Core practical: a small ester sample

Student activity • practical and reasoning

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The question

How can we prepare a sample without claiming it is pure?

Prepare a small ethyl ethanoate-containing mixture using supervised microscale esterification. Distinguish evidence of a reaction from proof of purity or yield.

Equipment

- Goggles, borosilicate specimen tube, rack, tongs and heatproof mat
- Teacher-controlled ethanol, ethanoic acid and acid catalyst additions
- Electric hot-water bath, thermometer and open work-up tube with sodium carbonate solution

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.

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

Plan, model or apparatus sketch

Draw the open reaction tube supported in an electrically heated water bath, then the separate cooled carbonate work-up stage.

Method and reasoning

Read the whole sequence before starting

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1. Wear goggles and wait for the teacher to issue/check the reaction tube. All concentrated-acid additions take place at the staffed ventilated station; pupils do not dispense them.

2. Using the issued ethanol dropper, add the specified ten drops to the prepared tube under supervision. Keep the tube upright, open and away from ignition sources.

3. Place the tube securely in the teacher-managed hot-water bath for about one minute. Never heat the organic mixture directly or stopper it; tell the teacher immediately if it boils.

4. Use tongs as demonstrated to move the tube onto the heatproof mat and let it cool completely.

5. At the supervised station, add the cooled mixture gradually to the open carbonate work-up tube, pausing while it fizzes. Do not stopper or shake a closed vessel.

6. Record actual layer/appearance changes. Describe odour only if the teacher explicitly permits gentle distant wafting after work-up; no direct sniffing, tasting or skin application. Write the balanced esterification equation.

Cleanup

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

Record your evidence

Blank spaces are for your own work

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Reference and task data

Reaction model: $CH_3COOH+C_2H_5OH \rightleftharpoons CH_3COOC_2H_5+H_2O$. A small sample may show an organic layer after work-up; appearance or smell does not establish purity. No mass yield is inferred from drops, and no product is isolated for use.

Stage	Actual observation	Interpretation / limitation
Before / after warming		
Carbonate work-up		
Product evidence		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Name the alcohol, acid and predicted ester.

2. Write the reaction equation.

3. Why is a catalyst used?

4. Why use a water bath and keep vessels open?

5. Why does carbonate work-up fizz?

6. Why is this not a pure-product or percentage-yield measurement?