

GCE A level Chemistry A (H432)
H432/02 Synthesis and analytical techniques

Question Set 24

1. This question is about benzene.

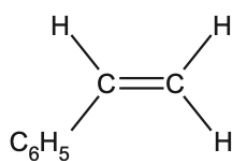
(a) Over time, the Kekulé and delocalised models have been used to describe the bonding and structure of a benzene molecule.

(i) Describe, in terms of orbital overlap, the similarities and differences between the bonding in the Kekulé model and the delocalised model of benzene. [3]

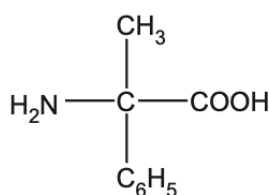
(ii) Experimental evidence led to the general acceptance of the delocalised model over the Kekulé model.

Describe **two** pieces of evidence to support the delocalised model of benzene. [2]

(b) Benzene can be used as the starting material for the synthesis of compounds **D** and **E**, shown below.



compound D



compound E

In the diagrams C_6H_5 is a phenyl group.

Compounds **D** and **E** can be converted into polymers.

(i) Draw **two** repeat units of these polymers. [3]

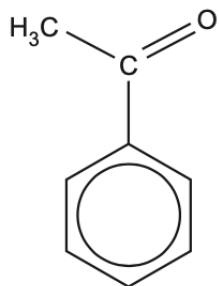
(ii) State the **type** of polymer formed from compounds **D** and **E**.

From compound **D**

From compound **E**

[1]

- (iii) In the synthesis of compounds **D** and **E**, benzene is first reacted with ethanoyl chloride, CH_3COCl , to form phenylethanone, shown below.



phenylethanone

The reaction takes place in the presence of aluminium chloride, AlCl_3 , which acts as a catalyst.

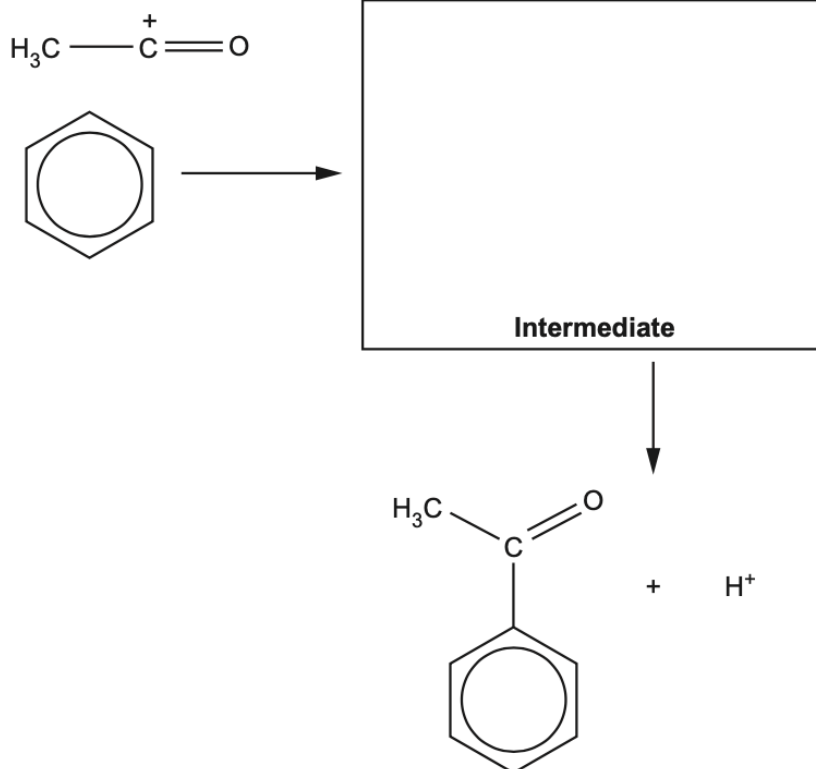
In the mechanism for this reaction,

- ethanoyl chloride first reacts with aluminium chloride to form the $\text{CH}_3\text{-C}^+=\text{O}$ cation
- the $\text{CH}_3\text{-C}^+=\text{O}$ cation then behaves as an electrophile.

Complete the mechanism for the reaction.

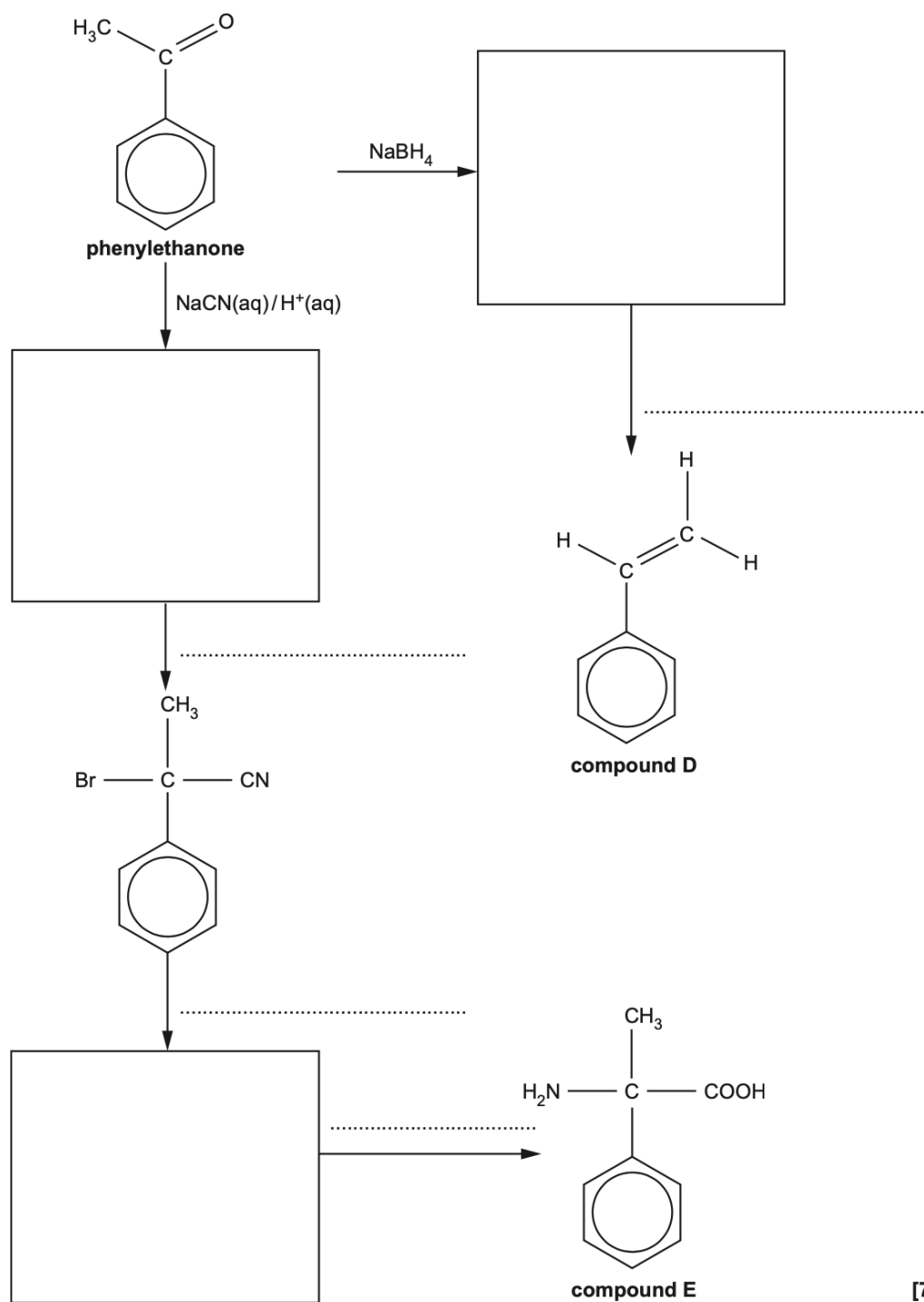
Include equations to show the role of the AlCl_3 catalyst, relevant curly arrows and the structure of the intermediate.

Formation of electrophile



Regeneration of catalyst

(iv) Complete the flowchart for the synthesis of compounds **D** and **E** from phenylethanone.



[7]

[7]

Total Marks for Question Set 24: 21

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