

POLYMERS 1

Q1. Thermosoftening polymers can be used to make plastic bottles and food packaging.

Thermosoftening polymers would not be suitable for packaging very hot food.

Explain why in terms of their properties and structure.

(2 marks)

Q2. Polymers are produced from crude oil.

Describe the structure and bonding in a thermosoftening polymer.

(4 marks)

Q3. Poly(ethene) is a thermosoftening polymer.

Poly(ethene) can be made with different properties. The properties depend on the conditions used when poly(ethene) is made.

Suggest two conditions which could be changed when poly(ethene) is made.

(2 marks)

Q4. Chloroethene can react to make a thermosoftening polymer.

(i) Draw a ring around the correct answer to complete the sentence.

When heated, a thermosoftening polymer will

dissolve.

melt.

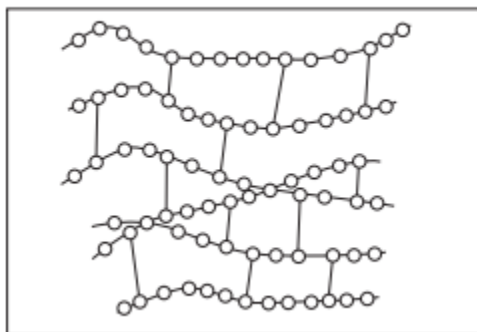
solidify.

(1 mark)

(ii) Polymer B is a different type of polymer.

The diagram shows the structure of polymer B.

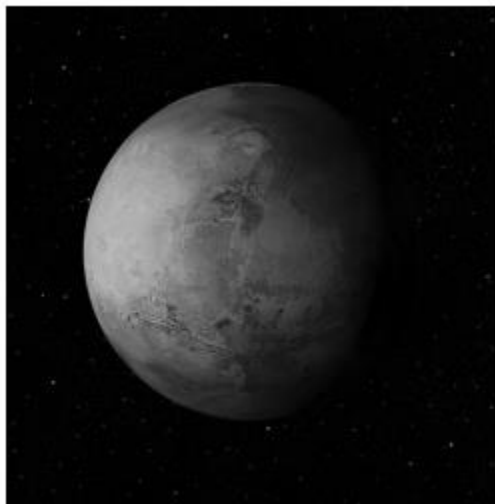
Polymer B



How can you tell from the diagram that polymer B is not thermosoftening?

(1 mark)

Q5. This question is about the planet Mars.



(a) Mars is a red colour in the sky at night.

The red colour of Mars is because of iron oxide.

Iron oxide is an ionic compound.

Draw a ring around the correct answer to complete the sentence.

Ionic compounds are made of

giant lattices.

polymer chains.

simple molecules.

(1 mark)

(b) Many spacecraft have been sent to Mars. Parts of these spacecraft are made from polymers.

Polymers that behave like shape memory alloys are used in spacecraft.

The shape memory polymers are cooled and compressed. These polymers are stored on the spacecraft until needed.

Suggest how the polymers could be made to return to their original shape.

(1 mark)

Q6. This drinks bottle is made of thermosoftening plastic.



Drinks bottles of this type can be recycled.

Describe and explain how these used plastic bottles can be changed into new plastic objects.

(4 marks)

Q7. Banks keep coins in poly(ethene) bags. These bags are made from low density poly(ethene).

High density poly(ethene) can also be made from the same monomer.

How can the same reaction produce two different products?

(1 mark)

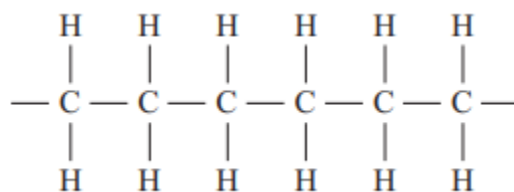
Q8.

(i) Alkanes, such as butane (C₄H₁₀), do not form polymers.

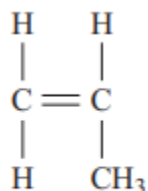
Alkenes, such as ethene (C₂H₄), do form polymers. Explain these statements.

(2 marks)

(ii) Ethene molecules form the polymer poly(ethene). One molecule in poly(ethene) will contain thousands of carbon atoms. The diagram represents part of a poly(ethene) molecule.



Propene molecules form the polymer poly(propene).



Propene molecule

Draw a diagram to represent part of a poly(propene) molecule.

(2 marks)

Q9. PEX is a material that is used as an alternative to copper for hot water pipes.

PEX is made from poly(ethene).

(i) Describe how ethene forms poly(ethene).

(2 marks)

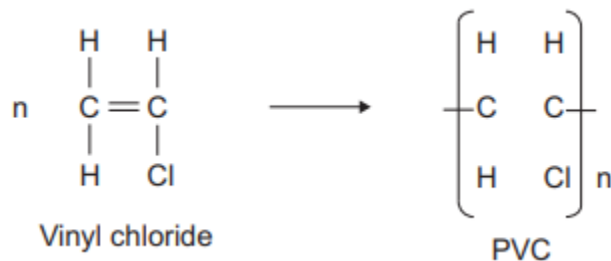
(ii) PEX is a shape memory polymer. What property does a shape memory polymer have?

(1 mark)

Q10. The raw materials used to make the polymer polyvinyl chloride (PVC) are crude oil and sea salt (sodium chloride).

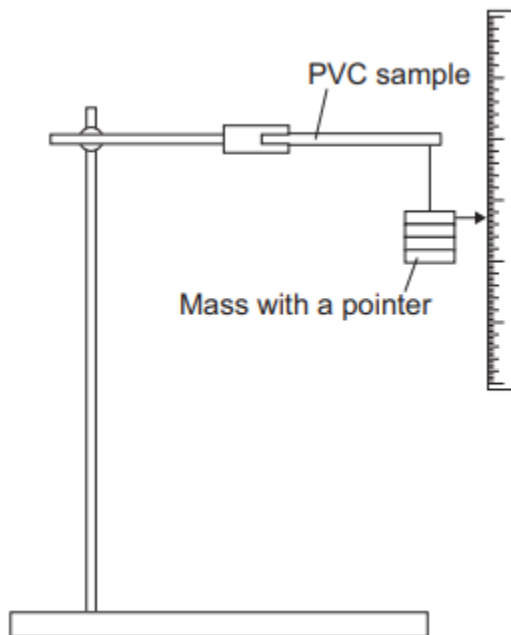
Polymerisation of vinyl chloride produces polyvinyl chloride (PVC).

(a) Complete the chemical equation by drawing in the missing bonds of the product, PVC.



(1 mark)

(b) Unplasticised polyvinyl chloride (uPVC) is used to make door and window frames. PVC with a plasticiser added is used to make cling film for wrapping food. A plasticiser is a chemical compound. A student investigated how the percentage of plasticiser added to PVC affected its flexibility. The student measured the bending of PVC samples when a mass was added.



The student's results are shown in the table.

Sample of PVC	Percentage (%) of plasticiser added	Bending of PVC sample in mm				
		Test 1	Test 2	Test 3	Test 4	Mean
A	0	2	3	3	4	3
B	5	22	15	23	24	
C	10	27	27	29	29	28
D	15	34	35	35	36	35

(i) Each PVC sample should be the same size to make it a fair test. Explain why.

(1 mark)

(ii) The student repeated the test four times for each sample. Explain why.

(1 mark)

(iii) Calculate the mean value for sample B.

(2 marks)

(iv) Each of the samples bent the most in test 4. Suggest a possible reason for this.

(1 mark)

(c) Suggest why unplasticised polyvinyl chloride (uPVC) is used to make door and window frames.

(1 mark)

Total marks (31)