EXERCISES ON ALKENES 1

1. (i) Name the alkene $CH_3CH_2CH=CH_2$

.....

(ii) Explain why $CH_3CH_2CH=CH_2$ does not show geometrical isomerism.

.....

.....

(iii) Draw an isomer of $CH_3CH_2CH=CH_2$ which does show geometrical isomerism.

(iv) Draw another isomer of $CH_3CH_2CH=CH_2$ which does not show geometrical isomerism.

(Total 4 marks)

2. The alkene $CH_3CH=C(CH_3)CH_2CH_3$ reacts with hydrogen bromide to form 3-bromo-3-methylpentane, $CH_3CH_2CBr(CH_3)CH_2CH_3$, as the major product.

(a) Give the name of this alkene and state the type of stereoisomerism shown by this compound.

Name of alkene .....

Type of stereoisomerism .....

(2)

(b) Name and outline a mechanism for the reaction between the alkene and hydrogen bromide.

Name of mechanism .....

Mechanism

(5)

(c) Give the structure of the isomeric product also formed in the above reaction and explain why the two isomers are obtained in unequal amounts.

Structure

Explanation.

(3)
(Total 10 marks)

3. Many naturally-occurring organic compounds can be converted into other useful products.

Oleic acid can be obtained from vegetable oils. Oleic acid is an example of an unsaturated compound.

$CH_3(CH_2)_7CH=CH(CH_2)_7COOH$
oleic acid

(i) Deduce the molecular formula and the empirical formula of oleic acid.

Molecular formula .....

Empirical formula .....

(ii) State what is meant by the term *unsaturated*.

.....

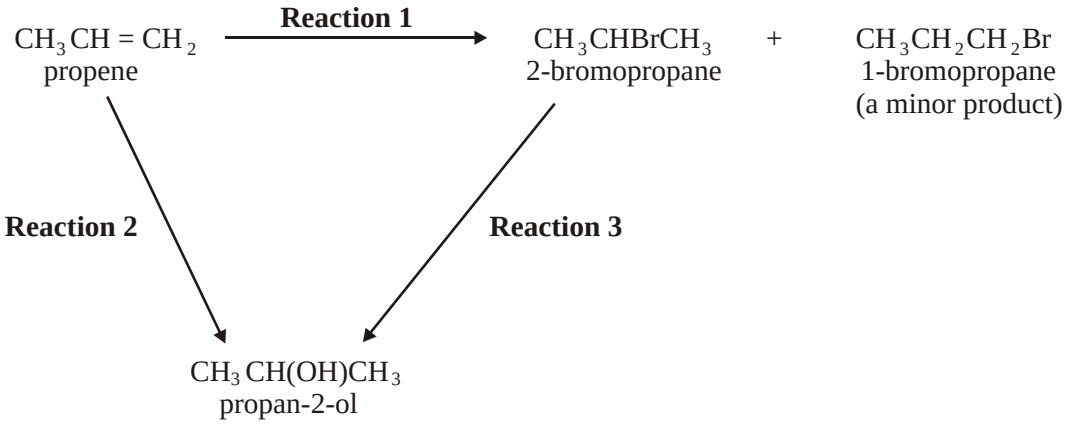
(iii) Identify a reagent for a simple chemical test to show that oleic acid is unsaturated. State what you would observe when oleic acid reacts with this reagent.

Reagent .....

Observation with oleic acid .....

(5)
(Total 5 marks)

4. Consider the following reaction scheme.



(a) (i) Name the mechanism for **Reaction 1**.

.....

(ii) Explain why 1-bromopropane is only a minor product in **Reaction 1**.

.....

.....

.....

(3)

(b) **Reaction 2** proceeds in two stages.

Stage 1 $CH_3CH{=}CH_2 + H_2SO_4 \rightarrow CH_3CH(OSO_2OH)CH_3$

Stage 2 $CH_3CH(OSO_2OH)CH_3 + H_2O \rightarrow CH_3CH(OH)CH_3 + H_2SO_4$

(i) Name the class of alcohols to which propan-2-ol belongs.

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(ii) Outline a mechanism for Stage 1 of **Reaction 2**, using concentrated sulphuric acid.

(iii) State the overall role of the sulphuric acid in **Reaction 2**.

.....

(6)

(Total 9 marks)

5. This question concerns the chemistry of ethene and compounds derived from it. Consider the following statements and then answer the questions below.

- Ethene may be polymerised to form poly(ethene).
- Treatment of ethene with bromine gives a compound **C**.
- Compound **C** may be converted in the laboratory into a compound **D**, which has a percentage composition by mass of: C 38.71%; H 9.68%; O 51.61%. The relative molecular mass, M_r, of **D** is 62.

(a) (i) Explain what is meant by the term *polymerisation.*

.....

.....

.....

(2)

(ii) Write an equation to represent the polymerisation of ethene.

.....

(1)

(b) Give the name of compound **C**.

.....

(1)

(c) Give the name of the mechanism of the reaction between ethene and bromine. Draw the mechanism for this reaction.

Name of the mechanism.

.....

Mechanism

(4)

(d) (i) Use the analytical data provided at the start of the question to deduce the molecular formula of compound **D**.

(3)

(ii) Give the reagent(s) and condition(s) for the conversion of **C** into **D**.

Reagent(s) .....

Condition(s) .....

(2)

(iii) Write an equation for the conversion of **C** into **D**.

.....

(2)

(Total 15 marks)