

GCSE Combined Science: Trilogy

Worksheet: Polymers

TIME 20 min	TOTAL 21 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Polymers

NAME _____	CLASS _____	DATE _____
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Poly(ethene) is a polymer.

0 1 . 1

Complete the sentence.

Tick (✓) **one** box.

Polymers have molecules.

very large

☐

very small

☐

charged

☐

single-atom

☐

[1 mark]

0 1 . 2

What type of bond joins the atoms within a polymer molecule?

Tick (✓) **one** box.

Covalent

☐

Ionic

☐

Metallic

☐

Intermolecular

☐

[1 mark]

0 1 . 3

Why is poly(ethene) a solid at room temperature?

Tick (✓) **one** box.

The intermolecular forces between the polymer molecules are relatively strong.

☐

The polymer molecules are held together by ionic bonds.

☐

Poly(ethene) contains delocalised electrons.

☐

Poly(ethene) molecules are very small.

☐

[1 mark]

0 1 . 4

What name is given to the small molecules that join together to make a polymer?

.....

.....

.....

[1 mark]

0 2

Polymers are made from many small molecules joined together.

0 2 . 1

What type of bond joins one repeating unit to the next in a polymer chain?

Tick (✓) **one** box.

Covalent

☐

Ionic

☐

Metallic

☐

Weak intermolecular forces only

☐

[1 mark]

0 3

Table 1 describes the structures of four substances, **P**, **Q**, **R** and **S**.

Table 1

Substance	Description of structure
P	long chains of thousands of carbon atoms joined by covalent bonds, with hydrogen atoms bonded to each carbon atom; there are no covalent bonds between the chains
Q	each carbon atom is covalently bonded to four other carbon atoms in a three-dimensional network
R	molecules made of two atoms joined by one covalent bond
S	long chains made of thousands of $\text{-CF}_2\text{-CF}_2\text{-}$ units joined by covalent bonds

0 3 . 1

Which **two** substances are polymers?

Tick (✓) **two** boxes.

P

☐

Q

☐

R

☐

S

☐

[2 marks]

0 3 . 2

Which substance has the highest melting point?

Explain your answer.

.....

.....

.....

.....

[2 marks]

0 3 . 3

Explain why substance **P** has a higher melting point than substance **R**.

.....

.....

.....

.....

[2 marks]

0 4

Propene, C_3H_6 , is a gas at room temperature. It can be made into poly(propene), which is a solid.

0 4 . 1

Explain why poly(propene) is a solid at room temperature, even though propene is a gas.

.....

.....

.....

.....

.....

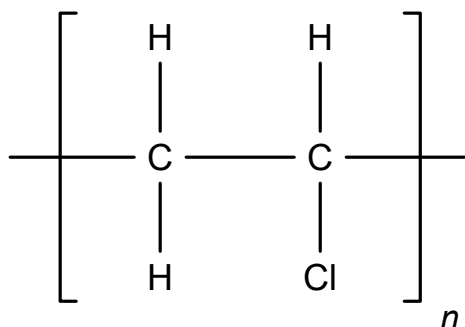
.....

[3 marks]

0 5

Figure 1 shows the repeating unit of the polymer poly(chloroethene), PVC.

Figure 1



0 5 . 1

What does the letter n represent in Figure 1?

.....

.....

[1 mark]

0 5 . 2

Give the molecular formula of the repeating unit.

.....

.....

[1 mark]

0 5 . 3

The monomer, chloroethene, is a gas at room temperature. Poly(chloroethene) is a solid.

Explain why.

.....

.....

.....

.....

.....

.....

[3 marks]

0 6

A student says:

‘Poly(ethene) is a solid at room temperature because its covalent bonds are very strong.’

0 6 . 1 Evaluate the student’s statement.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Polymers · 21 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: very large

01.2 [1 mark]

Correct: Covalent

01.3 [1 mark]

Correct: The intermolecular forces between the polymer molecules are relatively strong.

01.4 [1 mark]

Answer: monomers

- monomers (1)
-
-

Question 2 (1 mark)

02.1 [1 mark]

Correct: Covalent

Question 3 (6 marks)

03.1 [2 marks]

Correct: P; S

03.2 [2 marks]

Answer: Q: all the atoms are joined by strong covalent bonds, which must be broken for it to melt.

- Q (1)
 - (giant covalent:) many strong covalent bonds must be broken to melt it (1)
-

03.3 [2 marks]

Answer: Both consist of molecules, but the molecules of P are very long chains, so the intermolecular forces between them are much stronger than those between the small molecules of R, and more energy is needed to overcome them.

- P has much larger molecules than R / P is a polymer but R consists of small molecules (1)
- so the intermolecular forces in P are stronger and need more energy to overcome (1)

Notes: Do not accept references to breaking covalent bonds.

Question 4 (3 marks)

04.1 [3 marks]

Answer: Poly(propene) molecules are very much larger than propene molecules, so the intermolecular forces between them are much stronger and need more energy to overcome.

- poly(propene) molecules are (very much) larger than propene molecules (1)
 - so the intermolecular forces between poly(propene) molecules are stronger (1)
 - more energy is needed to overcome these forces, so poly(propene) has a higher melting point and is a solid at room temperature (1)
-

Question 5 (5 marks)

05.1 [1 mark]

Answer: A large number (the number of repeating units in the chain).

- a large number (of repeating units) (1)

05.2 [1 mark]

Answer: C₂H₃Cl

- C₂H₃Cl (1)

Notes: Atoms may be in any order.

05.3 [3 marks]

Answer: Polymer molecules are much larger, so the intermolecular forces between them are much stronger and more energy is needed to overcome them.

- polymer molecules are (much) larger than monomer molecules (1)
- so the intermolecular forces (between polymer molecules) are stronger (1)
- so more energy is needed to overcome the intermolecular forces (1)

Notes: Do not accept references to breaking covalent bonds.

Question 6 (2 marks)

06.1 [2 marks]

Answer: The covalent bonds in the chains are strong, but they are not broken when poly(ethene) melts. Poly(ethene) is a solid because its molecules are very large, so the intermolecular forces between them are relatively strong.

- the covalent bonds within the chains are strong, but they are not broken when poly(ethene) melts / softens (1)
- it is a solid because the intermolecular forces between the (very large) polymer molecules are relatively strong (1)