Paper 3

Questions are applicable for both core and extended candidates

1 Fig. 7.1 shows the displayed formula of compound **S**.

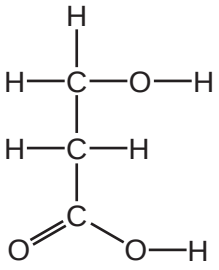


Fig. 7.1

(b) Compound **S** can be converted to acrylic acid.
The molecular formula of acrylic acid is $C_3H_4O_2$.

(i) Complete Table 7.1 to calculate the relative molecular mass of acrylic acid.

Table 7.1

atom	number of atoms	relative atomic mass	
carbon	3	12	3 × 12 = 36
hydrogen		1	
oxygen		16	

relative molecular mass = ... [2]

(ii) Acrylic acid is an unsaturated compound.

Describe a test for an unsaturated compound.

test .....

observations .....
[2]

(iii) When left in the air, acrylic acid forms a polymer.

State the meaning of the term polymer.

.....

..... [2]

(iv) Poly(ethene) is also a polymer.

Choose from the list the type of polymerisation that occurs when poly(ethene) is made.

Draw a circle around your chosen answer.

substitution **oxidation** **neutralisation** **addition** [1]

2 **(a)** A list of symbols and formulae is shown.

CaO
CH_4
C_2H_4
C_2H_6
Cl^-
Cu^{2+}
H_2
He
K^+
N_2
Na^+
SO_2

Answer the following questions using these symbols or formulae.
Each symbol or formula may be used once, more than once or not at all.

State which symbol or formula represents:

(iv) the monomer used to produce poly(ethene)

..... [1]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

3 Butane and but-1-ene are colourless gases at room temperature and pressure.

(e) But-1-ene undergoes polymerisation.

(i) State the type of polymerisation but-1-ene undergoes. **(extended only)**

..... [1]

(ii) Draw part of the polymer molecule to show **three** repeat units. **(extended only)**

[3]

4 Propane, propene, propan-1-ol and propanoic acid are members of different homologous series.

Molecules of these substances contain three carbon atoms.

(f) Propene forms a polymer named poly(propene).

(i) Draw the displayed formula of a section of poly(propene) showing **three** repeat units.

(extended only)

[2]

(ii) State the type of polymerisation that occurs when propene forms poly(propene).

..... [1]

5 This question is about organic compounds.

(b) The structure of compound **A** is shown in Fig. 7.1.

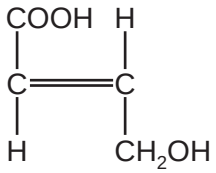


Fig. 7.1

(i) Deduce the molecular formula of compound **A**.

..... [1]

(ii) There are three functional groups in compound **A**.

Name the homologous series of compounds that contain the following functional groups:

–C=C– .....

–OH .....

–COOH. .....

[3]

(iii) State what is observed when compound **A** is added to:

aqueous bromine .....

aqueous sodium carbonate. .....

[2]

(iv) Compound **A** can be used as a single monomer to produce two different polymers.

Draw **one** repeat unit of the addition polymer formed from compound **A**. **(extended only)**

[2]

(v) Compound **A** can be converted into a dicarboxylic acid. **(extended only)**

Name the type of condensation polymer formed from a dicarboxylic acid and a diol.

..... [1]

6 A list of gases is shown.

ammonia
carbon dioxide
carbon monoxide
ethene
fluorine
oxygen
sulfur dioxide
xenon

Answer the following questions using only the gases from the list.
Each gas may be used once, more than once or not at all.

Give the name of the gas that:

(e) can form a polymer

..... [1]

7 Carboxylic acids can be converted into esters.

(b) Polyesters are polymers made from dicarboxylic acids.

(i) Name the **other** type of organic compound used in the formation of polyesters.

(extended only)

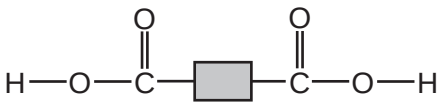
..... [1]

(ii) Name the type of polymerisation used in the manufacture of polyesters.

(extended only)

..... [1]

8 **(e)** Polyesters can be made from the two different molecules shown.



and

(i) Complete the diagram to show a section of the polyester made from these two molecules. Include all of the atoms and all of the bonds in the linkages. **(extended only)**

[3]

(ii) Name the type of polymerisation that takes place when this polymer forms. **(extended only)**

..... [1]

(iii) Name a polyester. **(extended only)**

..... [1]