Ethanoic acid: metals and carbonates

Student activity • practical and reasoning

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The question

Do two fizzing reactions form the same gas?

Compare small-scale reactions of dilute ethanoic acid with magnesium and sodium carbonate. Record evidence and use equations to distinguish the predicted gases.

Equipment

- Eye protection, rack, three test tubes and labelled droppers
- Staff-issued 0.050 mol dm^{-3} ethanoic acid, 0.40 mol dm^{-3} sodium carbonate solution and one 1 cm magnesium strip
- Measuring cylinder, forceps and labelled waste beaker; no flames

Wear eye protection; keep tubes open, avoid splashes and keep all flames away. Do not taste vinegar or laboratory solutions.

Course coverage: Chemistry only: 4.36C–4.37C. Dilute ethanoic acid reactions; vinegar is an aqueous mixture containing ethanoic acid.

Plan, model or apparatus sketch

Draw the two open reaction tubes and unchanged control. Label the reactants and predicted gases separately from observations.

Method and reasoning

Read the whole sequence before starting

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1. Wear eye protection. Label tubes M, C and control, and place 5 cm^3 dilute ethanoic acid in each.

2. Add the issued 1 cm magnesium strip to M using forceps. Keep the tube open and record actual changes over several minutes.

3. Add sodium carbonate solution to C one drop at a time, up to 0.5 cm^3. Pause if bubbling rises; keep it open.

4. Leave the control unchanged. Compare appearance and gas production without identifying a gas solely from bubbles.

5. Write balanced equations predicting hydrogen from the metal and carbon dioxide from the carbonate. Discuss the separate standard tests without performing flame tests.

6. Explain why vinegar concentration must be known before replacing the named acid solution; the activity is not a quantitative comparison of acid strength.

Cleanup

- Staff collect remaining metal and solutions under the local waste plan. Wash equipment and hands.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Use actual observations. Reference equations: $2CH_3COOH+Mg \rightarrow (CH_3COO)_2Mg+H_2$; $2CH_3COOH+Na_2CO_3 \rightarrow 2CH_3COONa+CO_2+H_2O$. Bubbles alone do not identify a gas. Standard gas-test descriptions are discussion only in this flame-free lesson.

Tube	Actual observations	Predicted gas / reason
M: magnesium		
C: carbonate		
Control		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Describe actual changes in M and C.

2. Name the metal-reaction salt and predicted gas.

3. Name the carbonate-reaction salt and gas.

4. Balance each equation.

5. Why is a control useful?

6. Why does fizzing alone not prove gas identity?