# Lesson 2: Navigating Pathways

## Connecting Reactions for Short Syntheses

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Module 7: Organic Chemistry

# Outline

# Recap & Expanding the Map

**Retrieval Practice:** (Teacher asks questions, e.g., "Reagent for Haloalkane $\rightarrow$ Alcohol?", "Product of alcohol dehydration?") **Review:**

Briefly show Chord Diagram from L1. Remind students of the connections learned. **New Reactions (Adding to our map):**

- **Alcohol Oxidation [CHM_M7_ALC_N6]:**
  - Primary Alcohol $\xrightarrow{[O]}$ Aldehyde $\xrightarrow{[O]}$ Carboxylic Acid
  - Secondary Alcohol $\xrightarrow{[O]}$ Ketone
  - Tertiary Alcohol $\xrightarrow{[O]}$ No reaction (usually)
  - *(Show these connections on the projected visualiser)*
- **Esterification [CHM_M7_ESTER_N1]:**
  - Carboxylic Acid + Alcohol $\xrightarrow{H^+/\Delta}$ Ester + $H_2O$
  - *(Show this connection on the visualiser)*
- **Ester Naming [CHM_M7_NOM_N11]:** (Brief mention - e.g., *Alkyl Alkanoate*)

# From A to C via B: Planning Pathways

Often, we can't get from starting material (A) to target product (C) in one step. We need intermediate compounds (B). **The Strategy:**

1. Identify Starting and Target Functional Groups.
2. **Use the Chord Diagram Tool:** Find pathway(s) connecting Start to Target. Identify the intermediate functional group(s).
3. Write out the sequence of reactions.
4. Add specific reagents and conditions for each step.

# Modelling: Ethene to Ethanoic Acid

**Problem:** Convert Ethene ($C_2H_4$) to Ethanoic Acid ($CH_3COOH$).
**Teacher Modelling ("Think Aloud" - S6):**

1. *"Start is Alkene, Target is Carboxylic Acid."*
2. *"Look at the map (Chord Diagram)... Alkene connects to Alcohol. Alcohol connects to Aldehyde, which connects to Carboxylic Acid (for primary). So, the path is Alkene $\rightarrow$ Alcohol $\rightarrow$ Carboxylic Acid. Intermediate = Alcohol (Ethanol)."*
3. *"Write the sequence:"*
   - Step 1 (Alkene $\rightarrow$ Alcohol): $CH_2{=}CH_2 \longrightarrow CH_3CH_2OH$. *"What reagent? Map hover/recall... Hydration."* Reagent: $H_2O$ / $H^+$.
   - Step 2 (Alcohol $\rightarrow$ Acid): $CH_3CH_2OH \longrightarrow CH_3COOH$. *"What reagent? Map hover/recall... Oxidation of primary alcohol."* Reagent: Strong Oxidising Agent (e.g., $Cr_2O_7^{2-}/H^+$), shown as [O].
4. *"Check: Path makes sense, reagents identified."*

*(Show final written sequence clearly)*

$$CH_2{=}CH_2 \xrightarrow{H_2O\,/\,H^+} CH_3CH_2OH \xrightarrow{[O]} CH_3COOH$$

# Paired Problem Solving Activity

Now, work with your partner on the problems from Activity Sheet 2.
**Instructions Recap:**

- Use the Chord Diagram tool to **PLAN** your route first.
- Write down the detailed steps on mini-whiteboard/paper/Worksheet 2:
  - Structures (or names).
  - Reagents & Conditions for each arrow.
- Discuss your strategy with your partner. Use the metacognitive prompts!

*(Teacher circulates, assists, and prompts using S6 questions)*

# Navigating Pathways: Key Takeaways

- We expanded our reaction map with Alcohol Oxidation and Esterification.
- We practiced using the map (visualiser) to plan short (2-3 step) synthesis pathways.
- The planning process: Identify Start/Target $\rightarrow$ Find Route via Intermediates (using map) $\rightarrow$ Add Reagents/Conditions.
- This moves us from knowing single reactions to connecting them.

**Next Steps:**

- Review drafted pathways.
- **Preview Lesson 3:** Tackling more complex synthesis problems and learning to communicate them using formal flowcharts (Syllabus requirement!).

**Thank you!**

Questions?