

# 21 Organic synthesis – Part 1

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

## Vocabulary

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*Write each word three times.***English****Write it 3 times** (English)

alkene

halogenoalkane

alcohol

aldehyde

ketone

carboxylic acid

## Recall

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This topic adds **no new reactions**. It asks you to **join up** the reactions you already know – to identify functional groups and to see how they interconvert.

- A molecule may have **more than one** functional group.
- Standard tests tell you which groups are present.

Nothing here is harder than IGCSE – it just connects the pieces.

## New ideas

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Read these first, then do the Practice.

## ■ 1 Identifying functional groups

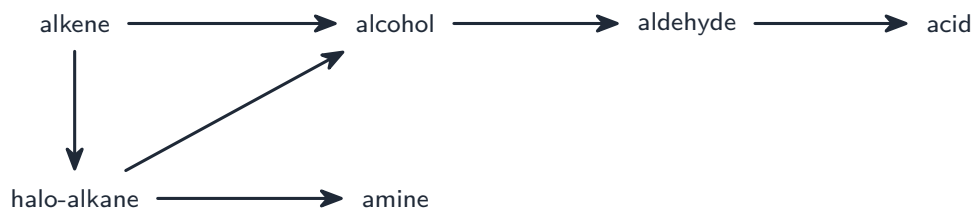
Each test gives a characteristic result that points to one group:

| Test                                          | Observation               | Group              |
|-----------------------------------------------|---------------------------|--------------------|
| bromine water                                 | decolourises              | C=C (alkene)       |
| silver nitrate                                | precipitate               | halogenoalkane     |
| K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | orange → green            | 1°/2° alcohol      |
| 2,4-DNPH                                      | orange precipitate        | aldehyde or ketone |
| carbonate                                     | fizzes (CO <sub>2</sub> ) | carboxylic acid    |

|                                               |                |   |                 |
|-----------------------------------------------|----------------|---|-----------------|
| bromine water                                 | decolourises   | → | alkene          |
| silver nitrate                                | precipitate    | → | halogenoalkane  |
| K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> | orange → green | → | alcohol         |
| 2,4-DNPH                                      | orange ppt     | → | aldehyde/ketone |
| carbonate                                     | fizzes         | → | carboxylic acid |

## ■ 2 A map of the reactions

Each reaction turns one functional group into another. Learn it as a **map** you can travel around: alkene ⇌ alcohol ⇌ aldehyde ⇌ carboxylic acid, with halogenoalkane and amine branches.



**Watch out:** match each test to its group – bromine water decolourises for an alkene, 2,4-DNPH gives an orange precipitate for *any* carbonyl, a carbonate fizzes for a carboxylic acid. (Tollens’/Fehling’s then single out the *aldehyde*.)

## Practice

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Try these in order.

**21.1** A compound decolourises bromine water. What functional group does it have? [1]

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**21.2** Which test, and result, identifies a carboxylic acid? [2]

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**21.3** A compound gives an orange precipitate with 2,4-DNPH but no silver mirror with Tollens'. What is it? [1]

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**21.4** Name the reagent that turns an alkene into an alcohol. [1]

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**21.5** Name the product when a halogenoalkane reacts with NaOH(aq). [1]

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**21.6 Challenge.** A compound decolourises bromine water *and* fizzes with sodium carbonate. Name the two functional groups it must contain. [2]

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