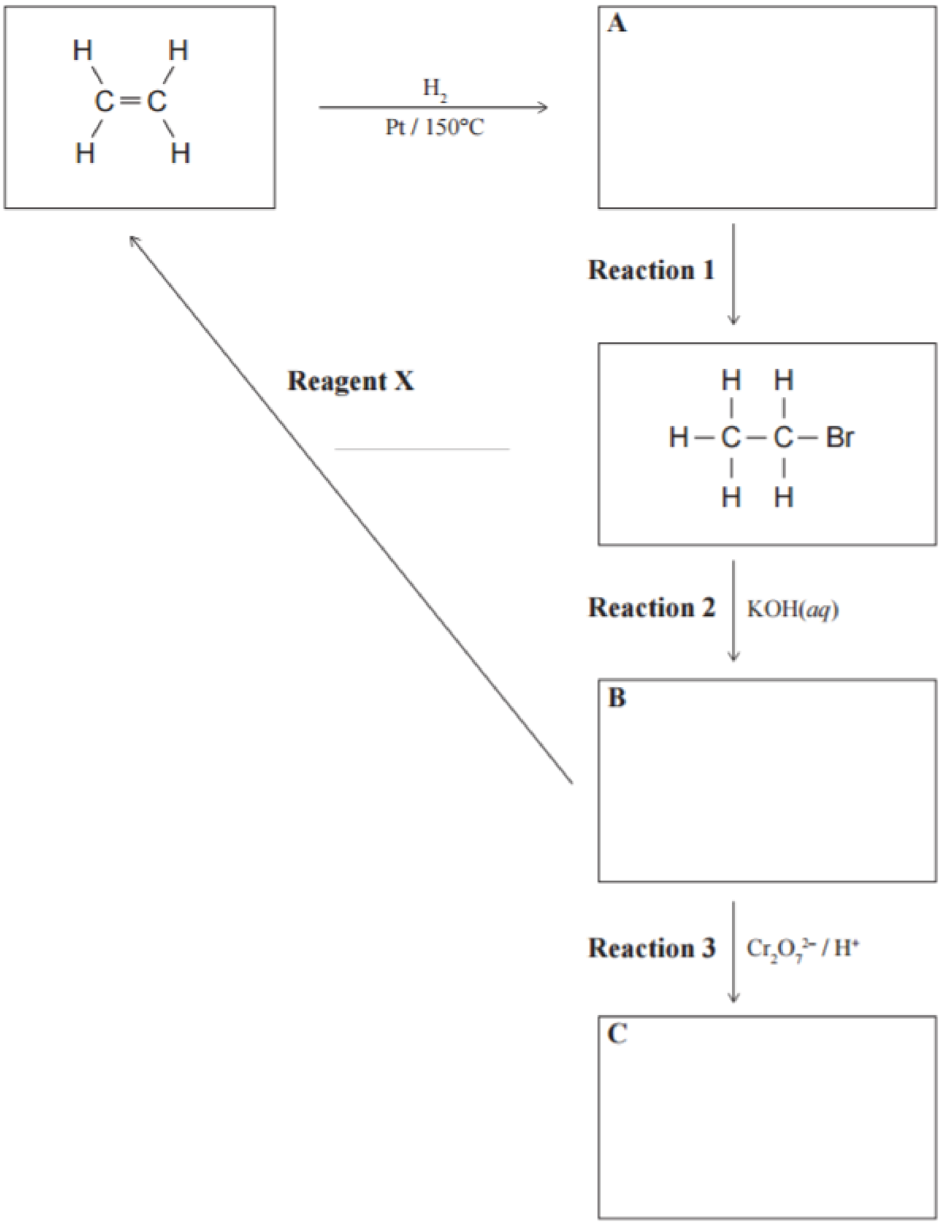
AS 91165
Demonstrate understanding of the properties of selected organic compounds

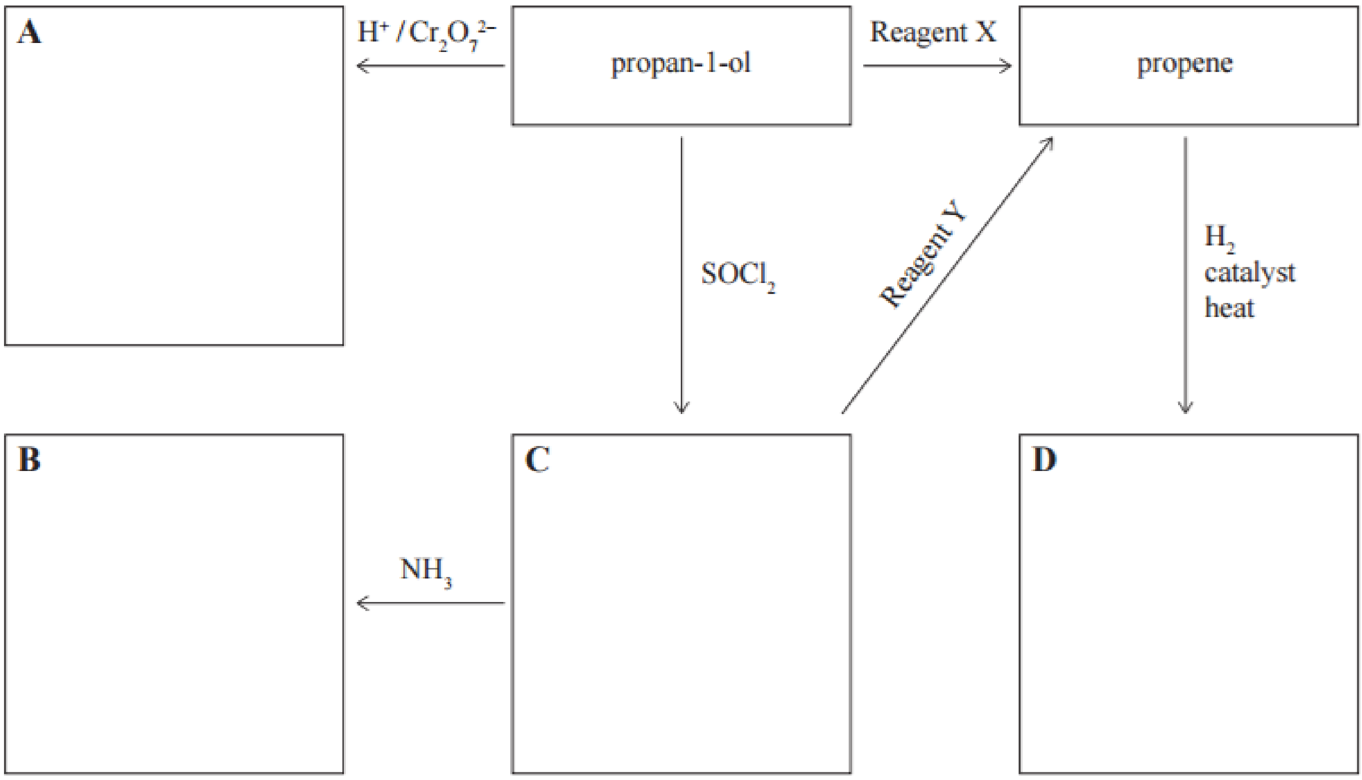
Collated Flow Chart Type Questions / types of reaction

(2016)

(a) (i) Complete the following chart by drawing the structural formulae for the organic compounds A, B, and C and identifying reagent X



(2015)



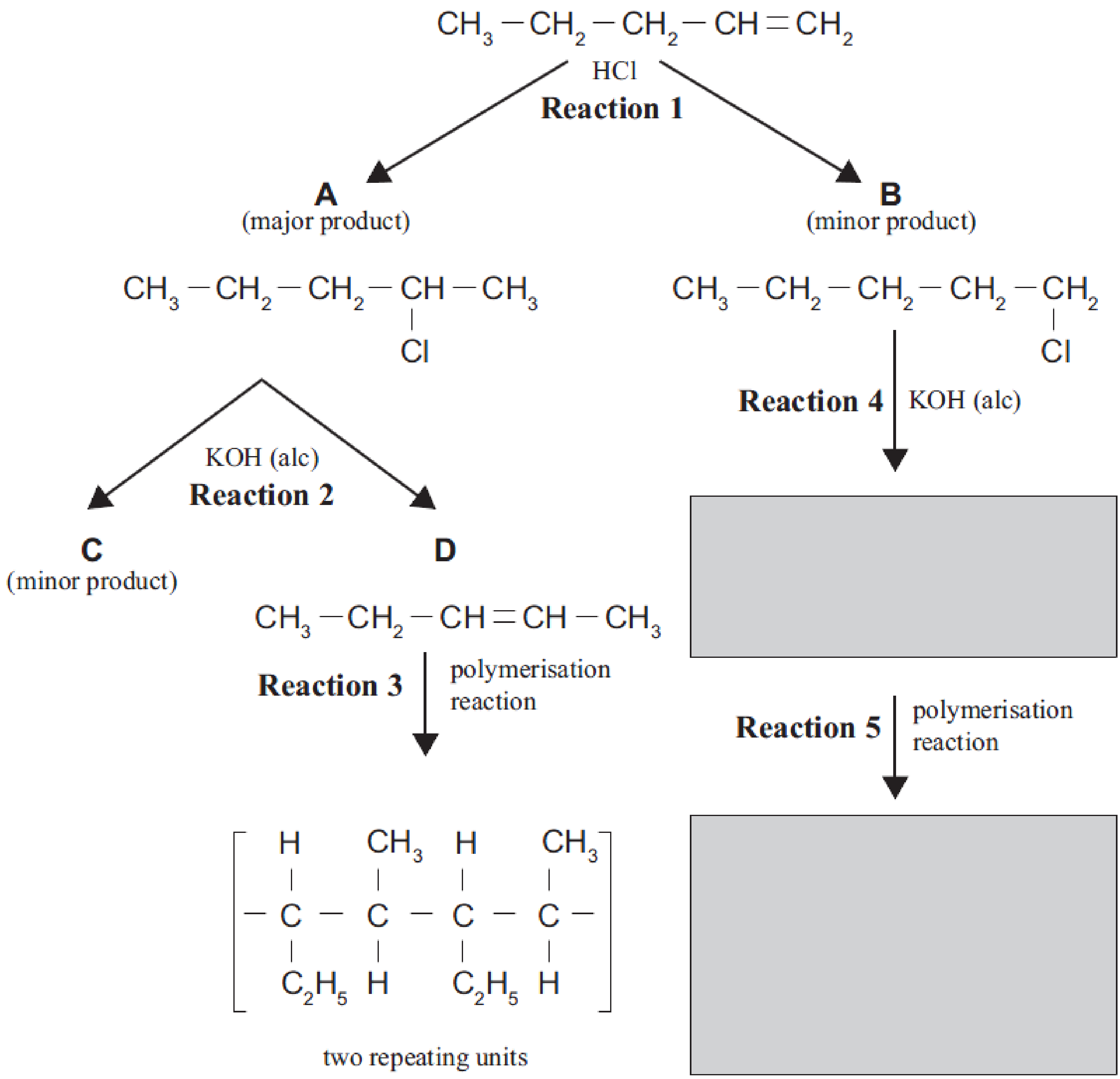
(a) Complete the scheme above by drawing the structural formulae of the organic compounds A to D.

(b) Circle the functional group of each of the organic compounds A, B, and C that you have drawn.

(c) Identify reagents X and Y. Reagent X: Reagent Y

(2014)

A reaction scheme is shown below.



(a) (i) Explain why **Reaction 1** from the reaction scheme is classified as an addition reaction.

(ii) Explain why compound **A** is the **major** product for **Reaction 1** shown in the reaction scheme.

(b) (i) Explain why **Reaction 2** from the reaction scheme, is classified as an elimination reaction.

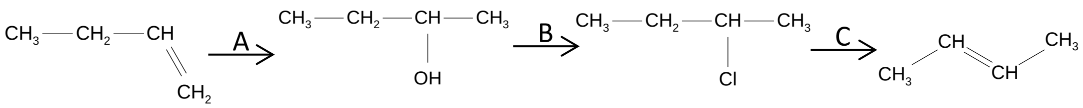
(ii) **Reaction 4** is also an elimination reaction. Draw the structural formula of the product formed in **Reaction 4**.

(c) (i) Draw TWO repeating units of the polymer formed in **Reaction 5**.

(ii) Compare and contrast the polymer formed in **Reaction 5** to the polymer formed in **Reaction 3**. In your answer you should explain why the polymers formed in these two reactions are different.

(2013)

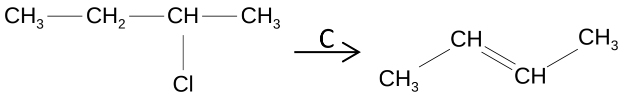
(a) The flow diagram below shows a reaction scheme for the conversion of but-1-ene into but-2-ene.



(i) Use the reaction scheme above to complete the following table to show:

- the formula of each reagent (A, B and C), including any necessary conditions
- the type of reaction occurring.

(ii) For the following reaction:

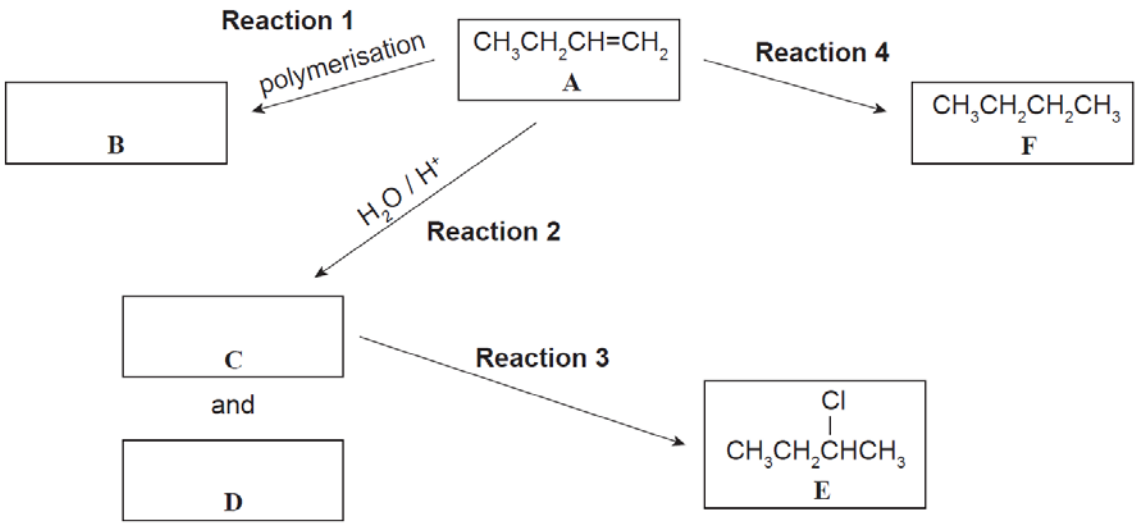


Circle the words that describe the product formed. **major product** **minor product**

Explain your answer.

(2012)

But-1-ene is used in the reaction sequence shown below.



(a) (i) Draw two repeating units of the polymer, B, formed in Reaction 1.

(ii) Give the name or formula of a suitable reagent in Reaction 4; include any specific conditions required.

(iii) Give the name or formula of a suitable reagent in Reaction 3; include any specific conditions required.

(b) Can compound A exist as geometric (cis-trans) isomers?

Justify your answer, including reference to the requirements for geometric (cis-trans) isomers.

(c) (i) Draw the structural formulae of the organic molecules C and D, formed in Reaction 2.

(ii) Elaborate on the reaction occurring in Reaction 2. In your answer you should include:

- identification of the major and minor products
- an explanation of why there are two possible products
- justification of your placement of the different structures in boxes C and D with reference to the reaction sequence.

(2009) From expired standard

For each of the THREE following reactions:

- Write the name or structural formula of the reactant used.
- State the type of reaction occurring. Choose from the list below.

acid-base, addition, elimination, hydrolysis, substitution

Reaction One

$$CH_3\text{-}CH{=}CH_2 \xrightarrow{\text{Reactant A}} CH_3\text{-}CH(OH)\text{-}CH_3$$

propene → propan-2-ol

Reaction Two

$$CH_3\text{-}CH(OH)\text{-}CH_3 \xrightarrow{\text{Reactant B}} CH_3\text{-}CH{=}CH_2$$

propan-2-ol → propene

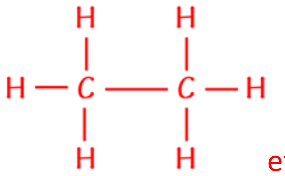
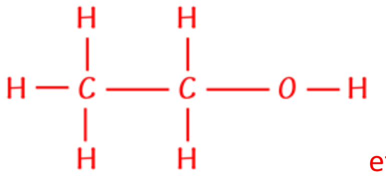
Reaction Three

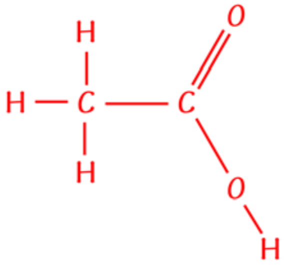
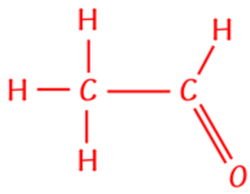
$$CH_3\text{-}CH_2\text{-}CH_3 \xrightarrow{\text{Reactant C}} CH_3\text{-}CH_2\text{-}CH_2Br$$

propane → 1-bromopropane

ANSWERS

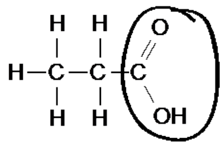
(2016)

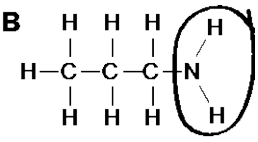
(a) (i) A =  ethane, B =  ethanol,

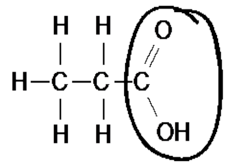
C =  ethanoic acid (or  ethanal)

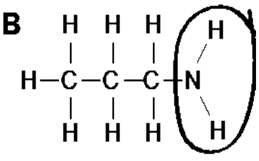
(2015)

(a)









(b) Functional groups circled.

(c) Reagent X is concentrated sulfuric acid, conc H_2SO_4, or c.H_2SO_4. Reagent Y is alcoholic potassium hydroxide, KOH (*alc*).or alcoholic sodium hydroxide, NaOH (*alc*).

(2014)

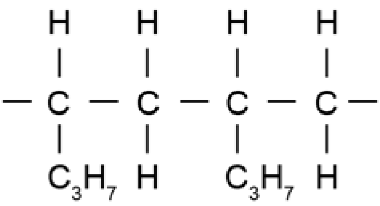
(a) (i) It is an addition reaction because the double bond is breaking and an H and a Cl are being added to each of the carbons that were in the double bond.

(ii) It is the major product because the hydrogen atom from HCl more often adds onto the carbon atom in the double bond which already contains the most hydrogen atoms; in this case, C1. Therefore the Cl atom from the HCl joins onto the carbon atom in the double bond which had the least number of hydrogen atoms; in this case, C2.

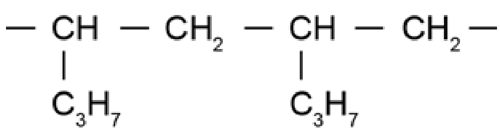
(d) (i) It is an elimination reaction because two atoms are being removed from the molecule and a double bond is being formed between the carbon atoms from which the atoms have been removed.

(ii) CH_3-CH_2-CH_2-CH=CH_2

(e) (i)



or



(ii) The molecular formulae of the two repeating units of both polymers are the same, but the structural formulae are different OR States repeating units are structural isomers.

Addition polymerisation occurs when the C=C breaks and the carbon atoms in this double bond join to each other from adjacent molecules to form long chains.

In Reaction 3, the polymer formed will have a carbon with one hydrogen and a methyl group, and a carbon with one hydrogen and an ethyl group, as its repeating unit, due to the double bond being on the C2 position.

In Reaction 5, since the double bond is in a different position (the C1 position), the polymer formed will have as its repeating unit a carbon atom with 2 hydrogen atoms attached, and a carbon atom with one hydrogen attached and a propyl group attached.

(2013)

(i) A: H_2O/H^+, heat; addition

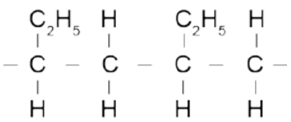
B: PCl_5 / PCl_3 / $SOCl_2$; substitution

C: KOH (alc), heat; elimination

(ii) Major product – the carbon with the least hydrogen atoms attached loses another hydrogen atom (to form the double bond).

(2012)

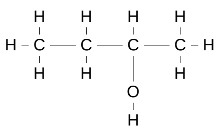
(a) (i)

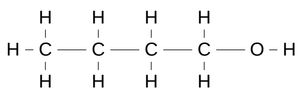


(ii) H_2 (/Pt)

(iii) PCl_3 / PCl_5 / $SOCl_2$

(b) No; for a molecule to exist as geometric isomers, it must contain a double bond, and each carbon (involved in the double bond) must have two different atoms / groups attached to it. Compound A has a double bond, but the atoms attached to one carbon are both the same (two hydrogen atoms) so it does not form a geometric isomer.

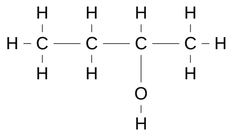
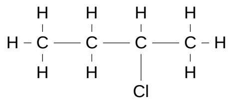




(c) (i) C D

(ii) C is the major product and D is the minor product.

There are 2 possible products because when the double bond is broken, an H (or –OH) will bond to one C (and a –OH group (or H) will bond with the other C). The product will depend on which (C) the H (or the –OH) bond to.

C must be  since product E is 

i.e. both functional groups are on the second carbon atom.

If $CH_3CH_2CH_2$ CH2OH was C then E would be $CH_3CH_2CH_2CH_2Cl$.

(2009)

Reaction One: Reactant A – H_2O/H^+ OR H_2O/ acid OR concentrated H_2SO_4 then H_2O OR dilute / aq H_2SO_4 Type – addition

Reaction Two: Reactant B – conc / H_2SO_4 Type – elimination OR Al_2O_3 / broken pottery / steel wool

Reaction Three: Reactant C – bromine / Br_2 Type – substitution