Alcohols: structures and oxidation routes

Student activity • observation and reasoning

YEAR 11 / LESSON 95 / CHEMISTRY ONLY

The question

How can the same alcohol form different oxidation products?

Draw the first four primary alcohols and distinguish complete combustion from oxidation to a carboxylic acid. Interpret the chemical oxidant as reference chemistry only.

Equipment

- Booklet, pencil, periodic table and optional molecular model kit

Desk activity only; keep small model pieces away from mouths.

Course coverage: Chemistry only: 4.29C–4.31C. No alcohol combustion or dichromate practical is performed in this lesson.

Plan, model or apparatus sketch

Draw a labelled structure or model to explain your reasoning for this lesson.

Method and reasoning

Read the whole sequence before starting

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1. Draw fully displayed methanol and ethanol; show O–H as well as C–O.

2. Draw propan-1-ol and butan-1-ol and identify the hydroxyl functional group.

3. Balance complete ethanol combustion to carbon dioxide and water.

4. Write ethanol + oxygen → ethanoic acid + water for microbial oxidation in air.

5. Use [O] notation to write ethanol +2[O] → ethanoic acid + water for oxidation by acidified dichromate(VI).

6. Compare required conditions, products and hazards; keep observations supplied by the teacher distinct from actual experiments.

Cleanup

- Return shared equipment and retain corrected reasoning.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Structural formulae: CH_3OH, CH_3CH_2OH, $CH_3CH_2CH_2OH$, $CH_3CH_2CH_2CH_2OH$. Reference oxidant: potassium dichromate(VI) acidified with dilute sulfuric acid, heated; orange Cr(VI) changes to green Cr(III). [O] represents oxidising equivalents, not oxygen atoms issued as a reagent.

Task	My structure / working	Reason / correction
Structures		
Combustion		
Acid formation		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What group identifies an alcohol?

2. Name $CH_3CH_2CH_2OH$.

3. Balance ethanol combustion.

4. Write microbial oxidation with O_2.

5. Write the acidified-oxidant equation using [O].

6. Why must these two oxidation outcomes not be confused?