

21 Organic synthesis – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)
synthetic route	_____
functional group	_____
reagent	_____
nitrile	_____
by-products	_____

Recall

From Part 1 you have a **map** of the reactions. Here we use it to **plan a route** from a starting material to a target molecule, in several steps.

- Compare the target with the start: what has changed?
- Work **backwards** from the target, one reaction at a time.

New ideas

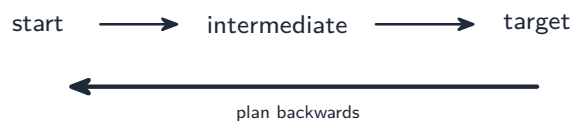
Read these first, then do the Practice.

■ 1 Planning a route

To devise a **synthetic route** :

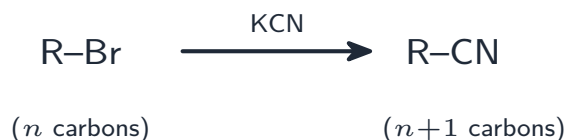
1. compare the target with the start – what changed (the **functional group** ? the number of carbons?).
2. work **backwards** from the target: which single reaction could make it, and from what?

- repeat until you reach the start.
- write each step with its **reagent** and conditions.



■ 2 Adding a carbon

If you need to **add a carbon** to the chain, the **KCN** step is the key – it is the only AS reaction that lengthens the chain (halogenoalkane $\rightarrow$ **nitrile**).



■ 3 Analysing a route

For each step given, state the **type of reaction** (oxidation, reduction, substitution, addition or elimination) and the **reagent**. Watch for **by-products** (e.g. making an amine also gives further-substituted amines, so the yield is low).

Watch out: plan a route by working *backwards* from the target, one reaction at a time. Remember the KCN step is the *only* AS reaction that adds a carbon to the chain.

Practice

Try these in order.

21.1 When planning a synthesis, which direction do you usually work – forwards from the start, or backwards from the target? [1]

21.2 Which reagent is the key to **adding a carbon** to the chain? [1]

21.3 To turn ethene into ethanol, give the reagent and conditions. [2]

21.4 Classify each reaction type: (a) alkene + $\text{H}_2 \rightarrow$ alkane, (b) alcohol $\rightarrow$ alkene + water. [2]

21.5 Plan a two-step route from ethene to ethanoic acid (give the product of each step). [2]

21.6 Challenge. Outline how to turn bromomethane (CH_3Br , 1 carbon) into ethanoic acid (CH_3COOH , 2 carbons), naming the reagent for each step. [3]