.1 \text{ mol dm}^{-3}$
  - Potassium manganate(VII),  $\text{KMnO}_4(\text{aq})$ ,  $0.01 \text{ mol dm}^{-3}$  (not hazardous < 0.01 M)
  - Starch solution