

20. Polymerisation

20.1 Addition polymerisation

Paper 2

Question Paper

- 1 Bromoalkanes are used widely in industry, although there is increasing concern about their environmental impact.

Fig. 4.1 shows a reaction scheme involving 1,2-dibromoethane.

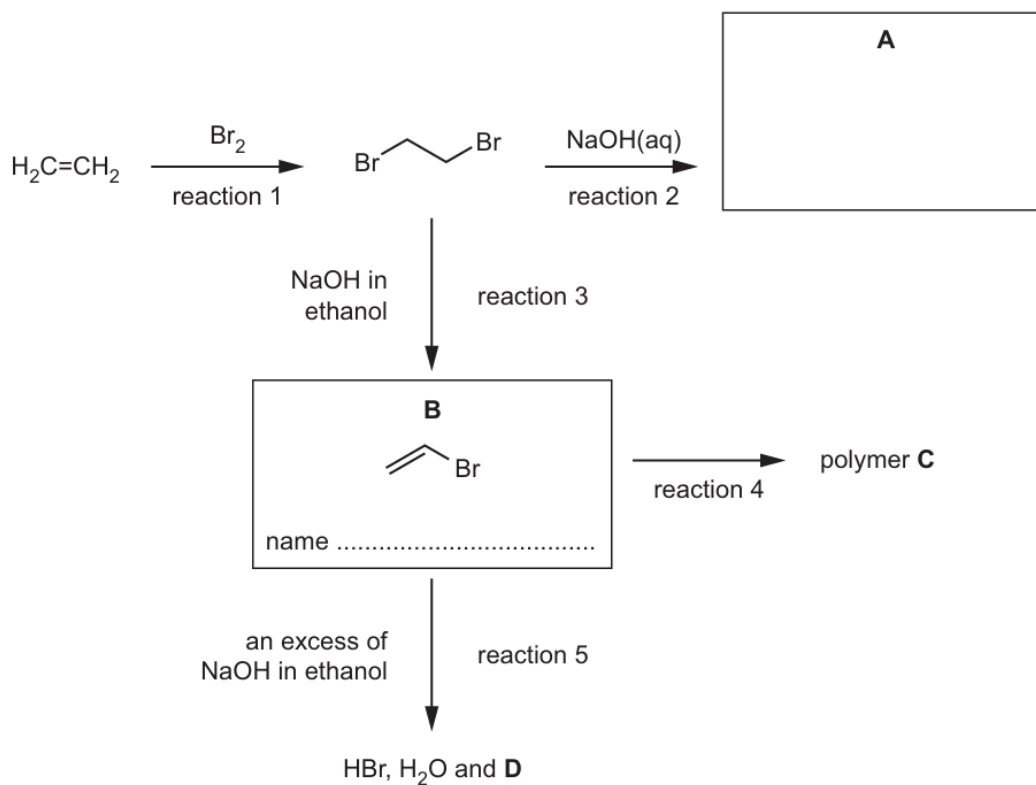


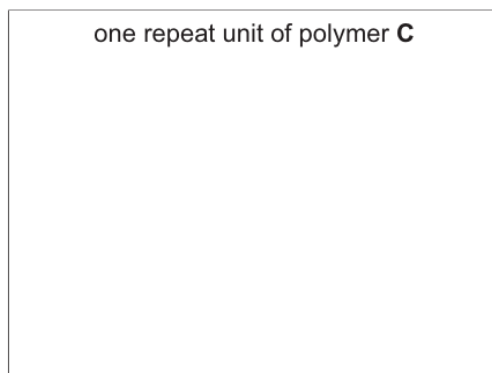
Fig. 4.1

(c) (i) Complete Fig. 4.1 to:

- draw the structure of compound **A**
- name compound **B**.

[2]

(ii) Draw the structure of one repeat unit of polymer **C** in the box.



[1]

- 2 (c) **X** is an addition polymer.

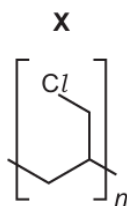


Fig. 4.3

- (i) Draw the monomer of **X**.

[1]

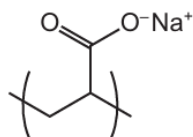
- (ii) Suggest **one** reason why the disposal of items made from **X** is difficult.

..... [1]

- 3 (d) X reacts with another reagent to form Y.

Molecules of Y react together to form addition polymer Z. The diagram shows the repeat unit of polymer Z.

repeat unit of polymer Z



Draw the structural formula of monomer Y.

[1]

- (e) Polymer Z is useful because it absorbs large amounts of water. However, there are problems associated with the disposal of products containing polymer Z.

Combustion is not an appropriate method to dispose of pure Z because the process releases harmful gases. Some of these gases contribute to the enhanced greenhouse effect.

- (i) Identify a gas released during the combustion of Z which contributes to the enhanced greenhouse effect.

..... [1]

- (ii) Identify another gas which could be produced during the combustion of pure Z. Describe a consequence, other than the enhanced greenhouse effect, of its release into the atmosphere.

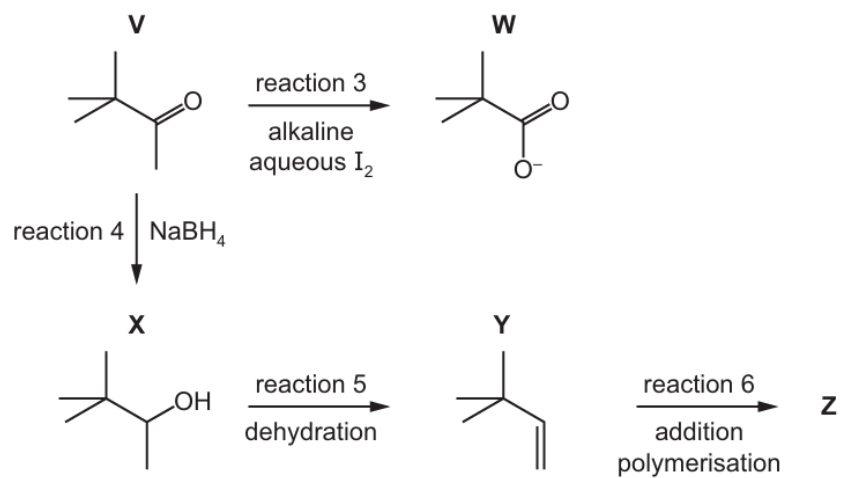
gas

consequence

[1]

4 (e) **V** is used in a wide range of organic reactions.

Some reactions of **V** are shown.



(vi) **Y** can form an addition polymer **Z**.

Draw one repeat unit of **Z**.

[1]

- 5** Crude oil is a complex mixture of hydrocarbon molecules.

The hydrocarbon molecules in crude oil are separated by fractional distillation. Fractional distillation is used because the different hydrocarbon molecules in crude oil have different boiling points.

- (c)** Cracking one mole of dodecane, $C_{12}H_{26}$, produces two moles of ethene and one mole of another hydrocarbon molecule.

- (i)** Write the equation for this cracking reaction.

..... [1]

The ethene can be used in the production of poly(ethene).

- (ii)** Give the full name of the process used to produce poly(ethene) from ethene.

..... [1]

- (iii)** Give **two** reasons why poly(ethene) should be reused or recycled rather than just thrown away.

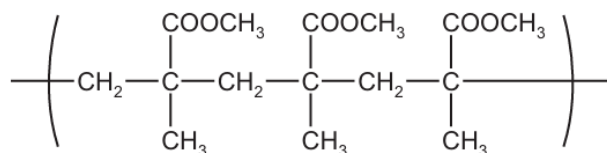
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..... [2]

- (iv)** Part of a polymer chain, produced by the same type of process as poly(ethene), is shown.



Give the **displayed** formula of the monomer used to produce this polymer.

[2]

- 6** Trihalomethanes are organic molecules in which three of the hydrogen atoms of methane are replaced by halogen atoms, for example CHCl_3 .

(c) CHClF_2 is also used to produce the monomer tetrafluoroethene, C_2F_4 .

This monomer can be used to produce poly(tetrafluoroethene), PTFE.

- (i) State the type of polymerisation that occurs during the production of PTFE.

..... [1]

- (ii) Draw the repeat unit of PTFE.

[1]

- (iii) Suggest why PTFE is used as a coating for cooking pans.

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..... [1]

- (iv) Waste disposal can cause litter problems.

State two **other** difficulties associated with the disposal of PTFE.

1
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2
..... [2]