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CHEMISTRY

ORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	AROMATIC CHEMISTRY
PAPER TYPE:	QUESTION PAPER - 4
TOTAL QUESTIONS	10
TOTAL MARKS	49

Aromatic Chemistry - 4

1. Consider the following conversion.

Identify a reducing agent for this conversion.

State the empirical formula of the product.

State the bond angle between the carbon atoms in the starting material and the bond angle between the carbon atoms in the product.

(4)

2. The acylium ion can be formed from ethanoyl chloride.

$H_3C-{}^{+}C=O$

The ion reacts with benzene to form $C_6H_5COCH_3$

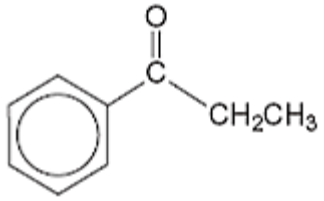
(a) Write an equation to show the formation of this acylium ion by the reaction of ethanoyl chloride with one other substance.

(2)

(b) Name and outline a mechanism for the reaction of benzene with this acylium ion.

(4)

3. Consider compound P shown below that is formed by the reaction of benzene with an electrophile.



(a) Give the two substances that react together to form the electrophile and write an equation to show the formation of this electrophile.

(3)

(b) Outline a mechanism for the reaction of this electrophile with benzene to form P.

(3)

4. Benzene reacts with nitric acid in the presence of a catalyst to form nitrobenzene.

This is an electrophilic substitution reaction.

(a) Write an equation for the overall reaction.

(1)

(b) State the name of the catalyst used.

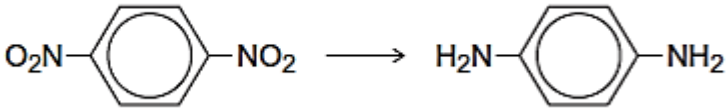
(1)

(c) Write the formula, including its charge, of the electrophile involved in the reaction.

(1)

5. Consider the following conversion.

Identify a reducing agent for this conversion.



Write a balanced equation for the reaction using molecular formulae for the nitrogen-containing compounds and [H] for the reducing agent.

Draw the repeating unit of the polymer formed by the product of this reaction with benzene-1,4-dicarboxylic acid.

(5)

6. Crude oil is a complex mixture of compounds.

Most of these are hydrocarbons although there are also sulphur compounds present.

Some of the hydrocarbon fractions of crude oil are catalytically cracked.

(a) What is the economic importance of cracking?

(1)

(b) The alkane, $C_{14}H_{30}$, can be cracked to give an alkene and an alkane.

Write a balanced equation to show one way in which this could happen.

(1)

(c) Why is it important that as many as possible of the sulphur compounds are removed from fuels obtained from oil?

(1)

7. Compound X, $(CH_3)_2CHCN$, can be formed from a haloalkane, C_3H_7Br.

(a) Name compound X.

(1)

(b) Give the reagent and conditions necessary to form X from C_3H_7Br.

(2)

(c) Name and outline the mechanism for this reaction, showing clearly the structure of C_3H_7Br.

(4)

8. Outline a mechanism for the reaction of $CH_3CH_2CH_2CHO$ with HCN and name the product.

(5)

9. This question is about amines.

(a) Name the compound $(CH_3)_2NH$

(1)

(b) $(CH_3)_2NH$ can be formed by the reaction of an excess of CH_3NH_2 with CH_3Br.

Name and outline a mechanism for this reaction.

(5)

10. Methylbenzene is converted into (chloromethyl)benzene in a free radical substitution reaction.

$$C_6H_5CH_3 + Cl_2 \rightarrow C_6H_5CH_2Cl + HCl$$

(a) Write an equation for the initiation step.

(1)

(b) Write equations for the two propagation steps.

(2)

(c) Give the formula of another possible organic product of the reaction.

(1)

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