

# Lesson 3: Designing & Communicating Syntheses

## Mastering Flowcharts (CHM\_M7\_SYNTH\_N1)

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Module 7: Organic Chemistry

# Outline

- 1 The Complete Picture
- 2 Flowchart Conventions
- 3 Modelling Practice
- 4 Review Summary

# The Interconnected Network

Let's look at the full reaction map (Chord Diagram) incorporating all the reactions we've learned in this module.



Figure: Overview of Key Functional Group Interconversions

**Challenge Question:** Can we directly convert an Alkane to an Ester using

# Communicating Synthesis Clearly

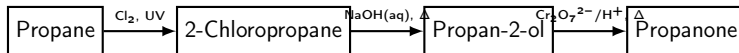
## (CHM\_M7\_SYNTH\_N1)

Flowcharts are the standard way to show multi-step syntheses. **Key**

### Conventions (Worksheet 3):

- **Compounds:** In boxes (Use IUPAC Name or Structural Formula).
- **Reactions:** Use arrows  $\rightarrow$ .
- **Reagents/Conditions:** Write above/below the arrow for THAT step.
- **Layout:** Logical flow (e.g., top-to-bottom).

### Example (Propane $\rightarrow$ Propanone):



# Plan then Draw: Example

**Problem:** Synthesise Propanoic Acid from Propane. **Teacher Modelling**

("Think Aloud"):

- 1 *"Start=Alkane, Target=Carboxylic Acid."*
- 2 *"Map Check: Alkane  $\rightarrow$  Haloalkane  $\rightarrow$  Alcohol (Primary needed for Acid)  $\rightarrow$  Carboxylic Acid. Path looks viable."* Intermediates:  
1-Chloropropane, Propan-1-ol.
- 3 *"Translate to Flowchart:"* (Draw step-by-step on board/slide)
  - Box 1: Propane ( $\text{CH}_3\text{CH}_2\text{CH}_3$ )
  - Arrow 1: Reagents  $\text{Cl}_2$ , UV Light (Free radical sub gives mix, but targets pathway)  $\rightarrow$  Box 2: 1-Chloropropane ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ )
  - Arrow 2: Reagents  $\text{NaOH(aq)}$ , heat (Substitution)  $\rightarrow$  Box 3: Propan-1-ol ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ )
  - Arrow 3: Reagents  $\text{Cr}_2\text{O}_7^{2-}/\text{H}^+$ , heat (Oxidation [O])  $\rightarrow$  Box 4: Propanoic Acid ( $\text{CH}_3\text{CH}_2\text{COOH}$ )
- 4 *"Ensure all reagents/conditions and structures/names are correct."*

Work in your groups on the challenge problem from Activity Sheet 3. **Your**

## Task Recap:

- Analyse the problem (Start/Target).
- Plan your route using the Chord Diagram tool.
- Construct a formal, accurate flowchart on your paper/board.
- Include all compounds (structures/names) and reagents/conditions.

**Goal:** Create a chemically correct and clearly communicated synthesis plan. (*Teacher circulates, facilitates group work, asks probing questions*)

# Evaluating Flowcharts

Time for Peer Review / Gallery Walk.

- Display your group's flowchart.
- Use the checklist on Activity Sheet 3 to review another group's work.
- Focus on: Logical Steps, Correct Chemistry (Structures/Reagents), Clear Conventions.
- Provide constructive feedback.

## Final Summary:

- Synthesis requires integrated knowledge and planning (use the map!).
- Flowcharts are the standard way to communicate these plans accurately (CH11/12-7).

**Next Steps:** Complete Exit Ticket. Revise reaction pathways for upcoming assessments.

**Thank you!**

Questions?