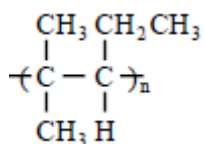


Q1. The correct name for the alkene monomer which forms the polymer shown below is



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

(Total 1 mark)

Q2. Which one of the following does **not** contain any delocalised electrons?

- A poly(propene)
- B benzene
- C graphite
- D sodium

(Total 1 mark)

Q3. Propene reacts with bromine by a mechanism known as electrophilic addition.

- (a) Explain what is meant by the term *electrophile* and by the term *addition*.

Electrophile

.....

Addition

.....

(2)

- (b) Explain why bromine, a non-polar molecule, is able to react with propene.

.....
.....
.....

(2)

- (c) Outline the mechanism for the electrophilic addition of bromine to propene. Give the name of the product formed.

Mechanism

Name of product

(5)

- (d) The polymerisation of propene to form poly(propene) is an important industrial process.

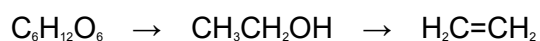
Name the type of polymerisation involved.

.....

(1)

(Total 10 marks)

- Q4.** Glucose can be used as a source of ethanol. Ethanol can be burned as a fuel or can be converted into ethene.



glucose ethanol ethene

(a) Name the types of reaction illustrated by the two reactions above.

Glucose to ethanol

Ethanol to ethene

(2)

(b) (i) State what must be added to an aqueous solution of glucose so that ethanol is formed.

.....

(ii) Identify a suitable catalyst for the conversion of ethanol into ethene.

.....

(2)

(c) (i) State the class of alcohols to which ethanol belongs.

.....

(ii) Give **one** advantage of using ethanol as a fuel compared with using a petroleum fraction.

.....

(2)

(d) Most of the ethene used by industry is produced when ethane is heated to 900°C in the absence of air. Write an equation for this reaction.

.....

(1)

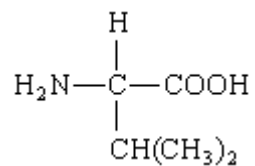
(e) Name the type of polymerisation which occurs when ethene is converted into poly(ethene).

.....

(1)

(Total 8 marks)

Q5. (a) Consider the following amino acid.



(i) Draw the structure of the amino acid species present in a solution at pH 12.

(ii) Draw the structure of the dipeptide formed from two molecules of this amino acid.

(iii) Protein chains are often arranged in the shape of a helix. Name the type of interaction that is responsible for holding the protein chain in this shape.

.....

(3)

(b) Consider the hydrocarbon **G**, $(\text{CH}_3)_2\text{C}=\text{CHCH}_3$, which can be polymerised.

(i) Name the type of polymerisation involved and draw the repeating unit of the polymer.

Type of polymerisation

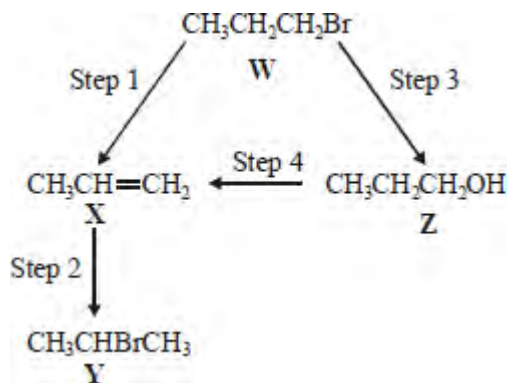
Repeating unit

(ii) Draw the structure of an isomer of **G** which shows geometrical isomerism.

(iii) Draw the structure of an isomer of **G** which does not react with bromine water.

(4)
(Total 7 marks)

Q6.For this question refer to the reaction scheme below.



Which one of the following statements is **not** correct?

- A** Reaction of **W** with sodium cyanide followed by hydrolysis of the resulting product gives propanoic acid.
- B** Mild oxidation of **Z** produces a compound that reacts with Tollens' reagent, forming a silver mirror.
- C** **Z** reacts with ethanoic acid to produce the ester propyl ethanoate.
- C** **W** undergoes addition polymerisation to form poly(propene).

(Total 1 mark)

Q7. Tetrafluoroethene, C_2F_4 , is obtained from chlorodifluoromethane, CHClF_2 , according to the equation:



(a) A 1.0 mol sample of CHClF_2 is placed in a container of volume 18.5 dm^3 and heated.

When equilibrium is reached, the mixture contains 0.20 mol of CHClF_2

(i) Calculate the number of moles of C_2F_4 and the number of moles of HCl present at equilibrium.

Number of moles of C_2F_4

Number of moles of HCl

(ii) Write an expression for K_c for the equilibrium.

.....

(iii) Calculate a value for K_c and give its units.

Calculation

.....

.....

.....

Units

(6)

(b) (i) State how the temperature should be changed at constant pressure to increase the equilibrium yield of C_2F_4 .

.....

(ii) State how the total pressure should be changed at constant temperature to increase the equilibrium yield of C_2F_4 .

.....

(2)

(c) C_2F_4 is used to manufacture the polymer polytetrafluoroethene, PTFE. Name the type of polymerisation involved in the formation of PTFE.

.....

(1)

(Total 9 marks)

Q8. (a) The compound $H_2C=CHCN$ is used in the formation of acrylic polymers.

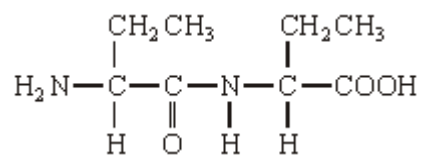
(i) Draw the repeating unit of the polymer formed from this compound.

(ii) Name the type of polymerisation involved in the formation of this polymer.

.....

(2)

(b) When the dipeptide shown below is heated under acidic conditions, a single amino acid is produced.



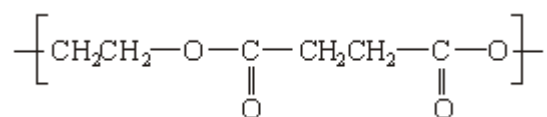
(i) Name this amino acid.

.....

(ii) Draw the structure of the amino acid species present in the acidic solution.

(2)

(c) The repeating unit of a polyester is shown below.



(i) Deduce the empirical formula of the repeating unit of this polyester.

.....

- (ii) Draw the structure of the acid which could be used in the preparation of this polyester and give the name of this acid.

Structure

Name

- (iii) Give **one** reason why the polyester is biodegradable.

.....
.....

(4)
(Total 8 marks)