

2.3 Acids salts and chemical tests

Name: _____ Class: _____ Date: _____

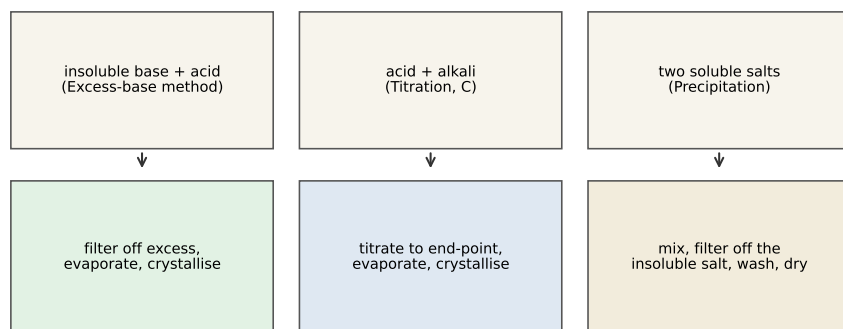
Total: 22 marks

Objective

Cover acids, alkalis, salt preparation (2.28–2.43C) and the chemical tests (2.44–2.50): indicators and pH, neutralisation as proton transfer, solubility rules, the three salt routes, and every named identification test. Original IGCSE-level practice.

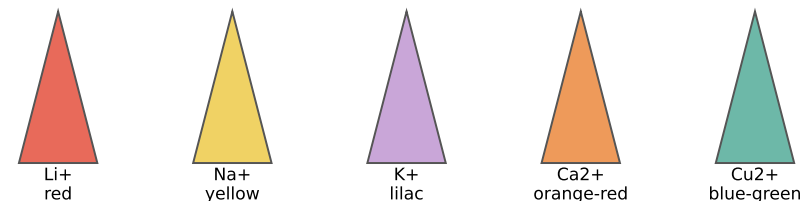
1 Key knowledge and worked examples

■ Salts by the right route



Soluble salt, insoluble base ($\text{CuO} + \text{H}_2\text{SO}_4$): warm, add excess base, filter, evaporate, crystallise. (C) Acid + alkali: titrate with indicator to the end-point, evaporate. (C) Insoluble salt: precipitation from two soluble salts, filter, wash, dry.

■ The tests to recall



Gases: H_2 pops; O_2 relights a glowing splint; CO_2 milky limewater; NH_3 damp red litmus blue; Cl_2 bleaches litmus. Cations: flames Li red/Na yellow/K lilac/Ca orange-red/Cu blue-green; NaOH(aq) gives NH_3 with NH_4^+ and blue/green/rust precipitates with $\text{Cu}^{2+}/\text{Fe}^{2+}/\text{Fe}^{3+}$. Anions: AgNO_3 white/cream/yellow for $\text{Cl}^-/\text{Br}^-/\text{I}^-$; BaCl_2 white for SO_4^{2-} ; HCl fizzes CO_2 from CO_3^{2-} . Water: white anhydrous $\text{CuSO}_4 \rightarrow$ blue; pure water boils at exactly 100°C .

2 Practice

2.1 State the colour change of phenolphthalein when alkali is added to acid. [1]

2.2 Name the two insoluble chlorides and the main insoluble sulfate. [3]

2.3 Write the equation for zinc oxide reacting with hydrochloric acid. [2]

2.4 Describe the positive result for the carbonate test. [2]

2.5 (C) In a titration, what is added from the burette, and what shows the end-point?[2]

3 Exam-style questions

3.1 Describe how to prepare a pure, dry sample of copper(II) sulfate crystals from copper(II) oxide and dilute sulfuric acid, naming each step in order. [5]

3.2 Describe tests to distinguish between chloride, bromide and iodide ions in solution, giving all observations. [4]

3.3 (C) Lead(II) nitrate solution is mixed with sodium sulfate solution. Write the equation, state the observation, and name the method used to collect the product. [3]

Solutions

2.1 Colourless to pink.

2.2 Silver chloride and lead(II) chloride; barium sulfate.

2.3 $\text{ZnO} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\text{O}$.

2.4 Effervescence/fizzing with dilute acid; the gas turns limewater milky – it is CO_2 .

2.5 (C) The acid (of known concentration) from the burette; the indicator changes colour permanently (e.g. methyl orange yellow, phenolphthalein pink).

3.1 Warm the dilute sulfuric acid and stir in copper(II) oxide until no more dissolves – excess base proves the acid is all used; filter off the unreacted black oxide; evaporate the filtrate to the crystallisation point; leave to crystallise and dry the blue crystals on filter paper.

3.2 Acidify each solution with dilute nitric acid, add silver nitrate solution; chloride gives a white precipitate, bromide cream, iodide pale yellow.

3.3 (C) $\text{Pb}(\text{NO}_3)_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{PbSO}_4\downarrow + 2\text{NaNO}_3$; a white precipitate forms; precipitation – collect by filtration, wash and dry.