ORGANIC CHEMISTRY Core (SL & HL)

1. (a) Ethanol (C_2H_5OH) is an alcohol and is a commonly used solvent.

(i) Ethanol can be oxidised to ethanal (CH_3CHO). State the reaction conditions needed to isolate ethanal and name the oxidising agent and catalyst commonly used to oxidise ethanol to ethanal.

[2]

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(ii) Draw the displayed (full structural) formula for ethanal.

[1]

(iii) Write a fully balanced equation for the oxidation of ethanol to ethanal. Use [O] to represent oxygen from the oxidising agent.

[1]

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(b) Ethanol, when reacted with carboxylic acids (and an H_2SO_4 catalyst) can also be used to make esters that are commonly used as flavourings.

(i) Name and draw the full structural formula for the ester formed from butanoic acid and ethanol.

[2]

Name:……

Structure:

(ii) Name an isomer of the ester in 1(b)(i) above that is also an ester.

[1]

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2. (a) Alkanes are a homologous series of hydrocarbons with the same general formula.

(i) Describe two features of a homologous series, other than having the same general formula.

[2]

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(ii) State the general formula for the alkanes.

[1]

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(b) Alkanes are often used as fuels, and combust completely in the presence of sufficient oxygen.

(i) Write an equation to show the complete combustion of butane.

[2]

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(ii) Explain why the **incomplete** combustion of butane can be dangerous.

[1]

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(c) Ethane (C_2H_6) will react with chlorine in the presence of sunlight to produce chloroethane.

(i) State the type of reaction and the mechanism by which this reaction occurs.

[2]

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(ii) Write an equation to show the initiation step of the reaction mechanism.

[1]

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(iii) Formulate **two** possible propagation steps and one possible termination step in the formation of chloroethane.

[3]

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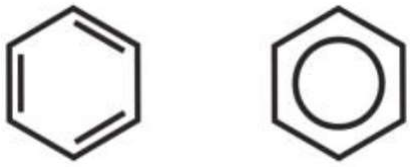
3. Benzene (C_6H_6) can be represented by a Kekulé structure (A) and a delocalised structure (B):



A **B**

(a) State one piece of physical evidence and one piece of chemical evidence that suggests that benzene has a delocalised structure (B) rather than the Kekulé structure (A).

[2]

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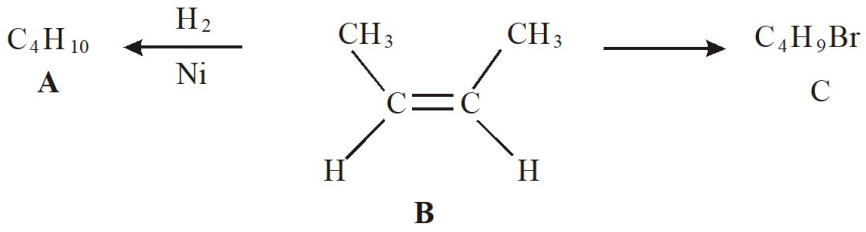
(b) Benzene will react with electrophiles in substitution reactions. A Cl^+ electrophile can be produced using a catalyst called a halogen carrier.

(i) Formulate an equation to show the substitution reaction of benzene with Cl^+.

[2]

PTO

4. (a) Two reactions of an alkene (**B**) are shown below:



(i) Name compounds **A** and **C**.

[2]

A.....

C.....

(ii) State the type of reaction, **and** the reagent needed for the conversion of **B** into **C**.

[2]

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(iii) Outline a simple laboratory test that could distinguish between **A** and **B** and state the results.

[2]

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(iv) State the molecular formula of the organic product when compound **C** reacts with NaOH (aq).

[1]

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(b) Propene is another alkene that undergoes polymerisation. Draw a section of the poly(propene) polymer showing **two** repeat units.

[2]

Total Marks 32 (48 minutes)