

11.3 Some reactions of the halide ions

Name: _____ Class: _____ Date: _____

Total: 11 marks

Objective

Build the skills to answer exam questions on **reactions of the halide ions** 卤离子—halides as **reducing agents** 还原剂, the **silver halide** 卤化银 test, and the reaction with concentrated sulfuric acid.

You must be able to:

- describe the relative reactivity of the halide ions as reducing agents
- describe the test with aqueous silver ions followed by ammonia
- describe and write equations for the reactions with concentrated sulfuric acid

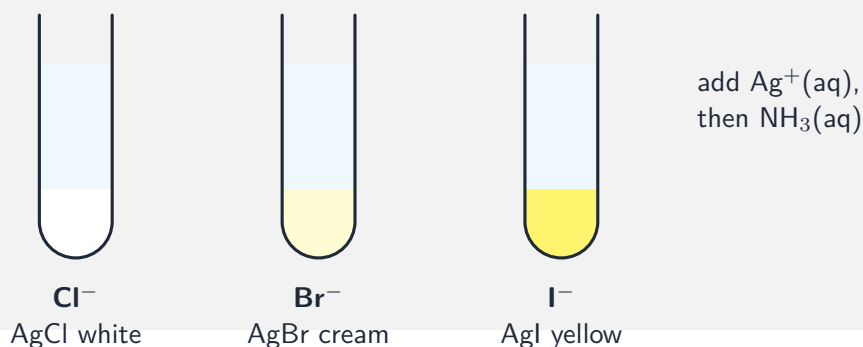
1 Worked examples

■ Halides as reducing agents

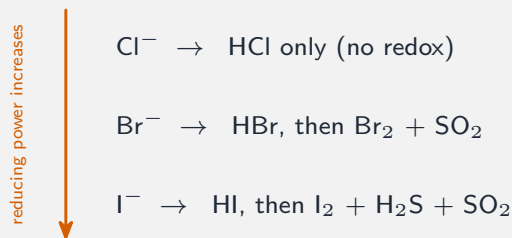


Reducing power of the halide ions increases down the group (a larger ion loses its electron more easily)

■ The silver halide test



■ With concentrated sulfuric acid



The stronger reducing agents (Br, I) are oxidised to the halogen, reducing the sulfur

- Cl : only HCl (no redox): $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$.
- Br : $\text{HBr} + \text{brown Br} + \text{SO}_2$. I : $\text{HI} + \text{I}_2 + \text{H}_2\text{S} + \text{SO}_2$ (I is the strongest reducing agent).

2 Practice

2.1 State the colour of the precipitate formed when silver nitrate is added to (a) chloride and (b) iodide ions. [2]

2.2 State the trend in reducing power of the halide ions down the group. [1]

3 Exam-style questions

3.1 A halide gives a cream precipitate with silver nitrate that dissolves only in concentrated ammonia. The halide is: [1]

- A chloride
- B bromide
- C iodide
- D fluoride

3.2 Which halide is oxidised to a coloured element by concentrated sulfuric acid, also producing H_2S ? [1]

- A chloride
- B bromide
- C iodide

- **D** none of them
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3.3 (a) Describe how you would use silver nitrate and ammonia to distinguish between solutions of sodium chloride and sodium iodide. [3]

(b) Explain why iodide ions are oxidised by concentrated sulfuric acid but chloride ions are not. [2]

3.4 Write the equation for the reaction of solid sodium chloride with concentrated sulfuric acid. [1]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **11.3 Some reactions of the halide ions** past-paper sheet in the Library, or try these in **Practice mode**:

- 9701/11 N25 —Q21 (halide tests)
- 9701/12 N25 —Q22 (halide reactions)
- 9701/31 N25 —Q3 (halide practical, calculation)

Solutions

2.1 (a) white; (b) yellow.

2.2 reducing power increases down the group.

3.1 B. A cream precipitate dissolving only in concentrated ammonia is bromide.

3.2 C. Iodide is the strongest reducing agent, reducing the acid to H₂S.

3.3 (a) add silver nitrate to each —both give a precipitate; chloride gives white, iodide gives yellow; add ammonia —the chloride (white) dissolves in dilute ammonia, the iodide (yellow) is insoluble.

(b) iodide ions are stronger reducing agents (lose their electron more easily), so they reduce the sulfuric acid; chloride ions are too weak a reducing agent.

3.4 $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$.