

12.5 Identification of ions and gases

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS sodium hydroxide 氢氧化钠 • sodium 钠 • flame test 焰色试验 • nitrate 硝酸盐 • nitric acid 硝酸

Objective

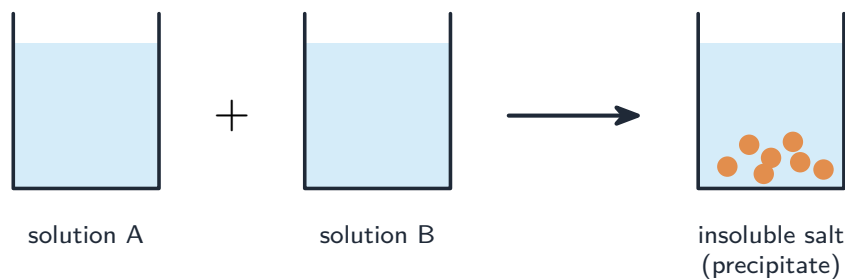
Build the skills to answer exam questions on the **identification of ions and gases** 离子与气体检验 — tests for **anions** 阴离子, **cations** 阳离子, gases, and **flame tests** 焰色试验.

You must be able to:

- give the test and result for common anions (carbonate, halides, sulfate, nitrate)
- give the cation tests with sodium hydroxide / aqueous ammonia
- give the gas tests and flame-test colours

1 Worked examples

■ Key tests



Many ion tests give a coloured precipitate

- **chloride:** dilute HNO_3 + silver nitrate $\rightarrow$ white precipitate.
- **sulfate:** dilute HNO_3 + barium nitrate $\rightarrow$ white precipitate.
- **CO_2 :** turns limewater milky. **H_2 :** squeaky pop. **O_2 :** relights a glowing splint.
- **flame:** Li red, Na yellow, K lilac, Cu blue-green.

2 Practice

2.1 Give the test and result for carbon dioxide gas. [2]

2.2 State the flame colour given by a potassium ion. [1]

3 Exam-style questions

3.1 A white precipitate forms when dilute nitric acid and silver nitrate are added. The ion present is: [1]

- **A** sulfate
- **B** carbonate
- **C** chloride
- **D** nitrate

3.2 A solution gives a light blue precipitate with sodium hydroxide that dissolves in excess aqueous ammonia to a deep blue solution.

(a) Name the cation present. [1]

(b) Describe the test for a sulfate ion and its result. [2]

3.3 Describe the test for hydrogen gas and its positive result. [2]

Solutions

2.1 bubble it through limewater; the limewater turns milky.

2.2 lilac (purple).

3.1 C. Silver nitrate (with nitric acid) gives a white precipitate with chloride.

3.2 (a) copper(II), Cu^{2+} .

(b) add dilute nitric acid then barium nitrate; a white precipitate confirms a sulfate.

3.3 hold a lighted splint at the mouth of the tube; a 'squeaky pop' shows hydrogen.