Carboxylic acids: structures and formation

Student activity • observation and reasoning

YEAR 11 / LESSON 99 / CHEMISTRY ONLY

The question

Which carbon belongs to the acid group?

Draw the first four unbranched carboxylic acids and connect ethanol oxidation to ethanoic acid. Count the carboxyl carbon in the parent chain.

Equipment

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

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

Course coverage: Chemistry only: 4.34C–4.35C and 4.31C. Structure and equation workshop; no oxidant handling.

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 –C(=O)–OH and identify both oxygen atoms.

2. Build HCOOH, CH_3COOH, CH_3CH_2COOH and $CH_3CH_2CH_2COOH$ with all bonds shown.

3. Name the four structures using total carbon count including the carboxyl carbon.

4. Compare ethanol –OH with the entire carboxyl group; explain why they are different functional groups.

5. Write ethanol+2[O] → ethanoic acid+water and check all atoms.

6. Explain microbial oxidation in air and why heating with acidified dichromate is a separate written reference route here.

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

Carboxyl group is –C(=O)–OH, abbreviated –COOH. The first member HCOOH has one carbon. [O] notation represents an oxidising equivalent. No chromium(VI), concentrated acid or organic liquid is issued.

Task	My structure / working	Reason / correction
Functional group		
Four structures / names		
Oxidation link		

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 HCOOH.

2. Give propanoic acid’s structural formula.

3. How many carbons are in $CH_3CH_2CH_2COOH$?

4. Show both oxygens in the functional group.

5. Balance ethanol oxidation using [O].

6. Why is –COOH not simply an alcohol group?