

AQA Chemistry A-level

Topic 3.12 - Polymers

Flashcards



What is condensation?



What is condensation?

Small molecule eliminated (usually H_2O) to form a larger molecule



How many monomers are
condensation polymers
usually formed from?



How many monomers are condensation polymers usually formed from?

two



What properties do these
monomers forming
condensation polymers
have?



What properties do these monomers forming condensation polymers have?

Each has two functional groups



Examples of condensation polymers?



Examples of condensation polymers?

Polyesters

Polyamides

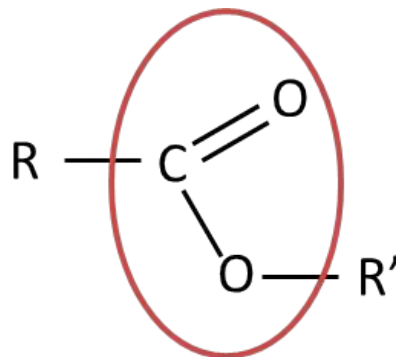
Polypeptides



What is the linkage in a polyester?



What is the linkage in a polyester?



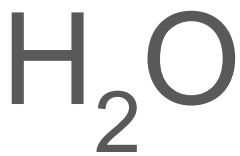
The ester linkage



What molecule is eliminated
in formation of a polyester?



What molecule is eliminated in formation of a polyester?



What are the two monomers
which form a polyester
(generic names and
structures)?



What are the two monomers which form a polyester (generic names and structures)?

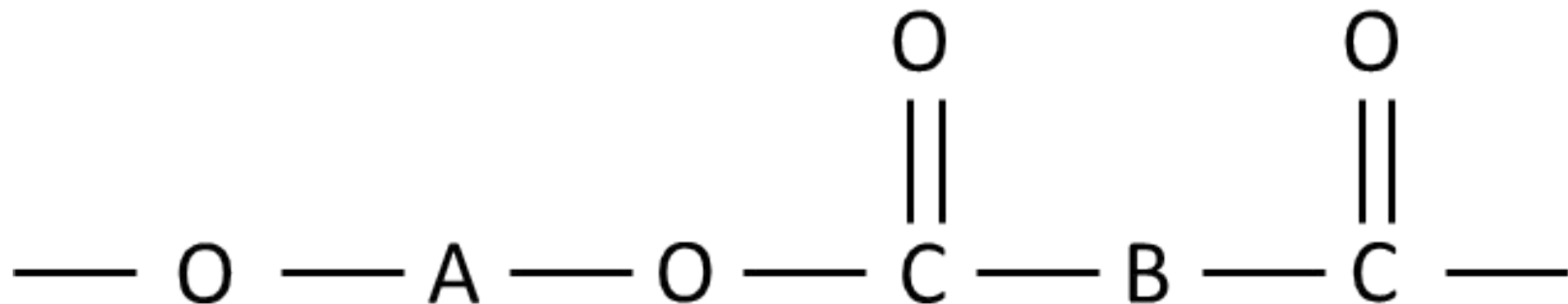
Diol and dicarboxylic acid or a molecule with both alcohol and a carboxylic acid functional groups



Draw a generic repeating unit for a polyester



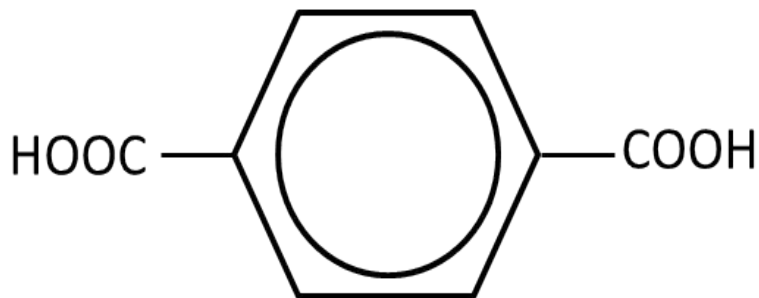
Draw a generic repeating unit for a polyester



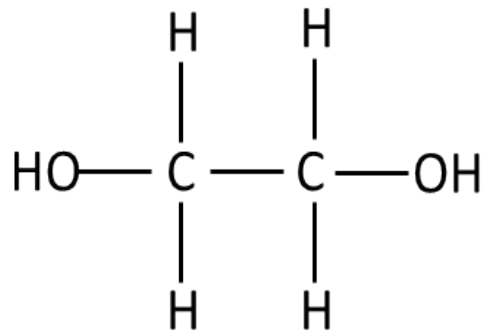
Which monomers is Terylene made from?



Which monomers is Terylene made from?



Benzene-1,4-dicarboxylic acid



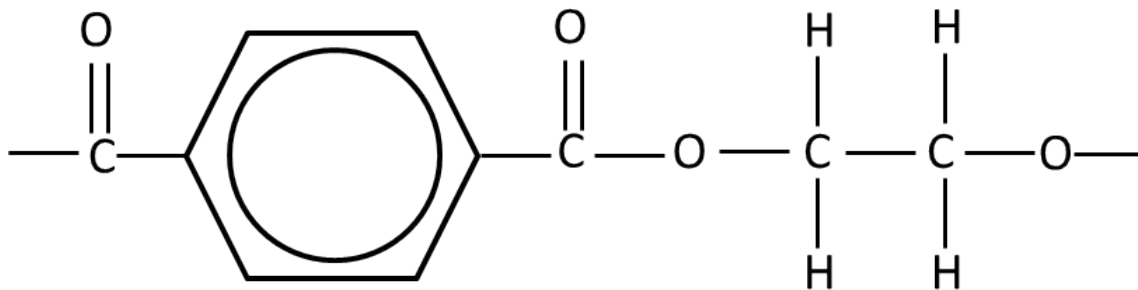
Ethane-1,2-diol



Draw the repeating unit of Terylene



Draw the repeating unit of Terylene



What is Terylene used for?



What is Terylene used for?

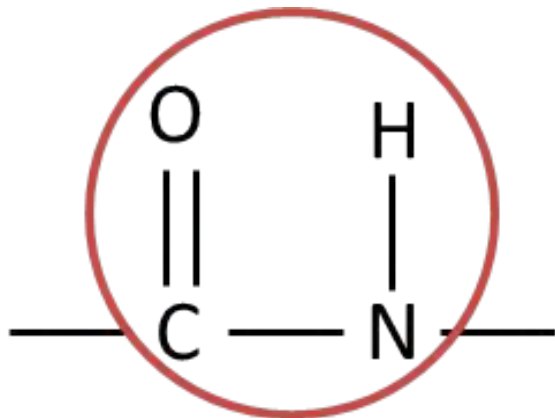
As a fibre for making clothes



What is the linkage in a polyamide?



What is the linkage in a polyamide?



The peptide linkage



Which molecule is
eliminated when a
polyamide is formed?



Which molecule is eliminated when a polyamide is formed?



What are the two monomers
used to form a polyamide
(generic names and
structures)?



What are the two monomers used to form a polyamide (generic names and structures)?

Diamine and dicarboxylic acid



Examples of polyamides?



Examples of polyamides?

Nylon, Kevlar



Which monomers is
Nylon-6,6 made from?



Which monomers is Nylon-6,6 made from?

1,6-diaminohexane

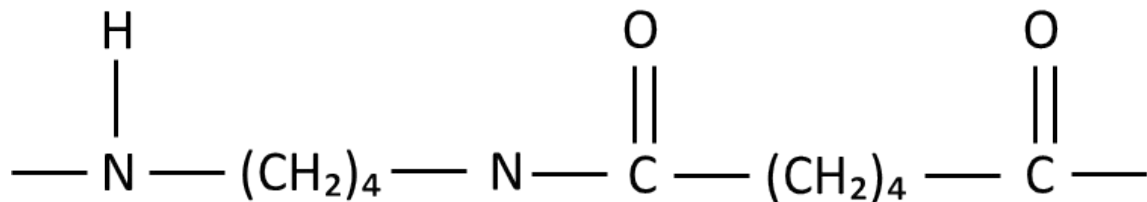
Hexanedioic acid



Draw the repeating unit of
Nylon-6,6.



Draw the repeating unit of Nylon-6,6.



If you are making Nylon in the lab, what monomers would you use and why? What molecule is eliminated?



If you are making Nylon in the lab, what monomers would you use and why? What molecule is eliminated?

Use hexane-1,6-diacyl chloride as the rate of reaction is much faster. HCl is eliminated



What is Kevlar used for?



What is Kevlar used for?

In body armour (bullet proof vests, stab vests), helmets (e.g. F1 drivers'), oven gloves

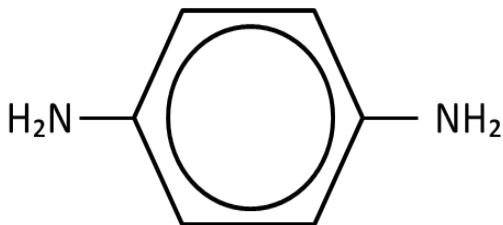


Which monomers is Kevlar made from?

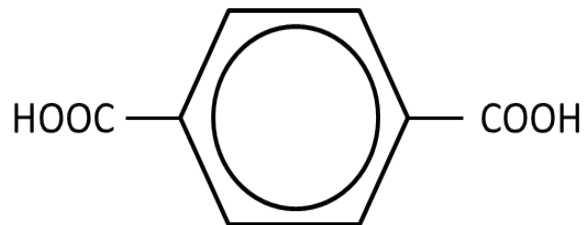


Which monomers is Kevlar made from?

1,4-diaminobenzene



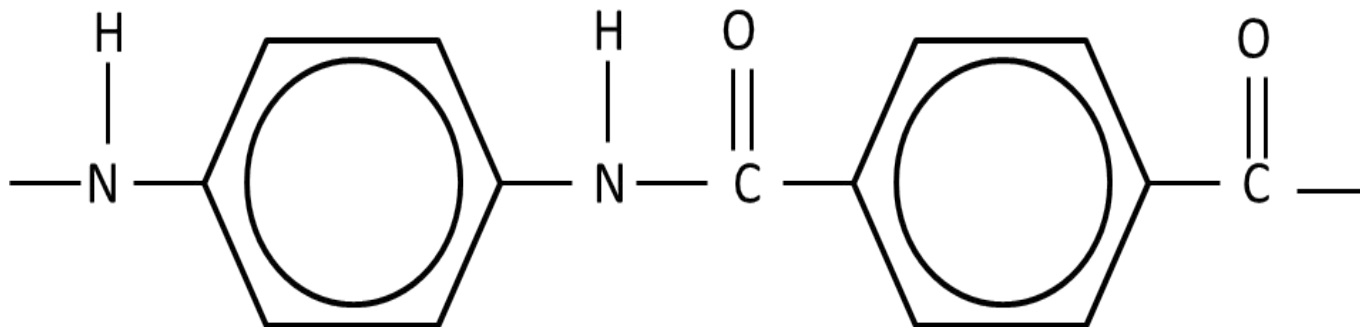
Benzene-1,4-dicarboxylic acid



What is the repeating unit of Kevlar?



What is the repeating unit of Kevlar?



Why is Kevlar so strong?



Why is Kevlar so strong?

Rigid chains and close packing of flat aromatic rings



What are polypeptides? What is the linkage?



What are polypeptides? What is the linkage?

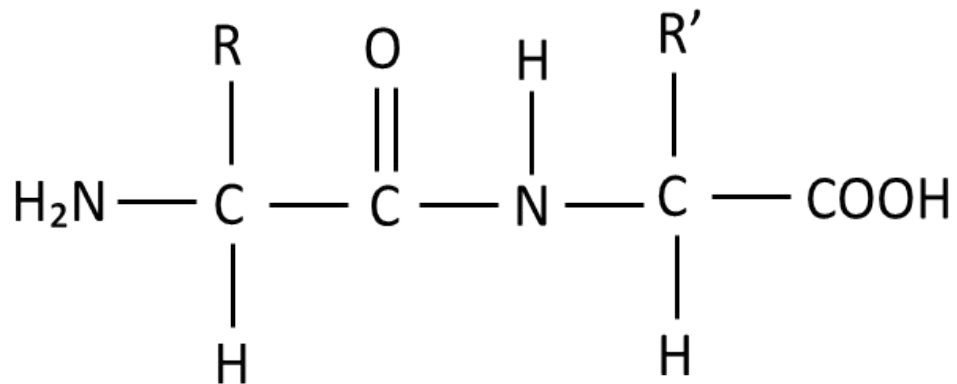
Same linkage as polyamides. But made from just one amino acid monomer



Draw a dipeptide.



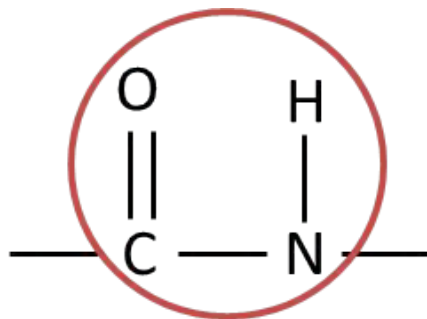
Draw a dipeptide.



Draw the repeating unit of a polypeptide.



Draw the repeating unit of a polypeptide.



The peptide linkage



Why are poly(alkenes) not biodegradable?



Why are poly(alkenes) not biodegradable?

Non-polar C-H and C-C bonds



Why is it bad to burn poly(alkenes)?



Why is it bad to burn poly(alkenes)?

Releases CO_2 , CO , C (soot) and other toxic chemicals from monomers



Where do most
poly(alkenes) end up?



Where do most poly(alkenes) end up?

Landfill sites



Why can condensation polymers be broken down?



Why can condensation polymers be broken down?

They have polar bonds



How are condensation polymers broken down?



How are condensation polymers broken down?

Hydrolysis (opposite of condensation)



Why does hydrolysis not happen in normal conditions?



Why does hydrolysis not happen in normal conditions?

Very slow rate in standard conditions



What are the four stages
needed when recycling
polymers?



What are the four stages needed when recycling polymers?

Collected → sorted → melted → reformed



Advantages of recycling polymers?



Advantages of recycling polymers?

Saves expense of crude oil and preserves a non-renewable resource

Reduces landfill



Disadvantages of recycling polymers?



Disadvantages of recycling polymers?

Energy and manpower is needed for collecting, sorting and melting the polymers, making it expensive.

Can only be done a limited number of times



What does “draw the polymer” mean?



What does “draw the polymer” mean?

Draw with square brackets, n , and trailing bonds



What does “draw the repeating unit” mean?



What does “draw the repeating unit” mean?

Just draw the molecule, with trailing bonds - no brackets or n



What is the difference
between addition and
condensation
polymerisation?



What is the difference between addition and condensation polymerisation?

Condensation makes the polymer and eliminates a small molecule; addition polymerisation breaks $C=C$ to form only one product (just the polymer).



Explain hydrogen bonding between polyamides.



Explain hydrogen bonding between polyamides.

Both C=O and N-H are polar bonds, as N's electronegativity > H's and O's electronegativity > C's.

Hydrogen bonding between H δ^+ and O δ^- in different molecules

Uses the lone pair of electrons on the O atom.



Why do polyesters not show hydrogen bonding?



Why do polyesters not show hydrogen bonding?

All O-H bonds are removed during polymerisation

