

Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

Q1.

The carbonyl compound $\text{CH}_3\text{CH}_2\text{CHO}$ reacts very slowly with HCN

- (a) Name and outline a mechanism for the reaction of $\text{CH}_3\text{CH}_2\text{CHO}$ with HCN

Name of mechanism _____

Mechanism

(5)

- (b) The reaction in part (a) produces a pair of enantiomers.

- (i) Draw the structure of each enantiomer to show how they are related to each other.

(2)

- (ii) State and explain how you could distinguish between the two enantiomers.

(2)

- (c) Give the IUPAC name of the product of the reaction in part (a).

(1)

- (d) In practice, KCN rather than HCN is added to the carbonyl compound.

Given that K_a for HCN = $4.0 \times 10^{-10} \text{ mol dm}^{-3}$, suggest why the reaction with HCN is very slow.

(2)

- (e) Acrylic fibres are used as a substitute for wool. Acrylics are copolymers of acrylonitrile with other compounds.

Acrylonitrile is the common name for the following compound.



- (i) Acrylonitrile can be formed from propene.

Write an equation for the reaction of propene with ammonia and oxygen to form acrylonitrile and one other product.

(1)

- (ii) The term copolymer is used to describe the product obtained when two or more different monomers form a polymer.

Draw the repeating unit of the acrylic copolymer that contains 75% acrylonitrile monomer and 25% chloroethene monomer.

(1)

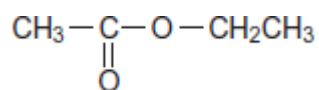
- (iii) Name the type of polymerisation involved in part (ii)

(1)

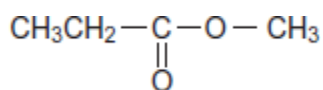
(Total 15 marks)

Q2.

- (a) **Ester 1** and **Ester 2** were studied by ^1H n.m.r. spectroscopy.

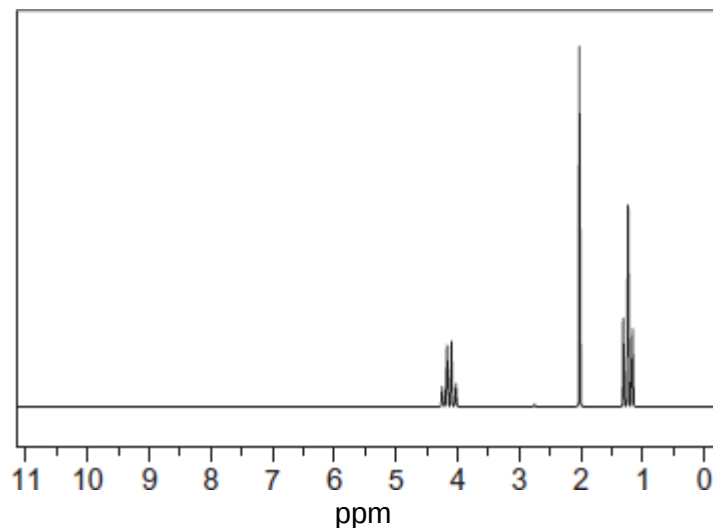


Ester 1



Ester 2

One of the two esters produced this spectrum.



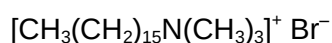
Deduce which of the two esters produced the spectrum shown. In your answer, explain the position and splitting of the quartet peak at $\delta = 4.1$ ppm in the spectrum.

Predict the δ value of the quartet peak in the spectrum of the other ester.

Use **Table B** on the Data Sheet.

(4)

- (b) Cetrimide is used as an antiseptic.



cetrimide

Name this type of compound.

Give the reagent that must be added to $\text{CH}_3(\text{CH}_2)_{15}\text{NH}_2$ to make cetrimide and state the reaction conditions.

Name the type of mechanism involved in this reaction.

(4)

- (c) Give a reagent that could be used in a test-tube reaction to distinguish between benzene and cyclohexene.

Describe what you would see when the reagent is added to each compound and the test tube is shaken.

(3)

(Total 11 marks)