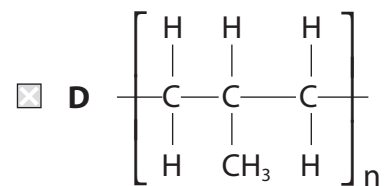
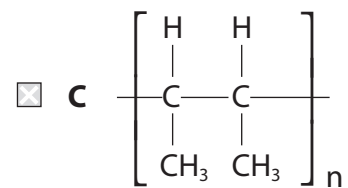
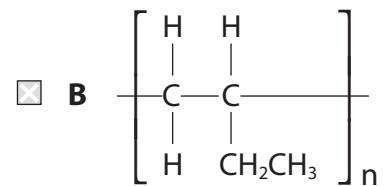
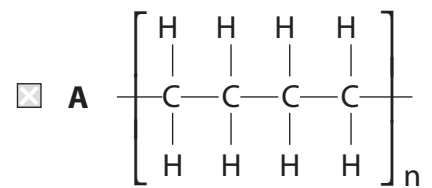


1 What is the formula of poly(but-1-ene)?



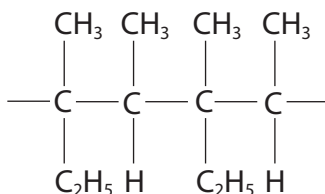
(Total for Question = 1 mark)

2 Which of the following molecules is formed on adding bromine **water** to ethene?

- A ethanol
- B ethane-1,2-diol
- C bromoethane
- D 2-bromoethanol

(Total for Question = 1 mark)

3 A section of a polymer is shown below.



What is the monomer for this polymer?

- A  $\begin{array}{cc} \text{CH}_3 & \text{CH}_3 \\ | & | \\ \text{H}-\text{C} & -\text{C}-\text{H} \\ | & | \\ \text{C}_2\text{H}_5 & \text{H} \end{array}$
- B  $\begin{array}{cccc} \text{CH}_3 & & \text{CH}_3 & \text{CH}_3 \\ & \diagdown & / & \diagdown \\ & \text{C}=\text{C} & -\text{C}=\text{C} & \\ & / & \diagdown & / \\ \text{C}_2\text{H}_5 & \text{CH}_3 & & \text{C}_2\text{H}_5 \end{array}$
- C  $\begin{array}{cc} \text{CH}_3 & \text{CH}_3 \\ & \diagdown & / \\ & \text{C}=\text{C} & \\ & / & \diagdown \\ \text{C}_2\text{H}_5 & \text{H} \end{array}$
- D  $\begin{array}{cc} \text{CH}_3 & \text{H} \\ & \diagdown & / \\ & \text{C}=\text{C} & \\ & / & \diagdown \\ \text{CH}_3 & \text{C}_2\text{H}_5 \end{array}$

(Total for Question = 1 mark)

4 Electrophiles are

- A electron pair donors that are attracted to regions of high electron density.
- B electron pair donors that are attracted to regions of low electron density.
- C electron pair acceptors that are attracted to regions of high electron density.
- D electron pair acceptors that are attracted to regions of low electron density.

**(Total for Question = 1 mark)**

5 Which of these solvents is most likely to be warmed by microwave radiation?

- A Hexane
- B Cyclohexane
- C Cyclohexanol
- D Cyclohexene

**(Total for Question = 1 mark)**

6 (a) Which of the following represents a step in the mechanism during the reaction between ethene and hydrogen bromide?

(1)

- A  $C_2H_4 + Br^+ \rightarrow C_2H_4Br^+$
- B  $C_2H_4 + HBr \rightarrow C_2H_5^+ + Br^-$
- C  $C_2H_4 + HBr \rightarrow C_2H_5^\bullet + Br^\bullet$
- D  $C_2H_4 + HBr \rightarrow C_2H_4Br^- + H^+$

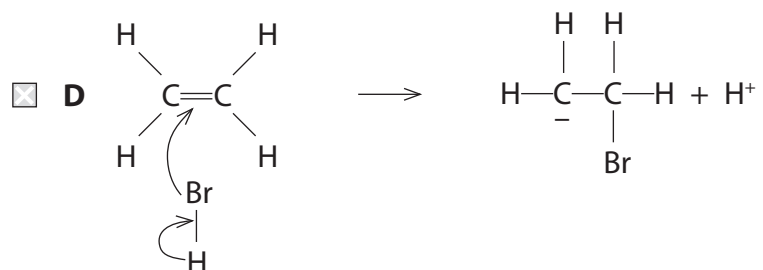
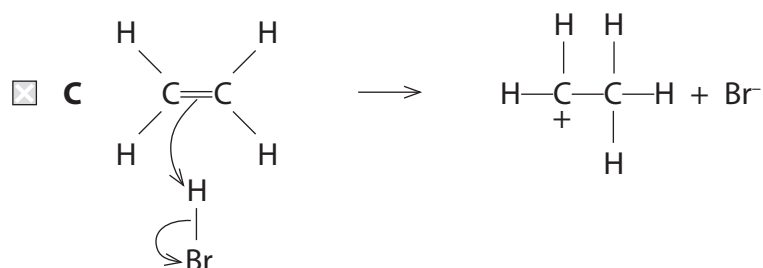
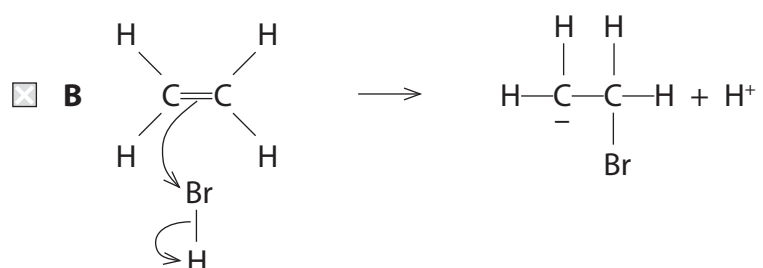
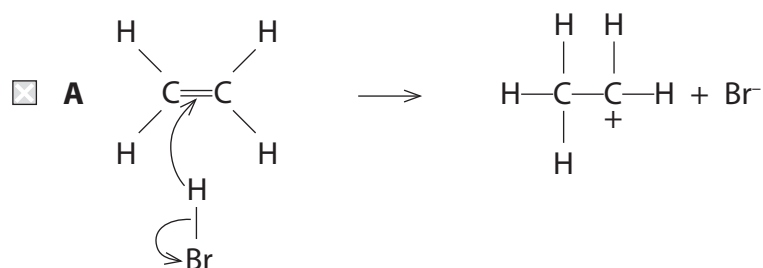
(b) The mechanism of the reaction between ethene and hydrogen bromide is

(1)

- A electrophilic addition.
- B electrophilic substitution.
- C nucleophilic addition.
- D nucleophilic substitution.

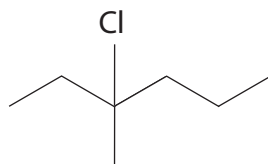
**(Total for Question = 2 marks)**

7 Which of the following equations shows the first step in the mechanism for the reaction between hydrogen bromide and ethene?



(Total for Question = 1 mark)

8



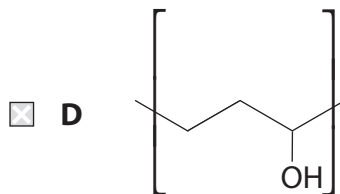
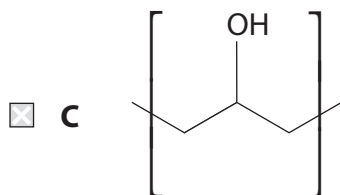
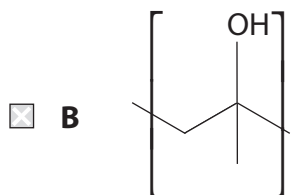
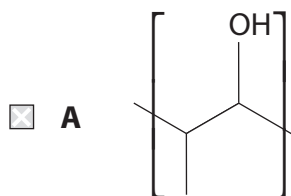
The molecule shown above is 3-chloro-3-methylhexane. It reacts with hot, alcoholic potassium hydroxide to produce a number of different alkenes. This reaction can be classified as

- A elimination.
- B oxidation.
- C reduction.
- D substitution.

**(Total for Question = 1 mark)**

9 The monomer of the addition polymer poly(propenol) may be represented as  $\text{CH}_3\text{-CH=CHOH}$ .

The repeat unit of the addition polymer is



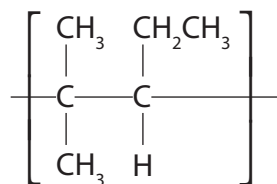
(Total for Question = 1 mark)

10 An electrophile is **defined** as a species that

- A is an electron pair acceptor.
- B is an electron pair donor.
- C has a negative charge.
- D has a positive charge.

(Total for Question = 1 mark)

11 The repeat unit of a polymer is shown below.



The systematic name of the alkene monomer that forms this polymer is

- A 2-methyl-3-ethylpropene
- B 2-methylpent-2-ene
- C 2-methylpent-3-ene
- D 4-methylpent-2-ene

(Total for Question = 1 mark)

12 The main reason for hardening vegetable oils when producing low-fat spreads is to

- A prevent oxidation.
- B make the oil less viscous.
- C increase the melting temperature.
- D decrease the cholesterol content.

(Total for Question = 1 mark)



13 The reaction of bromine with propene is an example of

- A electrophilic substitution.
- B free radical substitution.
- C electrophilic addition.
- D free radical addition.

**(Total for Question = 1 mark)**

14 All alkenes have

- A the same empirical formula and the same general formula.
- B the same molecular formula and the same general formula.
- C the same molecular formula and the same empirical formula.
- D the same empirical formula and the same structural formula.

**(Total for Question = 1 mark)**

14 Unsaturated vegetable oils are hardened to make margarine by reaction with hydrogen and a nickel catalyst. Which terms could both be used to describe this type of reaction?

- A Substitution and oxidation
- B Substitution and reduction
- C Addition and oxidation
- D Addition and reduction

**(Total for Question = 1 mark)**

**15** This question concerns the reaction of hydrogen bromide with propene.

(a) This reaction requires (1)

- A** normal laboratory conditions.
- B** the presence of UV light.
- C** the presence of a suitable catalyst.
- D** heating under reflux.

(b) The reaction is best described as (1)

- A** nucleophilic substitution.
- B** electrophilic substitution.
- C** nucleophilic addition.
- D** electrophilic addition.

(c) The major product of the reaction will be (1)

- A** 1-bromopropane
- B** 2-bromopropane
- C** 1,2-dibromopropane
- D** 2-bromopropene

**(Total for Question = 3 marks)**

**16** Unsaturated vegetable oils are hardened to make margarine by reaction with hydrogen and a nickel catalyst. Which terms could both be used to describe this type of reaction?

- A** Substitution and oxidation
- B** Substitution and reduction
- C** Addition and oxidation
- D** Addition and reduction

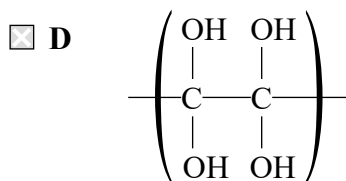
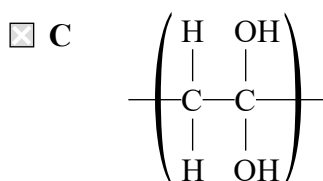
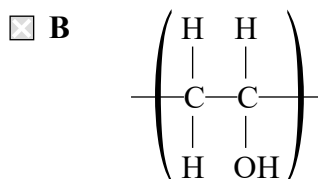
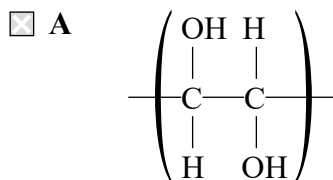
**(Total for Question = 1 mark)**

17 The use of poly(ethene) packaging has been criticised mainly because

- A the complete combustion of poly(ethene) produces dangerous fumes.
- B large amounts of oil are consumed in producing the monomer, ethene.
- C poly(ethene) degrades to form toxic products.
- D the catalyst used in the polymerization of ethene is expensive.

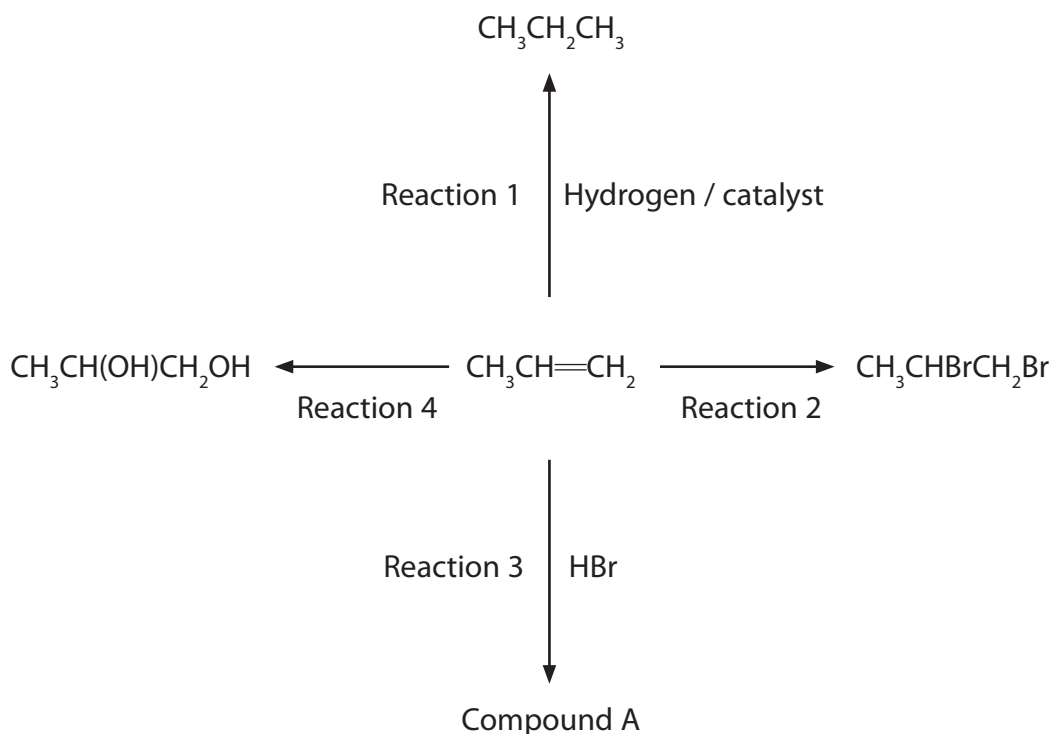
(Total for Question = 1 mark)

18 The addition polymer poly(ethenol) is water-soluble. The repeating unit of poly(ethenol) is



(Total for Question = 1 mark)

19 Four of the reactions of propene are shown on the diagram below.



(a) Nickel is often used as the catalyst for Reaction 1. Use your Periodic Table to select which of the following metals can be used instead of nickel to catalyse Reaction 1.

(1)

- A Potassium
- B Calcium
- C Gallium
- D Palladium

(b) The name of the reagent and the product for Reaction 2 are

(1)

	Reagent	Product
<input type="checkbox"/> A	bromine water	dibromopropane
<input type="checkbox"/> B	bromine	omopropane
<input type="checkbox"/> C	bromine water	1,2-dibromopropane
<input type="checkbox"/> D	bromine	dibromopropane

(c) What is formed in Reaction 3? (1)

- A** Only 1-bromopropane
- B** Only 2-bromopropane
- C** A mixture of bromopropanes containing mainly 2-bromopropane
- D** A mixture of bromopropanes containing mainly 1-bromopropane

(d) A mixture of dilute sulfuric acid and which of the following reagents is needed for Reaction 4? (1)

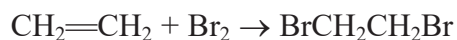
- A** KOH
- B**  $\text{KMnO}_4$
- C**  $\text{H}_2\text{O}_2$
- D**  $\text{O}_2$

(e) The reaction of propene in Reaction 4 can be classified both as (1)

<input type="checkbox"/> <b>A</b>	addition and reduction.
<input type="checkbox"/> <b>B</b>	addition and oxidation.
<input type="checkbox"/> <b>C</b>	free radical substitution and reduction.
<input type="checkbox"/> <b>D</b>	free radical substitution and oxidation.

**(Total for Question = 5 marks)**

20 In the reaction between ethene and bromine, the bromine molecule acts as an electrophile.



Which of the following statements is true?

- A Ethene acts as a nucleophile because it is polar.
- B Ethene acts as a nucleophile because it can donate a pair of electrons to bromine.
- C Ethene is not a nucleophile in this reaction.
- D Ethene acts as a nucleophile because it donates a single electron to bromine.

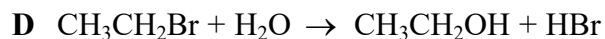
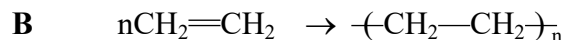
(Total for Question = 1 mark)

21 If propene,  $\text{CH}_3\text{CH}=\text{CH}_2$ , is reacted with aqueous acidified potassium manganate(VII) the organic product is

- A  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$
- B  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
- C  $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{OH}$
- D  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

(Total for Question = 1 mark)

22 Four organic reactions are given below:



(a) Which reaction is a substitution reaction?

(1)

A

B

C

D

(b) Which reaction is an electrophilic addition reaction?

(1)

A

B

C

D

(c) Which reaction involves initial attack by a nucleophile?

(1)

A

B

C

D

(d) Which reaction requires an initiator?

(1)

A

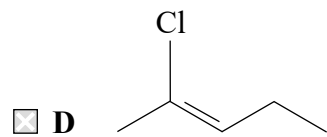
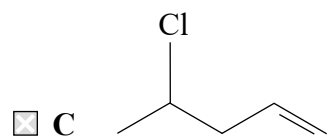
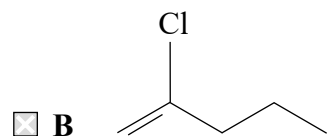
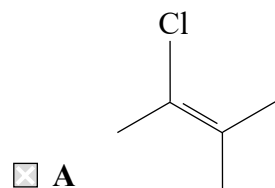
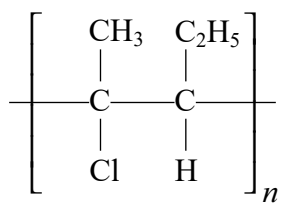
B

C

D

**(Total for Question = 4 marks)**

23 Which of the monomers **A to D** would form the polymer below?



(Total for Question = 1 mark)