Core practical: a small ester sample

Teacher / technician

YEAR 11 / LESSON 104 / CHEMISTRY ONLY

Staff preparation and answer guidance. Keep separate from student sheets. Supervised small sample, not an isolated pure ester. Staff must control corrosive additions and confirm local method suitability.

Coverage and delivery

Chemistry only: 4.43C, supported by 4.38C–4.42C. One ester only, with staff-controlled corrosive additions.

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
Tube / tongs / protection	1 set per pair; goggles each	15 sets; 30 goggles
Ethanol / ethanoic acid	10 drops each per pair; acid staff-only	20 cm^3 each prepared as controlled aliquots
Sulfuric catalyst	1 drop per pair, staff-only	15 drops plus minimal spare
0.50 M sodium carbonate	10 cm^3 per pair	200 cm^3 including spare

Immediate safety

Goggles throughout. Corrosive acids are staff-handled; organic liquids are flammable. No flames, sealed vessels, tasting or direct sniffing; allow full cooling before supervised work-up.

Preparation and delivery

Read alongside the student method

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1. For 15 pairs provide 15 stable borosilicate tubes, tongs/racks/mats, 15 large open work-up tubes, labelled droppers and 30 goggles. Use electric water heating and remove all naked flames and bulk organic stock from the work area.

2. At a staffed fume-cupboard station, preload each reaction tube with one drop of concentrated sulfuric acid, then ten drops glacial ethanoic acid. Staff alone handle corrosive stocks. Supply ten drops ethanol per pair; prepare 20 cm^3 each organic reagent and a minimal staff-held catalyst aliquot, allowing spare without pupil access.

3. Use the RSC small-sample method with an electric bath replacing flame heating. Staff provide hot water near boiling, confirm stable immersion without water entering tubes, and supervise about one minute warming. If the mixture boils, staff lift the tube with tongs and allow it to settle; do not cap it.

4. Provide 10 cm^3 0.50 M sodium carbonate per pair (prepare 200 cm^3 including spare) in a sufficiently large open tube. Add the fully cooled reaction mixture gradually with pauses for CO_2 release; prevent splashing or overflow.

5. Ethanol/ester are flammable; glacial ethanoic and concentrated sulfuric acid are corrosive. Use goggles, suitable staff gloves and working local extraction. Local trial/risk assessment must establish bath handling and drop delivery. Staff collect the organic/acidic work-up waste under the local plan. No pupil concentrated-acid dispensing, methanol, distillation or product use.

Close of lesson

• Staff collect labelled work-up waste and cooled apparatus. Never take a product sample away; wash hands and benches.

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

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- Ethanol, ethanoic acid and ethyl ethanoate.
- $CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$.
- Acid catalyses the reaction; it is not a stoichiometric reactant in the overall equation.
- Indirect controlled warming reduces ignition risk; open vessels avoid pressure buildup, especially during carbonate effervescence.
- Carbonate reacts with residual acids to form carbon dioxide, salts and water.
- The small mixed sample contains possible reactants/water/impurities; drop counts and odour do not quantify pure ester or yield.

References and provenance

Pearson Chemistry specification

RSC small-scale ester 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.