

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

Many synthetic routes need chemists to increase the number of carbon atoms in a molecule by forming new carbon–carbon bonds. This can be achieved in several ways including

- reaction of an aromatic compound with an acyl chloride
- reaction of an aldehyde with hydrogen cyanide.

(a) Consider the reaction of benzene with $\text{CH}_3\text{CH}_2\text{COCl}$

- (i) Write an equation for this reaction and name the organic product.
Identify the catalyst required in this reaction.
Write equations to show how the catalyst is used to form a reactive intermediate and how the catalyst is reformed at the end of the reaction.

(5)

- (ii) Name and outline a mechanism for the reaction of benzene with this reactive intermediate.

(4)

(b) Consider the reaction of propanal with HCN

(i) Write an equation for the reaction of propanal with HCN and name the product.

(2)

(ii) Name and outline a mechanism for the reaction of propanal with HCN

(5)

(iii) The rate-determining step in the mechanism in part (b) (ii) involves attack by the nucleophile.
Suggest how the rate of reaction of propanone with HCN would compare with the rate of reaction of propanal with HCN
Explain your answer.

(2)

(Total 18 marks)