

## Observing chemical changes – student sheet

In this experiment you will be observing the changes that occur when you mix solutions of chemicals on the grid shown.

### Instructions

Cover the table on your worksheet (see next page) with a clear plastic sheet, then follow steps 1–10 below.

1. Put two drops of barium nitrate solution into box 1 (at the top of the middle column). Add two drops of sodium sulfate solution to the drops of barium nitrate solution.
2. Put two drops of lead nitrate solution into box 2. Add two drops of potassium iodide solution to the drops of lead nitrate solution.
3. Put two drops of iron(III) nitrate solution into box 3. Add one drop of potassium thiocyanate solution to the iron(III) nitrate solution.
4. Put two drops of copper(II) sulfate solution into box 4. Add two drops of ammonia solution to the copper(II) sulfate solution.
5. Put two drops of ammonium vanadate(V) solution into box 5. Add one drop of hydrochloric acid, then a small piece of zinc metal to the ammonium vanadate(V) solution.
6. Put two drops of iron(II) sulfate solution into box 6. Add two drops of sodium hydroxide solution to the iron(II) sulfate solution.
7. Put two drops of potassium manganate(VII) solution into box 7. Add two drops of iron(II) sulfate solution to the potassium manganate(VII) solution.
8. Put two drops of barium nitrate solution into box 8. Add two drops of sodium hydroxide to the barium nitrate solution. Observe, and record any changes over the next ten minutes.
9. Put one drop of silver nitrate solution into box 9. Add one drop of iron(II) sulfate to the silver nitrate solution. Observe closely using a magnifying glass.
10. Put two drops of copper(II) sulfate solution into box 10. Add a small piece of zinc metal to the copper sulfate solution.

Barium nitrate	1	Sodium sulfate
Lead nitrate	2	Potassium iodide
Iron(III) nitrate	3	Potassium thiocyanate
Copper(II) sulfate	4	Ammonia solution
Ammonium vanadate(V)	5	Hydrochloric acid and zinc
Iron(II) sulfate	6	Sodium hydroxide
Potassium manganate(VII)	7	Iron(II) sulfate
Barium nitrate	8	Sodium hydroxide
Silver nitrate	9	Iron(II) sulfate
Copper(II) sulfate	10	Zinc

## Health, safety and technical notes

- Wear eye protection throughout (splash-resistant goggles to BS EN166 3).
- Silver nitrate,  $\text{AgNO}_3(\text{aq})$ ,  $0.1 \text{ mol dm}^{-3}$  is an eye irritant. Keep separate from organic waste containers.
- Lead nitrate,  $\text{Pb}(\text{NO}_3)_2(\text{aq})$ ,  $0.5 \text{ mol dm}^{-3}$  is a reproductive toxin, causes eye damage, causes damage to organs (especially the CNS) and is harmful to the aquatic environment. Avoid inhalation and skin contact.
- Ammonia solution,  $\text{NH}_3(\text{aq})$ ,  $3 \text{ mol dm}^{-3}$  is CORROSIVE.
- Ammonium vanadate(V),  $\text{NH}_4\text{VO}_3$ ,  $0.2 \text{ mol dm}^{-3}$  (acidified with sulfuric acid) is a mutagen and extremely toxic if inhaled – but not by any other route.
- Sodium hydroxide solution,  $\text{NaOH}(\text{aq})$ ,  $1 \text{ mol dm}^{-3}$  is corrosive.
- Copper(II) sulfate solution,  $\text{CuSO}_4(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$  causes eye damage and is HAZARDOUS to the aquatic environment.
- The following chemicals are all of low hazard:
  - Barium nitrate,  $\text{Ba}(\text{NO}_3)_2(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$
  - Sodium sulfate,  $\text{Na}_2\text{SO}_3(\text{aq})$ ,  $0.5 \text{ mol dm}^{-3}$
  - Hydrochloric acid,  $\text{HCl}(\text{aq})$ ,  $1 \text{ mol dm}^{-3}$
  - 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 manganate(VII),  $0.01 \text{ mol dm}^{-3}$
  - Potassium thiocyanate,  $\text{KSCN}(\text{aq})$ ,  $0.2 \text{ mol dm}^{-3}$
  - Zinc metal granules