

Practical 2 – Chapter 4

Reactions of transition metal solutions

This is an observation exercise, looking at some reactions of transition metal complexes. The observations you make should include the initial appearance of the substances and should be as detailed as possible.

You are provided with the following solutions containing transition metal ions:

- $\text{Cu}^{2+}(\text{aq})$
- $\text{Fe}^{2+}(\text{aq})$
- $\text{Fe}^{3+}(\text{aq})$
- $\text{Cr}_2\text{O}_7^{2-}(\text{aq})$
- $\text{MnO}_4^{-}(\text{aq})$

Safety

- Potassium thiocyanate solution may cause irritation. Avoid contact with bare skin.
- Potassium dichromate(VI) is an irritant and very toxic if swallowed. Avoid contact with bare skin.
- Potassium manganate (VII) is harmful. Avoid contact with bare skin.
- Ethanol is highly flammable. Take care when heating the solutions in Test 2.
- Sodium hydroxide solution is corrosive. Avoid contact with bare skin.
- Ammonia solution is an irritant. Avoid contact with bare skin.
- Wear safety goggles at all times.

Test 1

The first tests involve $\text{Cu}^{2+}(\text{aq})$, $\text{Fe}^{2+}(\text{aq})$ and $\text{Fe}^{3+}(\text{aq})$.

In each test take about 1 cm^3 of $\text{Cu}^{2+}(\text{aq})$, $\text{Fe}^{2+}(\text{aq})$ or $\text{Fe}^{3+}(\text{aq})$ in a test tube and observe the effects of the reagents on the solutions. The reagent should be added drop-wise at first and then to excess.

The reagents that you will use are all solutions:

- potassium iodide
- sodium hydroxide
- ammonia
- potassium thiocyanate
- potassium hexacyanoferrate(II)
- potassium hexacyanoferrate(III)

Test 2

The second set of tests involves redox reactions.

- 1 Take approximately 1 cm^3 of potassium dichromate(VI) solution in a boiling tube and add 1 cm^3 of dilute sulfuric acid and 1 cm^3 of ethanol.
Heat carefully in a boiling water bath on a tripod and gauze.
- 2 Take approximately 1 cm^3 of potassium manganate(VII) solution in a boiling tube and add 1 cm^3 of dilute sulfuric acid and 1 cm^3 of ethanol.
Heat carefully in a boiling water bath on a tripod and gauze.
- 3 Repeat step 2, but without the sulfuric acid.
- 4 Take approximately 1 cm^3 of potassium dichromate(VI) solution in a boiling tube and add 1 cm^3 of dilute sulfuric acid and 1 cm^3 of potassium iodide solution.
- 5 Take approximately 1 cm^3 of potassium manganate(VII) solution in a boiling tube and add 1 cm^3 of dilute sulfuric acid and 1 cm^3 of potassium iodide solution.