

Organic Chemistry Revision Questions – Paper 2, Triple only.

Q1.

Methylated spirit is a useful product made from a mixture of substances.

The table below shows the mass of the substances in a sample of methylated spirit.

Substance	Mass in grams
Ethanol	265.5
Methanol	23.3
Pyridine	3.0
Methyl violet	1.5

- (a) What name is given to a useful product such as methylated spirit?

(1)

- (b) Calculate the percentage by mass of methanol in methylated spirit.

Use the table above.

Percentage = _____ %

(2)

Methylated spirit contains ethanol and is available cheaply.

Methylated spirit also contains:

- pyridine which has a very unpleasant smell
- methyl violet which makes the mixture purple.

- (c) Suggest why pyridine and methyl violet are added to ethanol to make methylated spirit.

(1)

- (d) Suggest **one** use of methylated spirit.

(1)

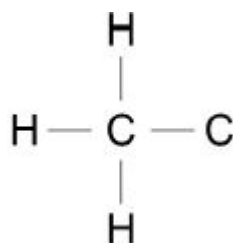
(e) Describe how ethanol is produced from sugar solution.

Give the name of this process.

(3)

(f) The diagram below shows part of the displayed formula for ethanol.

Complete the diagram.



(1)

(g) Name the gas produced when sodium is added to ethanol.

(1)

(h) Methanol is used to produce methanoic acid.

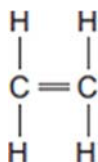
What type of substance reacts with methanol to produce methanoic acid?

(1)

(Total 11 marks)

Q2.

A molecule of ethene (C_2H_4) is represented as:



(a) A sample of ethene is shaken with bromine water.

Complete the sentence.

The bromine water turns from orange to _____.

(1)

(b) Most ethene is produced by the process of cracking.

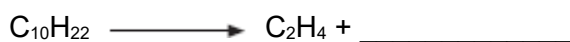
(i) Complete the sentence.

Cracking is a type of thermal _____.

(1)

(ii) Decane ($C_{10}H_{22}$) can be cracked to produce ethene (C_2H_4) and **one** other product.

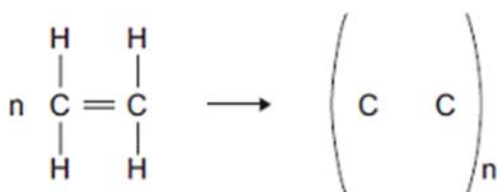
Complete the equation to show the formula of the other product.



(1)

(c) Many molecules of ethene join together to produce poly(ethene).

(i) Complete the structure of the polymer in the equation.



(2)

(ii) Some carrier bags are made from poly(ethene). Some carrier bags are made from cornstarch.

Suggest **two** benefits of using cornstarch instead of poly(ethene) to make carrier bags.

(2)

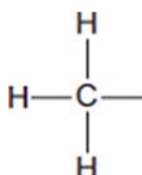
(Total 7 marks)

Q3.

This question is about organic compounds.

(a) Wine contains ethanol (CH_3CH_2OH).

(i) Complete the displayed structure of ethanol.



(1)

- (ii) Wine left in a glass for several days turns sour.
The sour taste is caused by ethanoic acid.



Complete the sentences.

The ethanoic acid is produced from a reaction between ethanol
and _____.

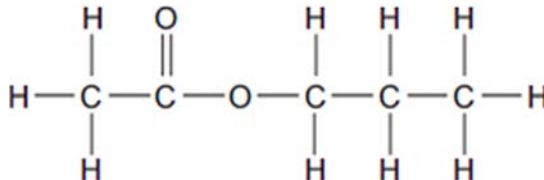
This type of reaction is _____.

(2)

- (b) Propyl ethanoate, a fragrance, can be produced by reacting ethanoic acid with an alcohol.

Propyl ethanoate is a member of a series of organic compounds. The members of the series all have the same functional group.

The displayed structure of propyl ethanoate is:



- (i) Draw a ring around the functional group for this series on the displayed structure of propyl ethanoate.

(1)

- (ii) Name the series of organic compounds with this functional group.

(1)

- (iii) The alcohol used to make propyl ethanoate has the formula $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
Name this alcohol.

(1)

(Total 6 marks)


Q4.

Modern window frames are often made from uPVC which contains the plastic poly(chloroethene).

WONDERFUL WINDOWS

Replace your old wooden windows
with our super high quality uPVC
windows!

NO PAINTING - MAINTENANCE FREE



- (a) State why plastic window frames need no painting or maintenance.

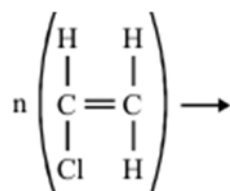
(1)

- (b) Poly(chloroethene) is a polymer formed by the *addition polymerisation* of chloroethene.

- (i) Chloroethene is an unsaturated molecule. Why is this molecule said to be unsaturated?

(1)

- (ii) Complete the diagram to represent how poly(chloroethene) is formed from chloroethene.



(3)

- (iii) Explain what is meant by the term *polymerisation*.

(2)

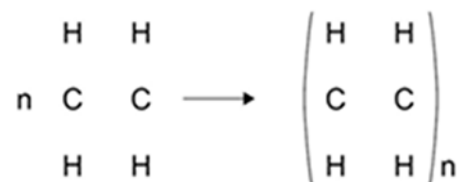
- (iv) Why is this an *addition polymerisation*?

(1)
(Total 8 marks)

Q5.

Ethene is used to produce poly(ethene).

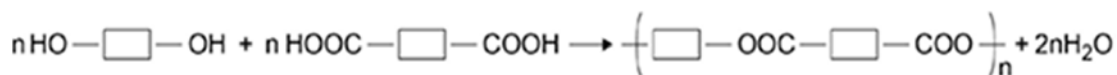
- (a) Draw the bonds to complete the displayed formulae of ethene and poly(ethene) in the equation.



(2)

- (b) Polyesters are made by a different method of polymerisation.

The equation for the reaction to produce a polyester can be represented as:



Compare the polymerisation reaction used to produce poly(ethene) with the polymerisation reaction used to produce a polyester.

(4)
(Total 6 marks)

Q6.

This question is about polymers.

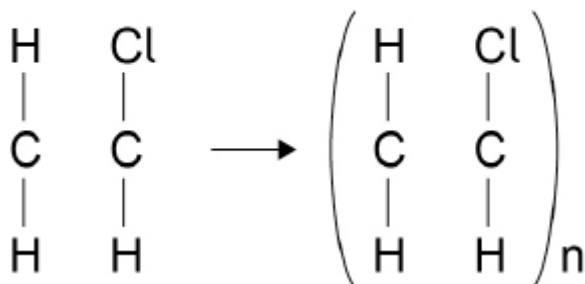
- (a) Name the monomer used to form poly(chloroethene).

(1)

- (b) **Figure 1** shows the equation for the formation of poly(chloroethene).

Complete **Figure 1**.

Figure 1



(3)

- (c) Poly(chloroethene) is the only product.

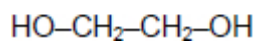
What type of polymer is poly(chloroethene)?

(1)

Ethanediol reacts with butanedioic acid to produce a polyester and a small molecule.

- (d) **Figure 2** shows the structural formula of ethanediol.

Figure 2

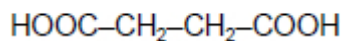


Name the functional group present in ethanediol.

(1)

- (e) **Figure 3** shows the structural formula of butanedioic acid.

Figure 3



Which formula represents the carboxylic acid functional group?

Tick (✓) **one** box.

-CH₂-

-CH₂-CH₂-

-CH₂-COOH

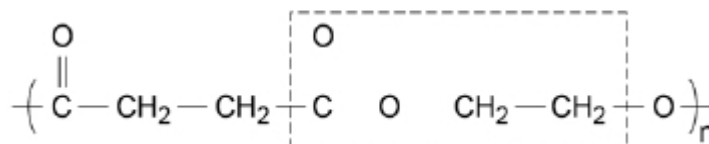


(1)

(f) **Figure 4** shows part of the structure of the polyester.

Complete the box in **Figure 4**.

Figure 4



(2)

(g) Name the small molecule produced when ethanediol reacts with butanedioic acid.

(1)

Starch, proteins and DNA are naturally occurring polymers.

(h) Name the monomers from which starch and proteins are produced.

Starch _____

Proteins _____

(2)

(i) Describe the structure of DNA.

(2)

(Total 14 marks)

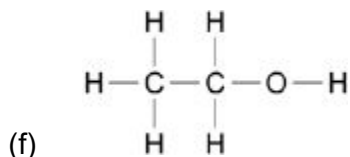
Mark schemes

Q1.

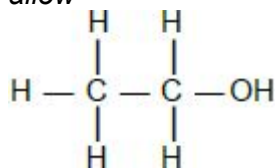
- (a) formulation 1
- (b)
$$\frac{23.3}{265.5 + 23.3 + 3.0 + 1.5} (\times 100)$$

allow
$$\frac{23.3}{293.3} (\times 100)$$

= 7.9 (%) 1
allow 7.944084555 (%) rounded correctly 1
an answer of 7.9 (%) scores 2 marks
- (c) to deter consumption / drinking (by people) 1
- (d) any **one** from: 1
- fuel
 - solvent
 - antiseptic
- allow specific uses e.g.*
- *fuel additive*
 - *cleaning products*
 - *hand-sanitisers*
- do not accept as an alcoholic drink* 1
- (e) ferment(ation) 1
ignore distillation
- add yeast 1
- anaerobic (conditions)
allow in the absence of oxygen
- or**
- warm
allow a temperature value in range 5 – 45 °C inclusive
allow room temperature
ignore hot / heat
ignore high temperature 1



allow



1

(g) hydrogen

allow H₂

1

(h) oxidising (agent).

allow permanganate / dichromate ions

allow [O]

ignore oxygen

1

[11]

Q2.

(a) colourless

ignore clear

1

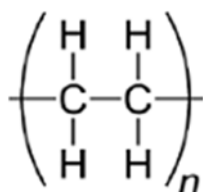
(b) (i) decomposition

1

(ii) C₈H₁₈

1

(c) (i)



*two single trailing bonds extending from the carbons
(through the brackets) 1 mark*

five single bonds (1 C–C bond and 4 C–H bonds) 1 mark

2

(ii) any **two** from:

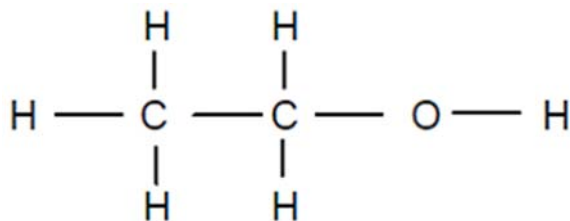
- (polymers made from) cornstarch are biodegradable
 - less space needed in landfill sites
 - polymers from cornstarch come from a renewable source.
- allow converse for poly(ethene)*

2

[7]

Q3.

(a) (i)



allow other arrangements provided connectivity is correct
allow — OH

1

(ii) oxygen

accept O₂

allow O

1

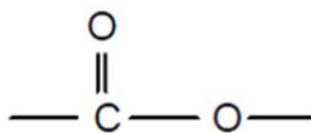
oxidation

allow oxidisation / oxidising / oxidised

allow redox

1

(b) (i) ring around



1

(ii) ester(s)

*do **not** allow ether(s)*

1

(iii) propanol

propanol accept propan-1-ol

allow propyl alcohol

1

[6]

Q4.

(a) not broken down by microorganisms **or** not bio-degradable

accept alternative answers such as:

do not rot / corrode / fade / react with atmosphere etc

any answers which imply the inertness or non-
biodegradability of this plastic

accept they don't react, they are 'inert'

ignore rusting

*do **not** accept weathering*

1

(b) (i) (have a) double bond **or** do not have maximum number of (hydrogen) atoms attached

accept can add / react with hydrogen

accept can take part addition reactions

*do **not** accept it is a double bond*

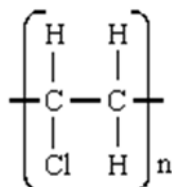
do **not** accept additional reactions
do **not** accept has 'spare' / 'free' bond
do **not** accept alkene alone

1

- (ii) single bond between carbon atoms

1

all atoms correct + 2 'linking' bonds
(linking bonds need not go through bracket)



1

n moved to bottom right of bracket i.e. is below $\frac{1}{2}$ way on the right
first 2 marks are possible for chain structures
accept $[-\text{CHCl}-\text{CH}_2-]_n$

1

- (iii) many molecules **or** many monomers

1

joined / bonded / linked **or** form long
chain molecules / large molecules **or** to
form a long chain polymer

accept many alkenes or many (ethene) molecules
do not accept many ethene alone etc.
to form a long polymer is not enough for 2nd mark

1

- (iv) no other substances formed
(A + B → C)

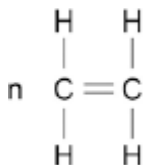
allow because double bond breaks so other atoms can add
allow one product only
do not accept saturation occurs

1

[8]

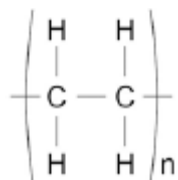
Q5.

- (a) (ethene)



1

(polyethene)



1

(b) any **four** from:

- poly(ethene) produced by addition polymerisation whereas polyester by condensation polymerisation
- poly(ethene) produced from one monomer whereas polyester produced from two different monomers
- poly(ethene) produced from ethene / alkene whereas polyester from a (di)carboxylic acid and a diol / alcohol
- poly(ethene) is the only product formed whereas polyester water also produced
- poly(ethene) repeating unit is a hydrocarbon whereas polyester has an ester linkage

4

[6]

Q6.

(a) chloroethene

1

(b) double bond in monomer

1

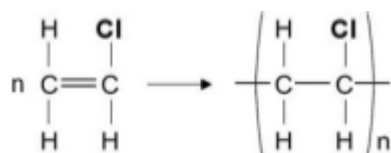
in polymer one C–C bond **and** two open ended bonds

1

'n' in front of monomer

1

an answer of:



scores 3 marks

(c) addition

1

(d) –OH

allow alcohol

1

(e) –COOH

1

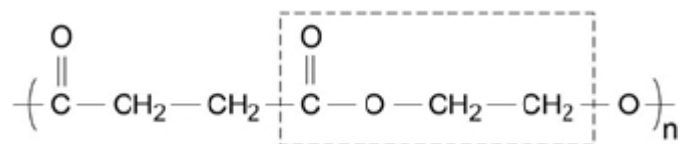
(f) C=O bond

1

2 × C–O bonds

1

an answer of:



scores **2** marks

(g) water 1

(h) glucose 1

amino acids 1

(i) any **two** from:
• two polymer chains
• double helix
• four different monomers / nucleotides 2

[14]