

1.

Alkenes are unsaturated hydrocarbons. They show structural isomerism. Alkenes take part in addition reactions and form polymers.

- (a) Structural isomers have the same molecular formula but different structural formulae. Give an example of structural isomerism.

molecular formula

two structural formulae

[3]

- (b) Ethene reacts with each of the following. Give the name and structural formula of each product.

- (i) steam

name of product

structure of product

[2]

- (ii) hydrogen

name of product

structure of product

[2]

(c) Alkenes polymerise by addition.

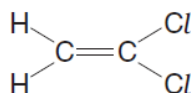
(i) Explain the term *polymerise*.

.....
.....[2]

(ii) What is the difference between addition polymerisation and condensation polymerisation?

.....
.....[2]

(iii) Poly(dichloroethene) is used extensively to package food. Draw its structure. The structural formula of dichloroethene is drawn below.



[2]

(d) Steel may be coated with another metal, eg zinc or chromium, or with a polymer, eg poly(chloroethene), to prevent rusting.

(i) Suggest a property of poly(chloroethene) that makes it suitable for this purpose.

.....[1]

(ii) Explain why the steel will rust when the protective coating of chromium or polymer is broken.

.....[1]

(iii) When the protective layer of zinc is broken, the steel still does not rust. Suggest an explanation.

.....
.....
.....[2]

Nov 03

2.

- 4 Esters occur naturally in plants and animals. They are manufactured from petroleum. Ethyl ethanoate and butyl ethanoate are industrially important as solvents.

(a) (i) Explain the term *solvent*.

.....[1]

(ii) Give the formula of ethyl ethanoate.

[1]

(iii) Ethyl ethanoate can be made from ethanol and ethanoic acid. Describe how these chemicals can be made.

ethanol from ethene

.....
.....[2]

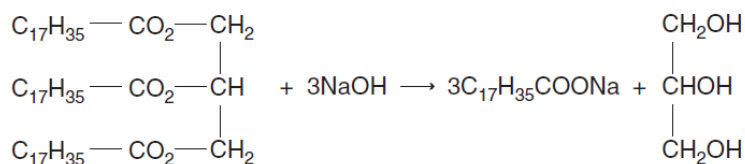
ethanoic acid from ethanol

.....
.....[2]

(iv) Name **two** chemicals from which butyl ethanoate can be made.

.....[1]

(b) The following equation represents the alkaline hydrolysis of a naturally occurring ester.



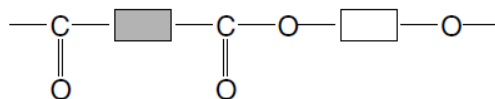
(i) Which substance in the equation is an alcohol? Underline the substance in the equation above.

[1]

(ii) What is the major use for compounds of the type $\text{C}_{17}\text{H}_{35}\text{COONa}$?

.....[1]

(c) A polymer has the structure shown below.



(i) What type of polymer is this?

.....[1]

(ii) Complete the following to give the structures of the two monomers from which the above polymer could be made.



[2]

(d) Esters are frequently used as solvents in chromatography. A natural macromolecule was hydrolysed to give a mixture of amino acids. These could be identified by chromatography.

(i) What type of macromolecule was hydrolysed?

.....[1]

(ii) What type of linkage was broken by hydrolysis?

.....[1]

(iii) Explain why the chromatogram must be sprayed with a locating agent before the amino acids can be identified.

.....

.....[1]

(iv) Explain how it is possible to identify the amino acids from the chromatogram.

.....

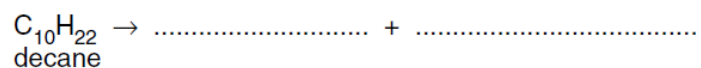
.....[2]

3.

3 Alkenes are unsaturated hydrocarbons. They undergo addition reactions.

(a) Two of the methods of making alkenes are cracking and the thermal decomposition of chloroalkanes.

(i) Complete an equation for the cracking of the alkane, decane.



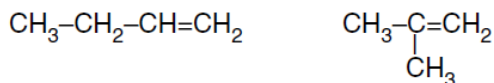
(ii) Propene can be made by the thermal decomposition of chloropropane. Describe how chloropropane can be made from propane.

reagents propane and

conditions

[4]

(b) The following alkenes are isomers.



(i) Explain why they are isomers.

.....
.....

(ii) Give the name and structural formula of another hydrocarbon that is isomeric with the above.

name

structural formula

[4]

(c) Give the name of the product when but-1-ene reacts with each of the following.

steam

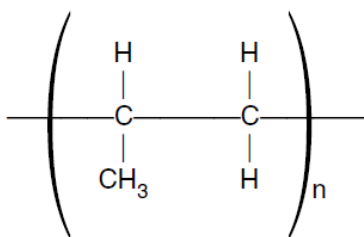
hydrogen

bromine

[3]

(d) Alkenes can polymerise.

(i) Deduce the name and structural formula of the monomer from the structure of the polymer.



name of monomer

structural formula