# 21. Organic synthesis Analysis

## 21.1 Organic synthesis

## Paper 2

Question Paper

**1** **(c)** Separate samples of $CH_3(CH_2)_5CHBrCH_3$, $CH_3(CH_2)_5CH(OH)CH_3$ and $CH_3(CH_2)_5CHCH_2$ are tested with different reagents.

Complete Table 4.1. If no reaction occurs, write × in the relevant box.

**Table 4.1**

| reagent added | observation with $CH_3(CH_2)_5CHBrCH_3$ | observation with $CH_3(CH_2)_5CH(OH)CH_3$ | observation with $CH_3(CH_2)_5CHCH_2$ |
|---|---|---|---|
| $Br_2$(l) in the dark | | × | |
| $PCl_5$(s) | × | | |
| $AgNO_3$(aq) | | | × |

[3]

**2** **(d)** **C** can be used to form **H**.

**H**

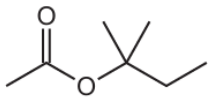


**Fig. 4.4**

One possible synthesis of **H** is shown in Fig. 4.5. Different portions of **C** are used in reactions 1 and 3. Some of the products are then combined to produce **H**.

Fig. 4.5 does not show any of the inorganic products of the reactions.

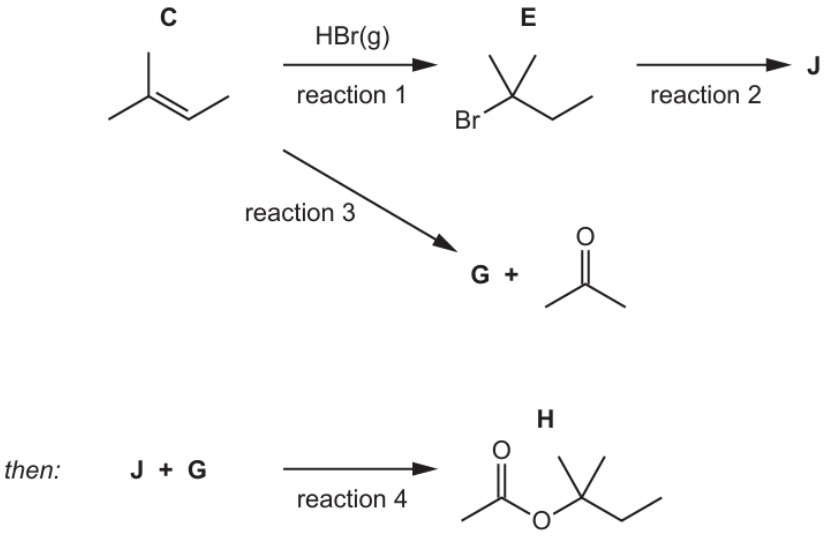



**Fig. 4.5**

Complete Table 4.1 with the reagents and conditions required for each of the reactions shown in Fig. 4.5.

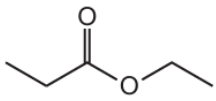
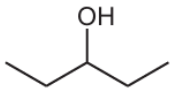
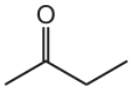
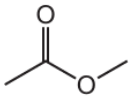
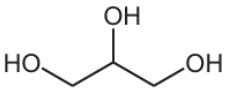
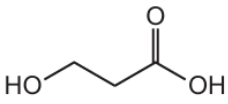
**Table 4.1**

| | reagent and conditions |
|---|---|
| reaction 1 **C** → **E** | HBr(g) |
| reaction 2 **E** → **J** | |
| reaction 3 **C** → **G** +  | |
| reaction 4 **J** + **G** → **H** | |

[3]

**3** Organic compounds can be distinguished using chemical tests.
Table 4.1 shows four pairs of compounds.

**Table 4.1**

| organic compounds | | reagent | positive result of chemical test on identified compound |
|---|---|---|---|
| **A1**  | **A2**  | | |
| **B1**  | **B2**  | | |
| **C1**  | **C2**  | | |
| **D1**  | **D2**  | | |

**(a)** Complete Table 4.1 to:

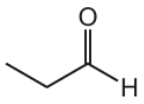
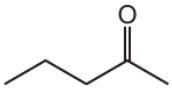
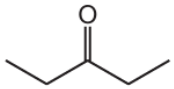
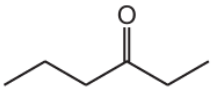
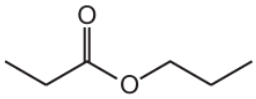
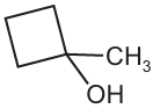
- identify a reagent that could distinguish between the compounds in each pair
- give the **positive** result of the chemical test **and** identify which compound shows this result.

Use a different reagent for each test. [8]

**4** Organic compounds can be distinguished using chemical tests and analytical techniques.

**(a)** Table 3.1 shows four pairs of organic compounds.

**Table 3.1**

| organic compounds | | reagent | positive result of chemical test on identified compound |
|---|---|---|---|
| **A1**  | **A2**  | | |
| **B1**  | **B2**  | | |
| **C1**  | **C2**  | | |
| **D1**  | **D2**  | | |

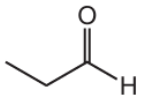
**(i)** Complete Table 3.1 to:

- identify a reagent which can distinguish between the compounds in each pair
- give the **positive** result of the chemical test **and** identify which compound shows this result.

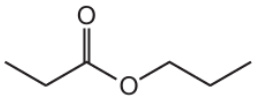
Use a different reagent for each test. [8]

**(d)** **C2** can be synthesised using **A1** as a single organic reactant.

**A1**




**C2**




Devise a multi-step synthetic route to form **C2** from **A1**.
Identify relevant reagents and conditions, and state the organic products of each step.

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..... [3]