20.2 Synthetic Routes

Question Paper

Course	DP IB Chemistry
Section	20. Organic Chemistry (HL only)
Topic	20.2 Synthetic Routes
Difficulty	Easy

Time allowed: 60

Score: /42

Percentage: /100

Question 1a

a)
Propan-1-ol can be synthesised from alkene P in the following synthetic route:

$$\text{alkene P} \xrightarrow{\text{Step 1}} \text{halogenoalkane Q} \xrightarrow{\text{Step 2}} \text{propan-1-ol}$$

i)
State the identity of halogenoalkane Q.

[1]

ii)
Give the reagents and conditions needed for Step 2.

[2]

[3 marks]

Question 1b

b) Give the name and structure of alkene P.

[2]

[2 marks]

Question 1c

c)
Give a reagent that could be used to convert P to Q and outline why this synthesis of propan-1-ol might not be very efficient.

[3]

[3 marks]

Question 1d

d)
This question is about alkene P and Step 1.

i)
Give the empirical formula of P.

[1]

ii)
Give the reagents and conditions needed for Step 1.

[2]

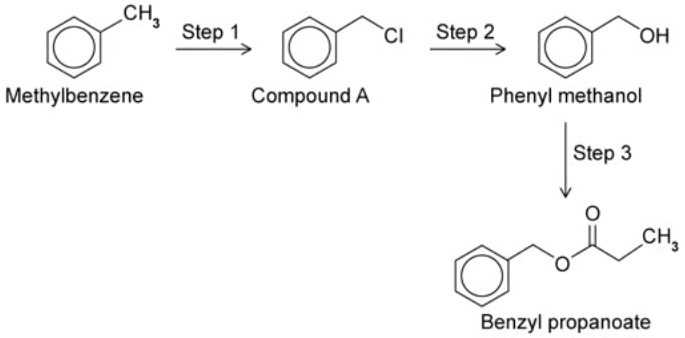
iii)
State the type of reaction mechanism.

[1]

[4 marks]

Question 2a

a)
A three step synthesis of benzyl propanoate is shown below:



i)
Give the reagents and conditions needed for Step 1.

[2]

ii)
Name the type of reaction mechanism taking place in Step 1.

[1]

[3 marks]

Question 2b

b)
This question is about Step 2.

i)
Give the reagents and conditions needed for Step 2.

[2]

ii)
Name the type of mechanism taking place.

[1]

[3 marks]

Question 2c

c)
This question is about Step 3.

i)
Give the reagents and conditions needed.

[2]

ii)
Name the type of reaction taking place.

[1]

[3 marks]

Question 2d

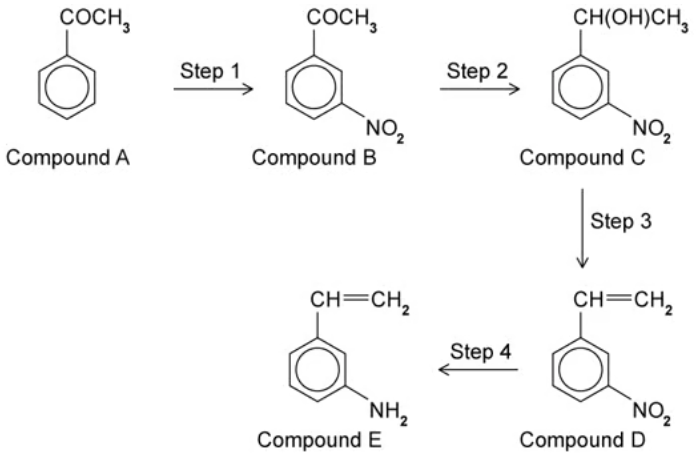
d)
State the molecular formula of benzyl propanoate.

[1]

[1 mark]

Question 3a

a)
The synthesis of 3-aminstyrene is shown below:



i)
Give the reagent needed in Step 1.

[1]

ii)
State the name of the functional groups in Compound B.

[2]

[3 marks]

Question 3b

b)
This question is about Step 2.

i)
Give the reagent needed.

[1]

ii)
Name the type of reaction taking place.

[1]

[2 marks]

Question 3c

c)
Step 3 is a dehydration reaction. Outline a chemical test that could distinguish between Compound C and the product of Step 3, Compound D.

[2]

[2 marks]

Question 3d

d)
This question is about Step 4.

i)
State the name of the reagent(s) and conditions needed in Step 4.

[2]

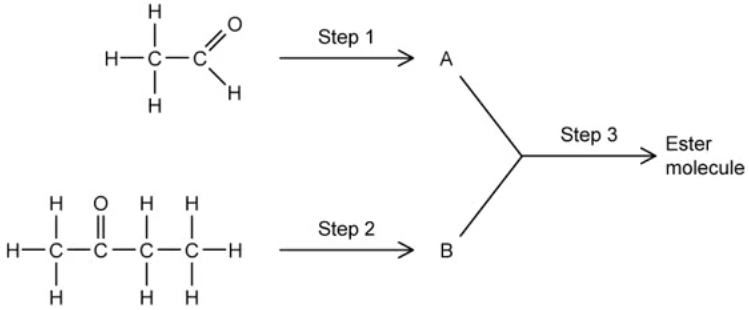
ii)
Identify the type of reaction taking place.

[1]

[3 marks]

Question 4a

a)
This question is about the synthesis of an ester.



Identify the class of compound produced in Steps 1 and 2.

[2]

[2 marks]

Question 4b

b)
This question is about Step 1.

i)
Give the reagent(s) and conditions needed to carry out Step 1.

[2]

ii)
Identify the type of reaction taking place.

[1]

[3 marks]

Question 4c

c)
This question is about Step 2.

i)
Give the reagent(s) needed to carry out Step 2.

[1]

ii)
Identify the type of reaction taking place.

[1]

[2 marks]

Question 4d

d)
Give the names of A and B and write the equation for the reaction in Step 3.

[3]

[3 marks]