POLYMERS 2

Q1. Explain how propene molecules form a polymer. You should name the polymer formed.

_____

_____

_____

_____

_____

_____

(3 marks)

Q2. The following table lists some properties of four different polymers, A, B, C and D.

Polymer	Maximum working temperature in °C	Appearance	Flexibility	Breaking strength
A	250	Grey	Medium	High
B	80	White	High	High
C	70	Transparent	Low	High
D	110	Transparent	High	Low

Match polymers, A, B, C and D, with the numbers 1– 4 in the table below.

	Most suitable polymer for
1	non-stick coating for cooking pans
2	spectacle lenses
3	cling film (for covering food)
4	toothbrush bristles

(4 marks)

Q3. Poly(ethene) is a polymer that is made from an alkene. The polymer is . . .

1 produced by thermal decomposition.

2 a thermosoftening polymer.

3 produced by cracking.

4 biodegradable.

(1 mark)

Q4. Four hydrocarbons, K, L, M and N, were each analysed to measure their carbon and hydrogen content.

The results are shown in the table.

	Hydrocarbon			
	K	**L**	**M**	**N**
Number of hydrogen atoms in each molecule	8	20	8	12
Number of carbon atoms in each molecule	4	10	16	5

(a) Hydrocarbon N cannot be used to make a polymer because its molecules . . .

1 are too short.

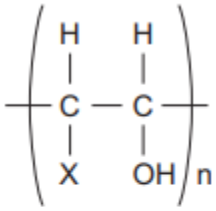
2 have an odd number of carbon atoms.

3 have fewer carbon atoms than hydrogen atoms.

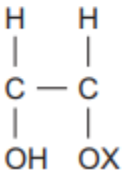
4 do not have a carbon-carbon double bond.

(1 mark)

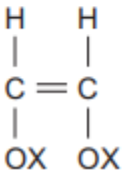
(b)

The polymer with the formula  where 'n' is a large number, could be made from the monomer . . .

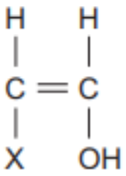
1



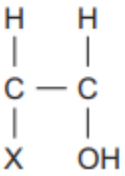
2



3

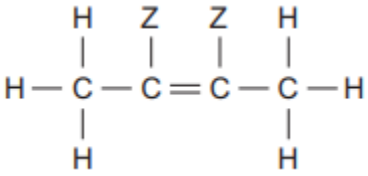


4



(1 mark)

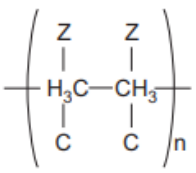
(c)

The monomer  is made into a polymer.

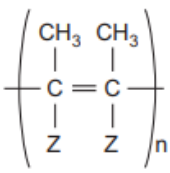
In the formulae below, 'n' is a large number.

The polymer may be represented as . . .

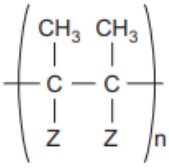
1



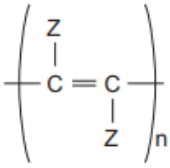
2



3

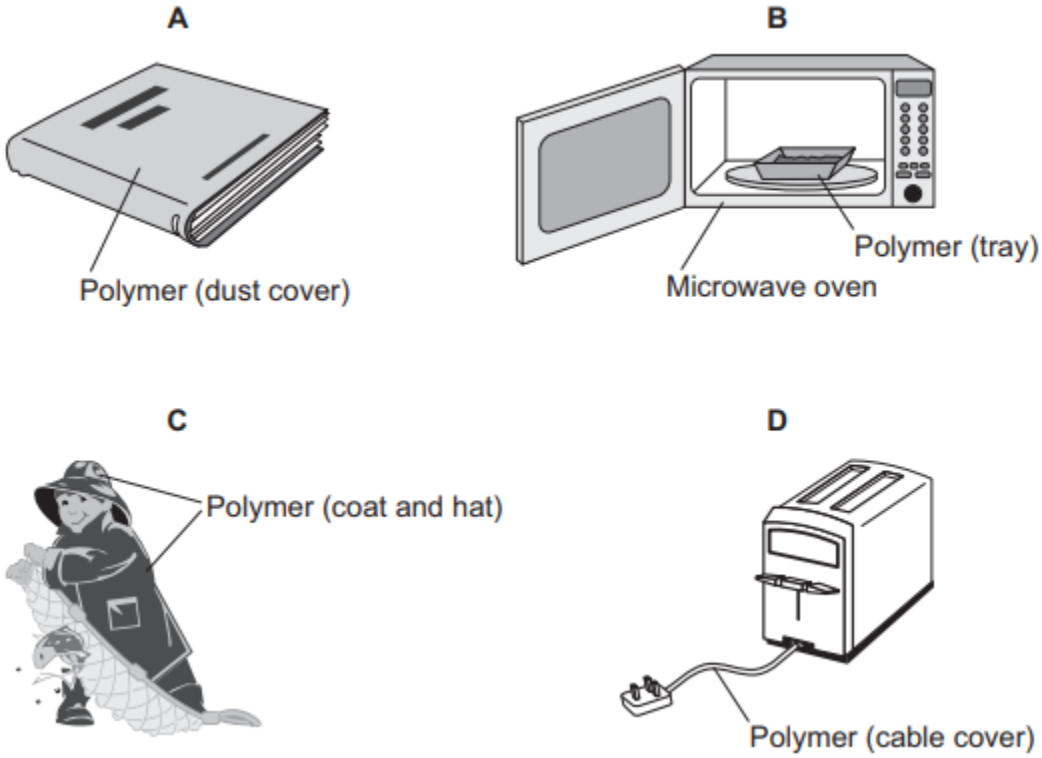


4



(1 mark)

Q5. The drawings show four different ways in which polymers are used.



For each of the uses shown, the polymer must have particular properties.

The table shows the properties of four different polymers.

Match diagrams, A, B, C and D, with the numbers 1–4 in the table.

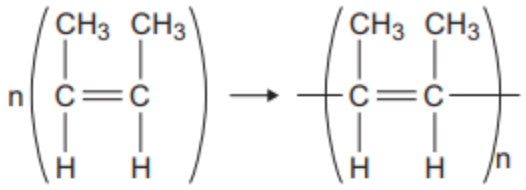
	Properties of the polymer
1	flexible, and must be a good electrical insulator
2	heat resistant and resistant to chemical attack
3	transparent, hard wearing and flexible
4	waterproof, breathable, flexible and can be coloured

(4 marks)

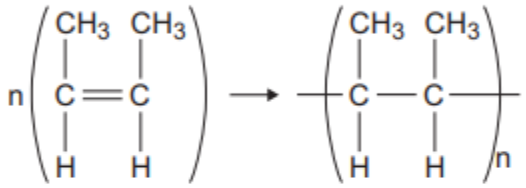
Q6.

(a) Which of the following equations represents the polymerisation of butene?

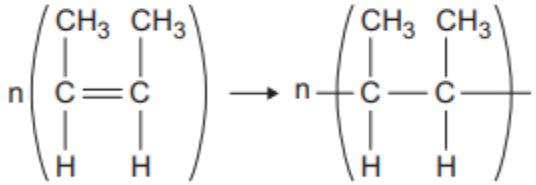
1



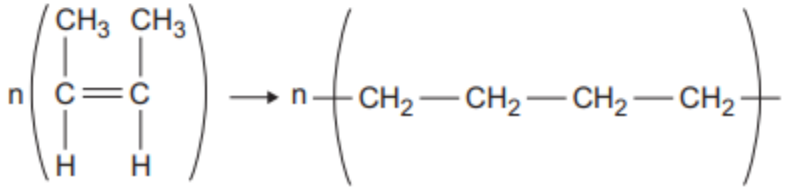
2



3

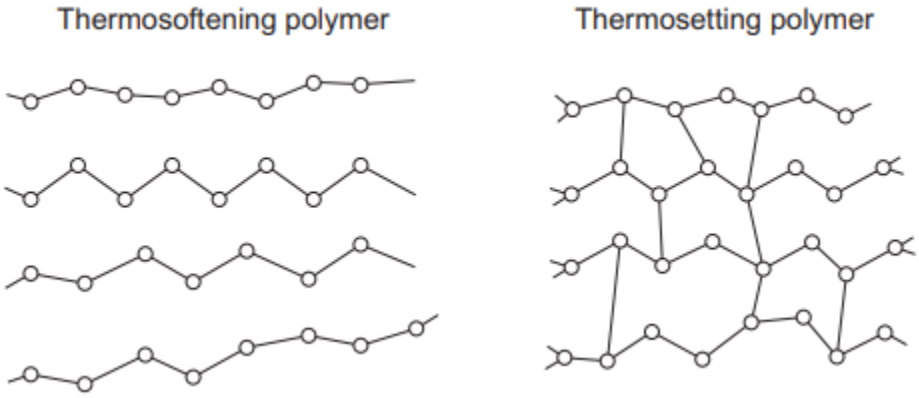


4



(1 mark)

(b) The diagram shows the structures of a thermosoftening polymer and a thermosetting polymer.



Which row in the table describes the properties of the two types of polymer?

	Thermosoftening polymer		Thermosetting polymer	
	Property 1	**Property 2**	**Property 1**	**Property 2**
1	Polymer molecules able to slide	Chemical bonds between the chains	Melt on heating	Short chain lengths
2	Long chain lengths	No chemical bonds between the chains	Chemical bonds between the chains	Polymer molecules able to slide
3	Long chain lengths	No chemical bonds between the chains	Do not melt on heating	Chemical bonds between the chains
4	Chemical bonds between the chains	Melt on heating	No chemical bonds between the chains	Long chain lengths

(1 mark)

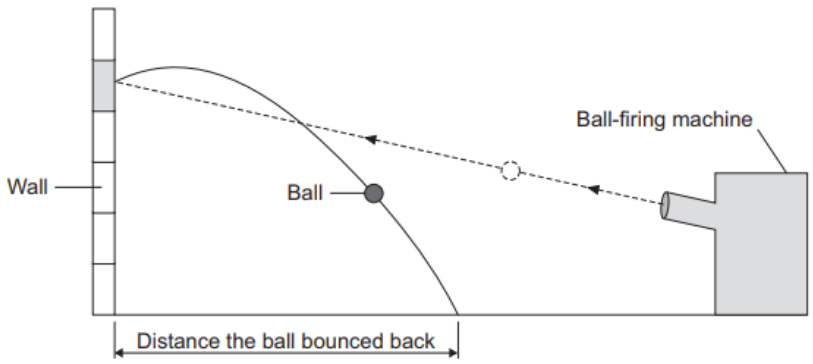
Q7. A student compared two balls to find out how well they bounced back from a wall. He used a machine to fire the balls at the wall. The machine was at a fixed distance from the wall.

One ball was made from rubber and the other from a polymer.

The student:

- set the machine to fire the ball at a speed of 2 metres per second
- fired the rubber ball from the machine to a point on a wall
- measured the distance that the ball bounced back from the wall
- repeated the experiment, but made the machine fire the ball at different speeds.

The student repeated the whole experiment using the polymer ball.



The results are shown in the table.

Speed of ball in metres per second	Distance the ball bounced back from the wall in metres	
	Rubber ball	Polymer ball
2	2.1	4.0
4	4.2	8.1
6	7.5	12.1
8	12.8	17.3
10	18.7	20.0

(a) The results show that for each speed . . .

1 the rubber ball bounced back higher than the polymer ball.

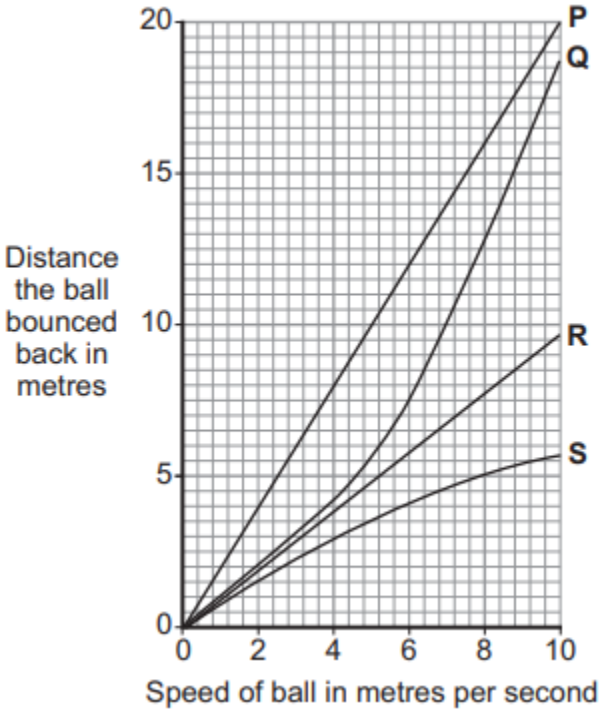
2 the polymer ball bounced back further than the rubber ball.

3 the rubber ball and the polymer ball bounced back an equal distance.

4 the rubber ball bounced back further than the polymer ball.

(1 mark)

(b) Which of the lines, P, Q, R or S, on the graph, represents the results for the rubber ball?



1 P

2 Q

3 R

4 S

(1 mark)

(c) To improve the reliability of the results, the student could repeat the experiment . . .

1 using balls of several different sizes.

2 several times for each speed.

3 using balls made from different polymers.

4 firing the balls at different points on the wall.

(1 mark)

(d) The student could get more precise measurements if he . . .

1 fired the balls at a higher speed.

2 repeated the experiments and calculated the mean.

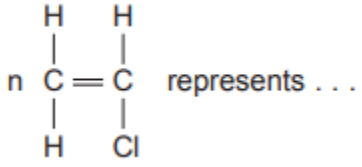
3 measured the distances in centimetres.

4 fired the balls at a point higher on the wall.

(1 mark)

Q8. The equation shows how poly(chloroethene) is made.

(a)



represents . . .

1 one molecule of chloroethane.

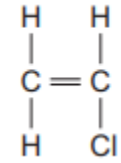
2 one molecule of chloroethene.

3 many molecules of chloroethane.

4 many molecules of chloroethene

(1 mark)

(b)

The compound  belongs to a series of chemicals.

The general formula for this series of chemicals is . . .

1 C_nH_nCl

2 $C_nH_{2n-1}Cl$

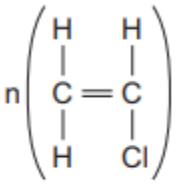
3 $C_nH_{n-1}Cl$

4 $C_nH_{2n}Cl$

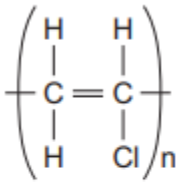
(1 mark)

(c) The formula for poly(chloroethene) is . . .

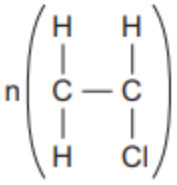
1



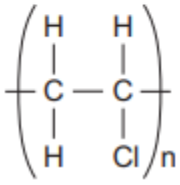
2



3



4



(1 mark)

(d) The word thermosoftening is used to describe how poly(chloroethene) behaves when heated. This means that poly(chloroethene) must therefore . . .

1 not be used for packaging in warm countries because it will become brittle.

2 only contain short chain molecules that move around easily on heating.

3 have chemical bonds between the chains, which strengthen on heating.

4 be capable of being shaped on heating.

(1 mark)