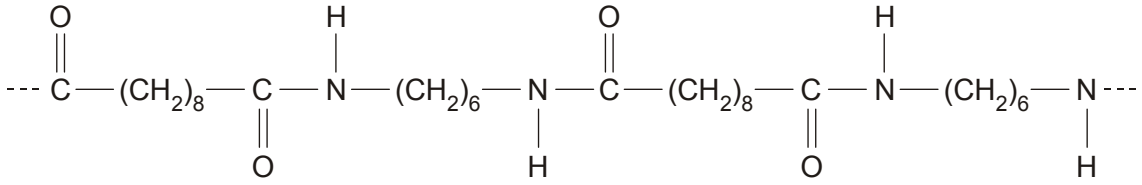
1. Synthetic polyamides, such as nylon, contain the same link as polypeptides. Nylon is the general name for a family of polyamides.

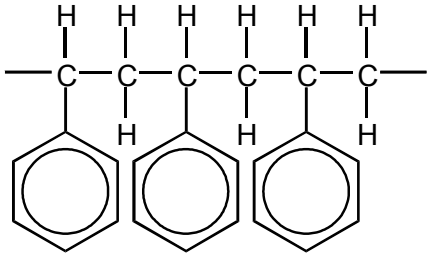
A short section of a nylon polymer is shown below.



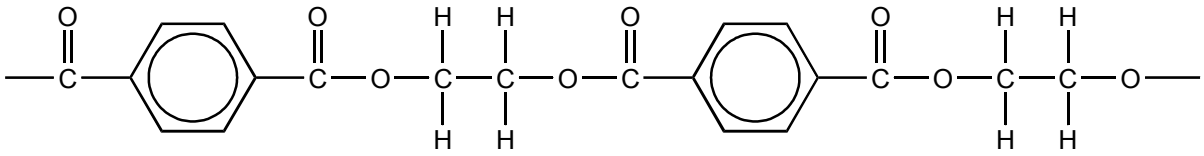
Draw the structures of **two** monomers that could be used to make this nylon.

[Total 2 marks]

2. Short sections of the molecular structures of two polymers are shown below.



polymer C



polymer D

(a) (i) Circle, on the diagrams above, the simplest repeat unit in each polymer.

[2]

(ii) In the boxes below, draw the displayed formulae of the two monomers that could be used to prepare polymer **D**.

[2]

(b) Chemists have developed degradable polymers to reduce the quantity of plastic waste being disposed of in landfill sites. Polymer **D** is more likely to be a 'degradable polymer' than polymer **C**.

Suggest **two** reasons why.

.....

.....

.....

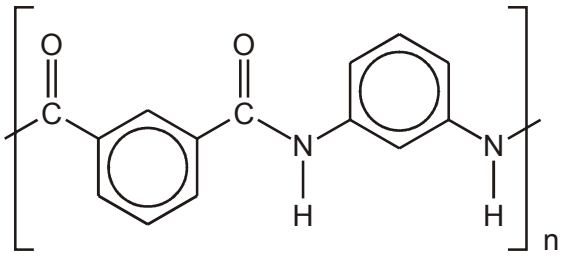
.....

[2]

[Total 6 marks]

3. Nylon is sometimes used for electrical insulation. However, if there is a risk of high temperatures then a polymer such as Nomex®, with a higher melting point, is used.

The repeat unit of Nomex® is shown below.



(i) Draw the structures of two monomers that could be used to form Nomex®.

[2]

(ii) Suggest a reason why the melting point of Nomex® is higher than that of nylon.

.....

.....

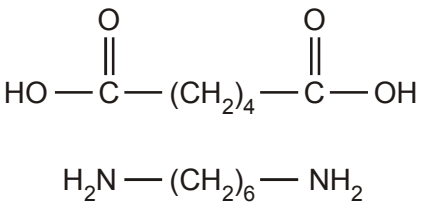
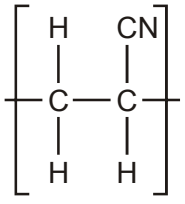
.....

[1]

[Total 3 marks]

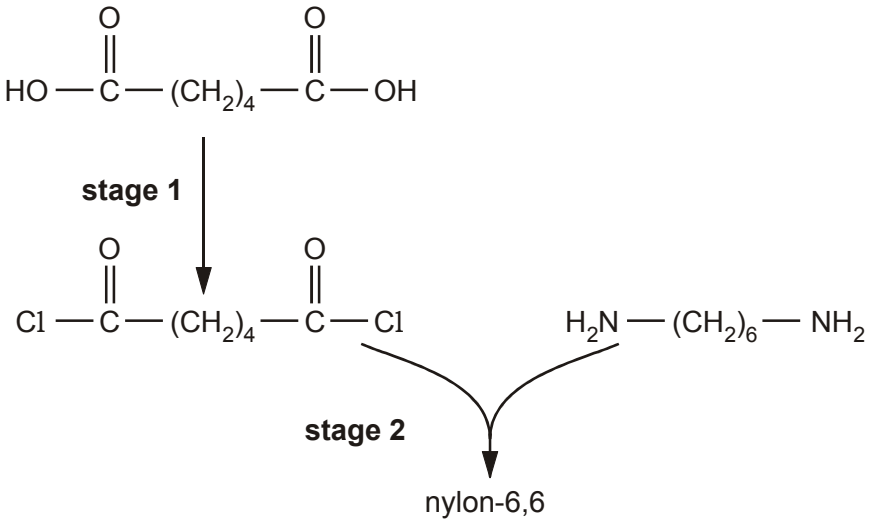
4. The fibres used in carpets are made from synthetic or natural polymers such as nylon-6,6, *Orlon*™ and wool.

(a) Complete the table below.

	nylo-6,6	**Orlon™**
monomer(s)		
repeat unit of the polymer		
type of polymerisation		

[4]

(b) Nylon-6,6 can be made from its monomers in the laboratory in two stages as shown below.



(i) State a suitable reagent to carry out **stage 1**.

.....

[1]

(ii) Deduce the inorganic product that is also formed in **stage 2**.

.....

[1]

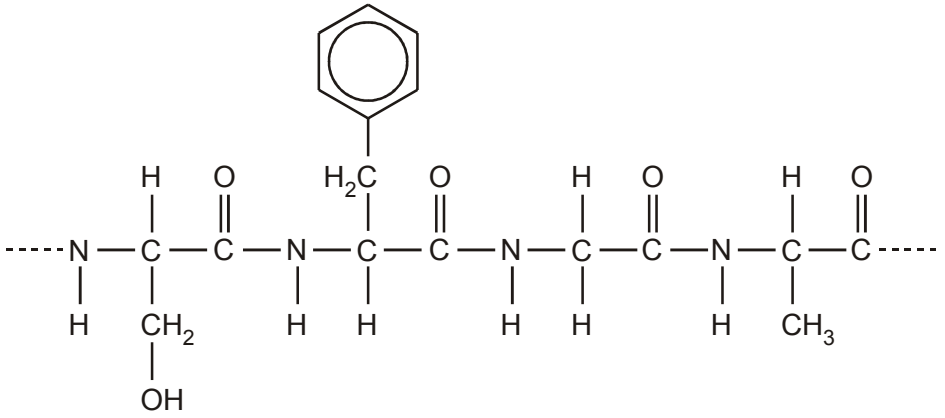
(c) Industrially, nylon-6,6 is **not** manufactured by the method in (b). Instead, the two monomers are mixed directly at room temperature to give a salt. This salt is then heated to convert it to nylon-6.6.

Suggest the structures of the two ions present in this salt.

[2]

(d) Wool is a protein. It is a natural polymer made by the same type of polymerisation as nylon-6,6.

A section of the polymer chain in a protein is shown below.



(i) How many monomer units does this section contain?

.....

[1]

(ii) Draw the structure of **one** of the monomer molecules that was used to form this section.

[1]

(iii) State **three** ways in which the monomer units of a protein differ from those of nylon-6,6.

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.....

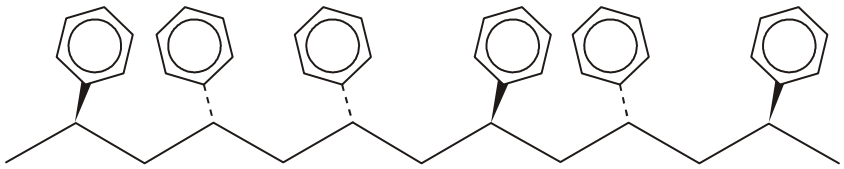
.....

[3]

[Total 13 marks]

5. Poly(phenylethene) is one of the most versatile and successful polymers.

The 3-D skeletal formula of a section of atactic poly(phenylethene) is shown in the diagram below.



(i) State the type of polymerisation used to make poly(phenylethene).

.....

[1]

(ii) Draw a skeletal or displayed formula to show the monomer used to make poly(phenylethene).

[1]

(iii) Outline how the polymer is formed from the monomer molecules. (You do **not** need to give any details of the catalyst or conditions involved.)

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[2]

[Total 4 marks]