

# 20.2 Synthetic Routes

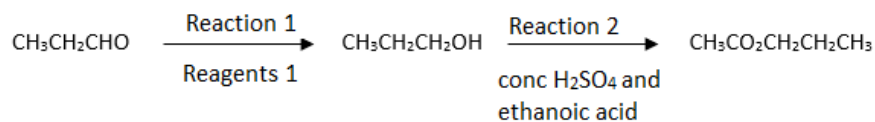
## Question Paper

|            |                                 |
|------------|---------------------------------|
| Course     | DIPB Chemistry                  |
| Section    | 20. Organic Chemistry (HL only) |
| Topic      | 20.2 Synthetic Routes           |
| Difficulty | Hard                            |

**Time allowed:** 10  
**Score:** /5  
**Percentage:** /100

## Question 1

The equation below shows the conversion of propanal to propyl ethanoate.



What are the reagents used and the reactions taking place?

|          | Reaction 1    | Reagents 1  | Reaction 2                               |
|----------|---------------|---|--|
| <b>A</b> | oxidation     | $\text{K}_2\text{Cr}_2\text{O}_7$ and $\text{H}_2\text{SO}_4$ | nucleophilic substitution (condensation) |
| <b>B</b> | reduction     | $\text{NaBH}_4$   | nucleophilic substitution (condensation) |
| <b>C</b> | reduction     | $\text{LiAlH}_4$  | oxidation                                |
| <b>D</b> | hydrogenation | $\text{H}_2$  | addition                                 |

[1 mark]

## Question 2

But-1-ene reacts separately with HBr and  $\text{H}_2/\text{Ni}$  to give products X and Z respectively.

What are the major products of the reactions?

|           | X   | Z   |
|-----------|---|---|
| <b>A.</b> | $\text{CH}_2\text{BrCH}_2\text{CH}_2\text{CH}_3$        | $\text{CH}_3\text{CH}_2\text{C} \equiv \text{CH}$ |
| <b>B.</b> | $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ | $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$    |
| <b>C.</b> | $\text{CH}_3\text{CHBrCH}_2\text{CH}_3$                 | $\text{CH}_3\text{CH}_2\text{C} \equiv \text{CH}$ |
| <b>D.</b> | $\text{CH}_3\text{CHBrCH}_2\text{CH}_3$                 | $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$    |

[1 mark]

### Question 3

Methylbenzene can be converted into 4-methylphenylamine in a multi-step reaction.

Which order should the reagents be used to do this conversion?

|    | 1st reagent  | 2nd reagent  | 3rd reagent  |
|----|--|--|--|
| A. | conc. $\text{HNO}_3$ / conc. $\text{H}_2\text{SO}_4$ | Sn / conc. HCl                                       | NaOH   |
| B. | Sn / conc. HCl                                       | conc. $\text{HNO}_3$ / conc. $\text{H}_2\text{SO}_4$ | NaOH   |
| C. | Sn / conc. HCl                                       | NaOH   | conc. $\text{HNO}_3$ / conc. $\text{H}_2\text{SO}_4$ |
| D. | NaOH   | conc. $\text{HNO}_3$ / conc. $\text{H}_2\text{SO}_4$ | Sn / conc. HCl                                       |

[1 mark]

### Question 4

Which alcohol could not be produced by the reduction of an aldehyde or a ketone?

- A. 2,2-Dimethylbutan-1-ol
- B. Propan-2-ol
- C. 3-Methylpentan-3-ol
- D. 2-Methylpentan-3-ol

[1 mark]

### Question 5

Which molecule(s) can be both reduced by sodium borohydride,  $\text{NaBH}_4$ , and oxidised by warm acidified potassium dichromate (VI)?

- I.  $\text{CH}_3\text{CHBr}(\text{CH}_3)_2\text{CCHO}$
- II.  $\text{CH}_3\text{CHOHCH}_2\text{CH}_3$
- III.  $(\text{CH}_3)_3\text{CCHO}$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

[1 mark]