

OCR (A) Chemistry GCSE

PAG 5: Identification of Species (chemistry only)

Notes



Identification of Species

Aim

To use qualitative analysis to identify ions and to use this information to determine the composition of unknown substances.

Equipment list

- Bunsen burner
- Heat proof mat
- 2 boiling tubes
- Test tubes
- 10 cm³ measuring cylinder
- Dropping pipettes
- Marker pen
- Clean nichrome wire loop
- Beaker

Chemicals required

- Ammonia solution
- Sodium hydroxide solution
- Nitric acid solution
- Silver nitrate solution
- Hydrochloric acid
- Barium chloride solution
- Deionised water
- Up to 8 unknown samples prepared (CuCl₂/K₂CO₃/KI/CuSO₄/FeCl₃/FeSO₄/AlCl₃/LiCl)

Method

5 different tests will be carried out on the substances:

1. Label the first unknown substance as number 1.
2. Add a spatula of the sample to a boiling tube and dissolve in 10 cm³ of water.
3. Add 2 cm³ of the solution in the boiling tube to 5 separate test tubes labelled 1A-1E.
4. Carry out the following tests for common ions and note your observations:

Test A - Test for halide ions: Add 3 drops of dilute nitric acid followed by 3 drops of silver nitrate solution. Observe the colour of the precipitate. Add 3 drops of ammonia solution.

Test B - Test for sulfate ions: Add 3 drops of dilute nitric acid followed by 3 drops of barium nitrate.

Test C - Test for carbonate ions: Add 1 cm³ of dilute nitric acid drop by drop into the test tube.

Test D - Test for metal ions: Add 1 cm³ of sodium hydroxide solution drop by drop into the test tube. Place damp red litmus paper over the end of the test tube.

Test E - Test for metal ions: Add 1 cm³ of ammonia solution drop by drop into the tube.

5. To carry out the flame test, begin by cleaning the nichrome wire, dipping it in HCl then holding it in a blue flame until it burns without altering the colour of the flame.
6. Pour some deionised water into a beaker. Dip the wire loop into the water then into the first solid sample. Hold this in the blue flame of a Bunsen burner and record the colour.
7. Repeat for the other unknown samples, ensuring each sample is correctly labelled.



Key points

- There are some false positive results, for example Test A for halides will give a white precipitate for FeSO_4 despite there being no chloride ions. Only state which ions are in a sample once you've recorded the results of every test.

Safety precautions

- Take care when using the Bunsen burner. Leave on the safety flame or turn gas off when not in use. Tie hair back and keep any flammable solutions away from the naked flame.
- Treat all of the unknown samples as harmful and irritant.
- Replace lids on chemicals after use to avoid spills.
- Clear up any broken glassware or chemical spillages immediately and wash hands after contact with any chemicals.
- Ensure the laboratory is well ventilated.

Analysis of results

Ppt - precipitate

| Sample | Test A | Test B | Test C | Test D | Test E | Flame |
|----------------------------|-------------------------------------|-------------------|-------------------|-------------------|--|-------------------|
| 1. CuCl_2 | White ppt dissolves in ammonia | No visible change | No visible change | Blue ppt | Blue ppt dissolves in excess NH_3 | Green/blue |
| 2. K_2CO_3 | Bubbles form | Bubbles form | Bubbles form | No visible change | No visible change | Lilac |
| 3. KI | Yellow ppt doesn't dissolve ammonia | No visible change | No visible change | No visible change | No visible change | Lilac |
| 4. CuSO_4 | White ppt | White ppt | No visible change | Blue ppt | Blue ppt dissolves in excess NH_3 | Green/blue |
| 5. FeCl_3 | White ppt dissolves in ammonia | No visible change | No visible change | Brown ppt | Brown ppt | Orange |
| 6. FeSO_4 | White ppt | White ppt | No visible change | Green ppt | Green ppt | Orange |
| 7. AlCl_3 | White ppt dissolves in ammonia | No visible change | No visible change | White ppt | White ppt | No visible change |
| 8. LiCl | White ppt dissolves in ammonia | No visible change | No visible change | No visible change | No visible change | Bright red |

