Soluble salt preparation by titration

Teacher / technician

YEAR 10 / LESSON 56 / CHEMISTRY ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Chemistry-only supervised titration. Use dilute working reagents, an indicator-free repeat, and a planned follow-up for crystallisation; no claim of instant crystals.

Coverage and delivery

Chemistry only: 2.33C and 2.40C. Acid–alkali titration and soluble-salt preparation. Titration and crystal collection may need separate sessions.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklet / writing tools	1 per learner	30 sets
Burette / pipette + filler / flask / tile	1 set per pair	15 sets
Eye protection / dish / label	1 protector each; 1 dish per pair	30 protectors; 15 dishes
0.100 M HCl / 0.100 M NaOH	Up to 125 cm^3 each + rinsing	2.5 L each incl. spare
Methyl orange / wash bottles	2 drops per titration	10 cm^3 indicator; deionised water
Warm bath / heat mats / paper	Shared supervised stations	Class capacity; 15 mats

Immediate safety

Wear eye protection and report splashes. Use a pipette filler. Fill a securely clamped burette below eye level and remove the funnel before use. Staff supervise warming; no boiling dry. Laboratory salt is not food.

Preparation and delivery

Read alongside the student method

YEAR 10 / LESSON 56 / CHEMISTRY ONLY

1. Budget a maximum of five 25 cm^3 portions per pair: one rough run, up to three accurate runs and one indicator-free preparation. For 15 pairs this is 1.875 L each reagent before rinsing; supply 2.5 L each of 0.100 M HCl and NaOH including spare.

2. Provide 15 burettes/clamps, 15 volumetric pipettes/fillers, flasks, white tiles and clean dishes. Supply 10 cm^3 methyl orange for the class; two drops per titration, at most 120 drops total. Use supplier formulation/SDS.

3. Staff verify the two working solutions, especially NaOH affected by atmospheric CO_2, and trial the endpoint. A nominal 25 cm^3 titre is not a replacement for measurement. If more runs are needed, issue additional solution under supervision.

4. Demonstrate safe burette filling below eye height, jet bubble removal, meniscus reading and pipette drainage according to its calibration (do not blow out a standard delivery pipette). Use a consistent indicator amount.

5. Read burettes to the precision supported by their graduations, normally nearest 0.05 cm^3 for 0.1 cm^3 divisions. Use concordant accurate titres, excluding the rough and any outlier; report absence of concordance honestly.

6. Allow the first session for titration and making the indicator-free solution; organise supervised concentration/slow evaporation and a later 10–15 minute collection. Nominal yield is only about 0.146 g per pair. Do not scale up or substitute strong reagents to rush crystallisation.

Close of lesson

- Collect used solutions as directed under the school waste plan. Rinse apparatus and return pipettes safely.
- Leave labelled product dishes in the designated tray for collection later; wash hands.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

YEAR 10 / LESSON 56 / CHEMISTRY ONLY

• Residual water would dilute reagent in burette/pipette. Water in the flask changes volume, not moles of the delivered NaOH.

• A funnel can drip after the initial reading; an empty jet uses some measured volume to fill itself instead of delivering to the flask. Both can bias the titre.

• 24.80 and 24.85 differ by 0.05 cm^3; mean=24.825 cm^3, conventionally 24.83 cm^3 to 2 decimal places. 25.40 is not concordant.

• Indicator would contaminate the salt. Determined volumes allow the reaction to be repeated in clean apparatus without indicator; simply filtering cannot remove dissolved indicator.

• n(NaOH)=0.100×0.0250=0.00250 mol; NaCl=0.00250×58.5=0.14625 g (0.146 g). Solubility and transfer losses reduce recovered mass; wet product can give an inflated value.

• The solution contains much water and little salt. NaCl solubility changes little on cooling, so considerable water removal/slow evaporation is required. Avoid spitting and overheating.

References and provenance

Pearson Chemistry specification

RSC titration and sodium-chloride preparation

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.