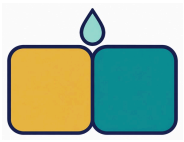
Polymers Map

AQA A-level Chemistry · 3.3.12 Polymers

1 Condensation 3.3.12.1

- Two reactive groups per monomer
- H_2O lost at each link
- Diamine + diacid: polyamide
- Diol + diacid: polyester



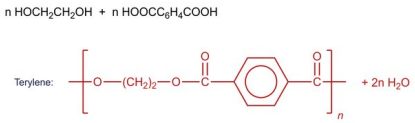
2 Polyamides 3.3.12.1

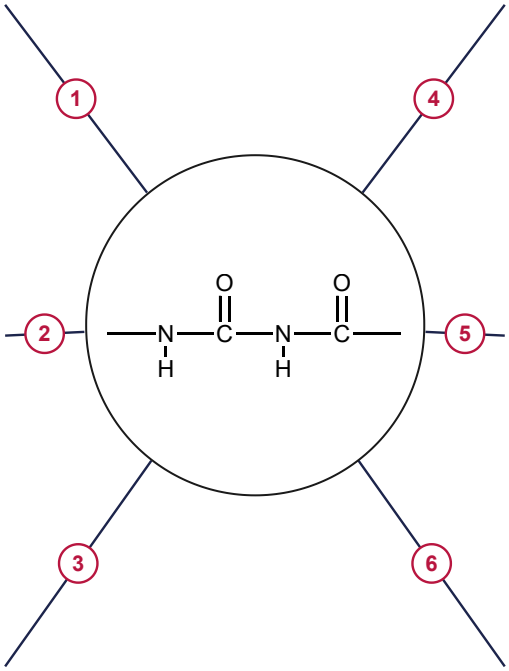
- Nylon 6,6 and Kevlar
- $–NH(CH_2)_6NHCO(CH_2)_4CO–$
- Going back: **break each C–N**
- Fibres, ropes, armour



3 Polyesters 3.3.12.1

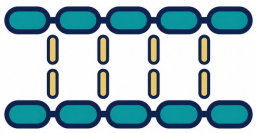
- Terylene
- $–OCH_2CH_2OCOC_6H_4CO–$
- Going back: **break each C–O**
- Fibres, drinks bottles





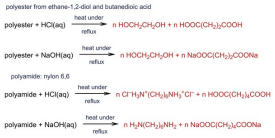
4 Forces 3.3.12.1

- Polyamides: **hydrogen bonds**
- N–H to O=C between chains
- Polyesters: dipole forces
- Kevlar: flat chains pack closely



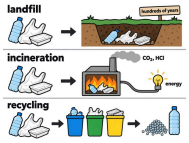
5 Hydrolysis 3.3.12.2

- Polar C=O: a δ+ carbon
- Acid: free COOH
- Alkali: COO^- salt
- Polyalkenes: no polar bonds



6 Disposal 3.3.12.2

- Landfill: cheap, uses land
- Burning: energy, toxic gases
- Recycling: saves oil, needs sorting
- Polyesters can biodegrade



Condensation polymers monomers, link and hydrolysis

Polymer	Monomers	Hot NaOH(aq) gives
Nylon 6,6	1,6-diaminohexane + hexanedioic acid	Diamine + carboxylate salt
Kevlar	Benzene-1,4-diamine + the diacid	Diamine + carboxylate salt
Terylene	Ethane-1,2-diol + the diacid	Diol + carboxylate salt
Poly(lactic acid)	$CH_3CH(OH)COOH$	Sodium lactate

Worked examples

Repeat unit Mr

- Diol 62, diacid 166
- 62 + 166 − 36
- **192**

Chain length

- Mr 96 000, unit 192
- 96 000 ÷ 192
- **500 units**

Monomers

- $–OCH_2CH_2OCO(CH_2)_4CO–$
- Break each C–O
- **Diol + diacid**

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