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POLYMERS

Some definitions

Polymer

long chain molecule made from lots of small molecules joined together

Monomer

small molecules that join together to make polymers

POLYMERS

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graph TD; A[POLYMERS] --> B[Addition polymers]; A --> C[Condensation polymers];
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**Addition
polymers**

**Condensation
polymers**

Some definitions

Addition Polymerisation

formation of long chain molecules from lots of small molecules joining together **with no other products**

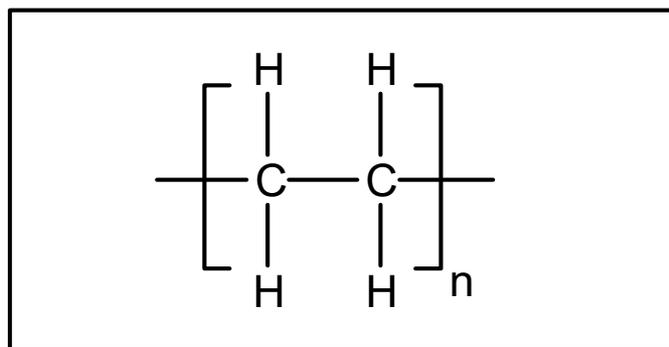
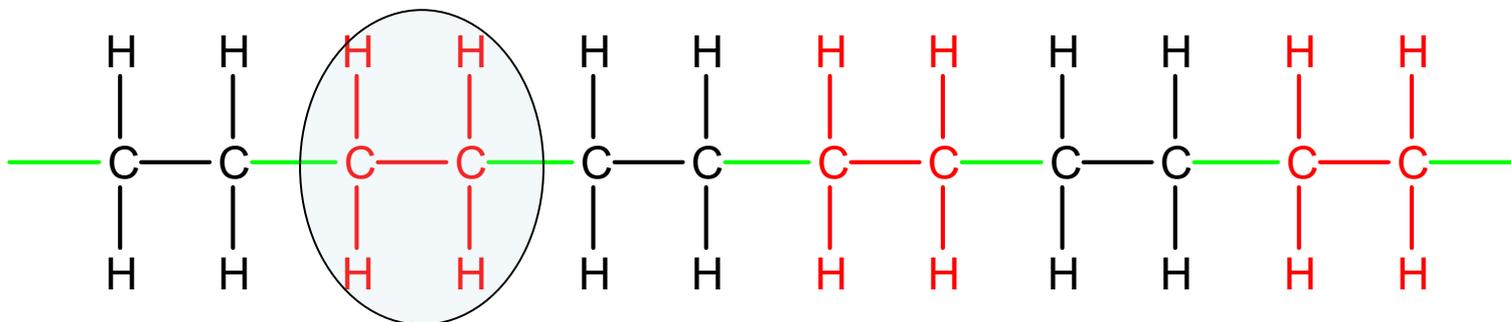
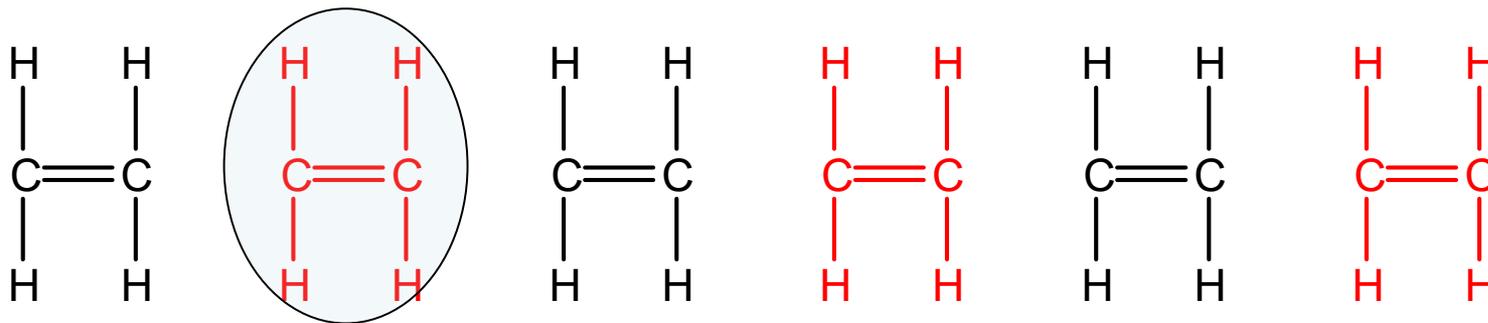
Condensation Polymerisation

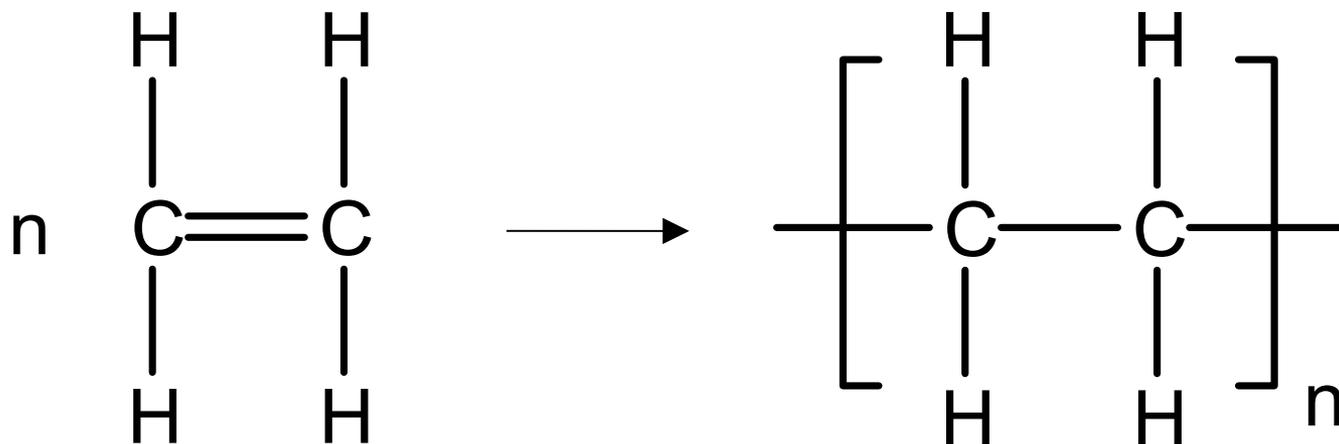
formation of long chain molecules from lots of small molecules joining together **with another small molecule (e.g. water) produced as well**



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ADDITION POLYMERS





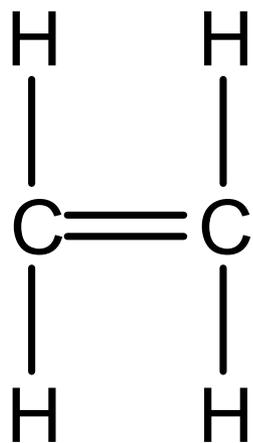
ethene

poly(ethene)

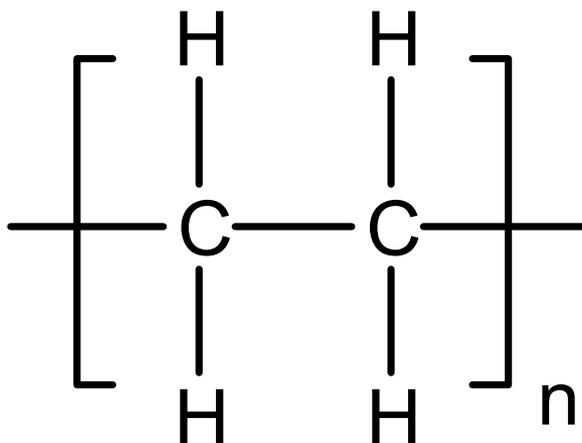
polythene

poly(ethene)

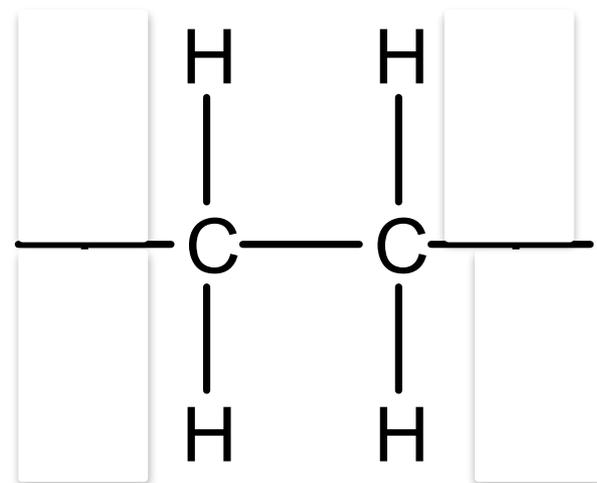
polythene



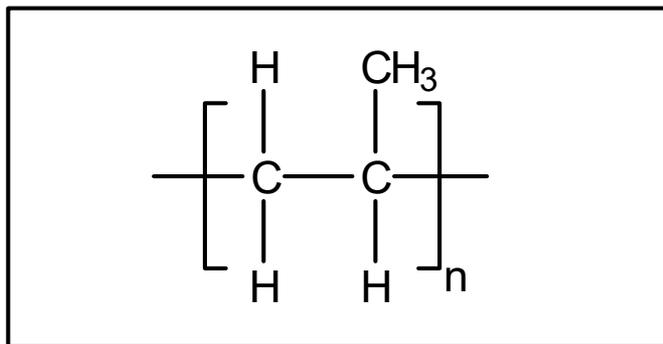
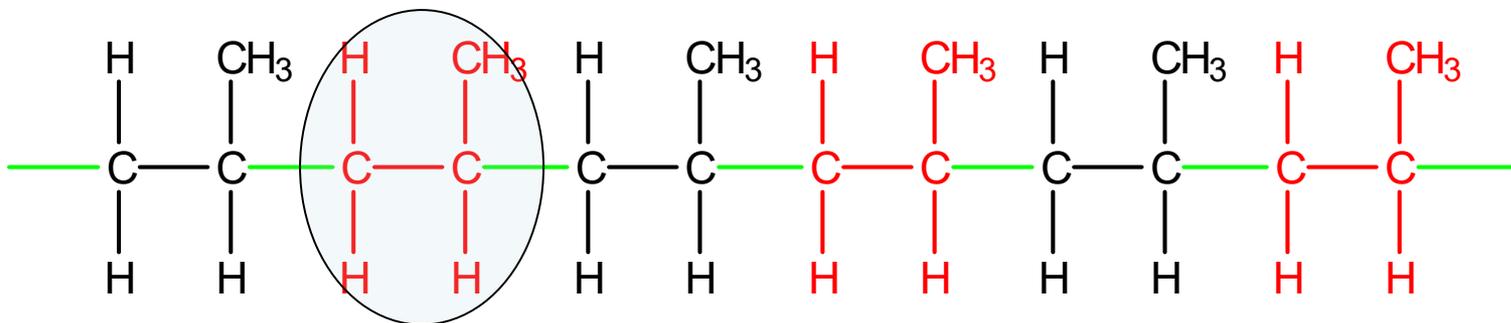
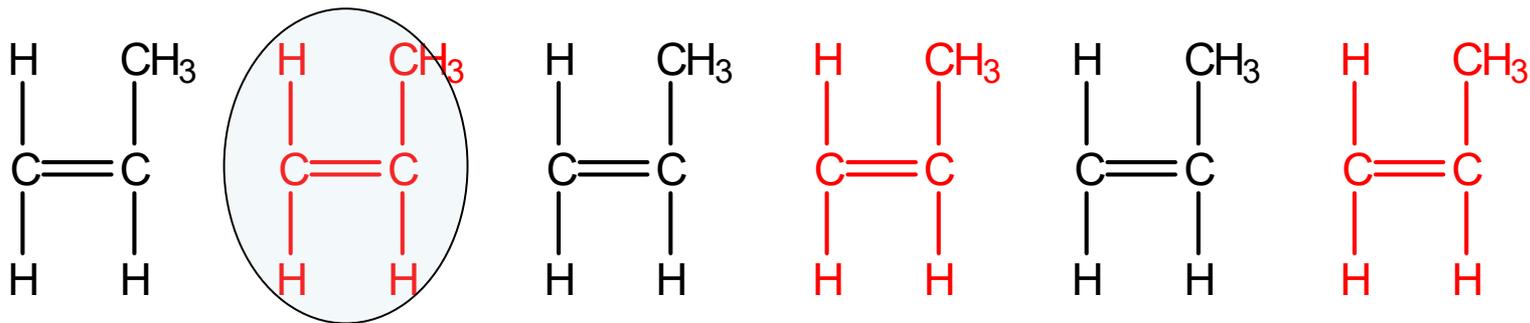
monomer
structure

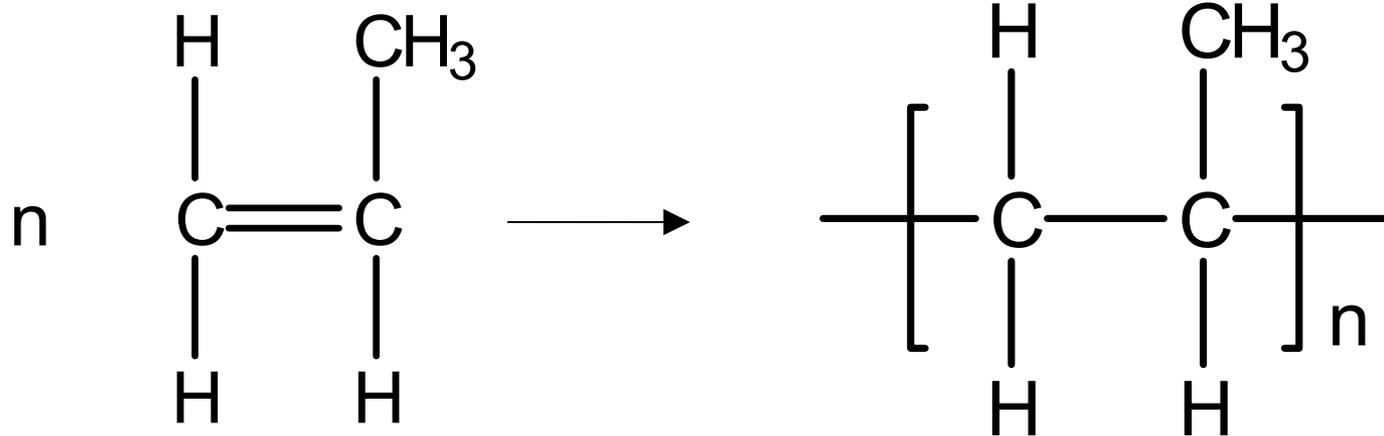


polymer
structure



repeating
unit





propene

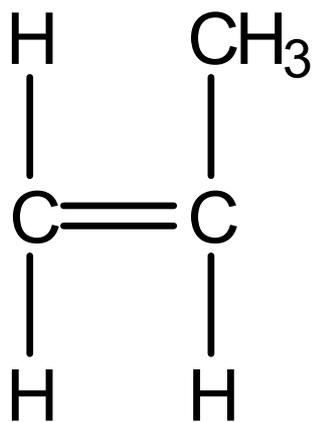
poly(propene)



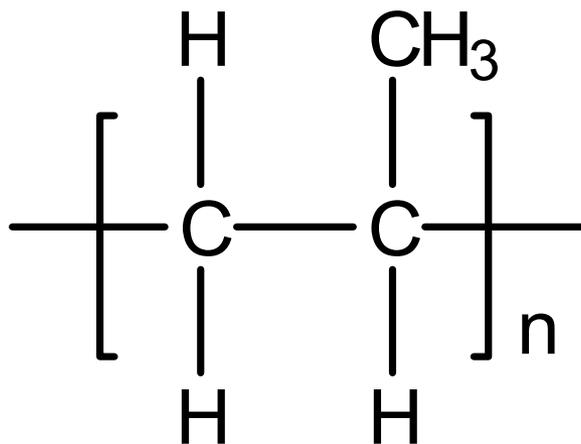
Polypropene



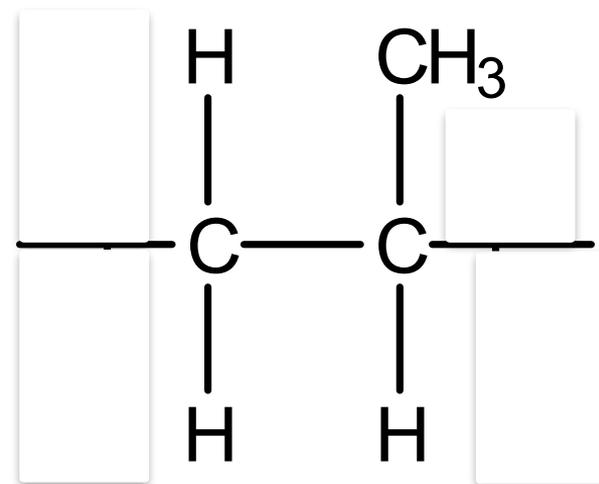
Poly(propene)



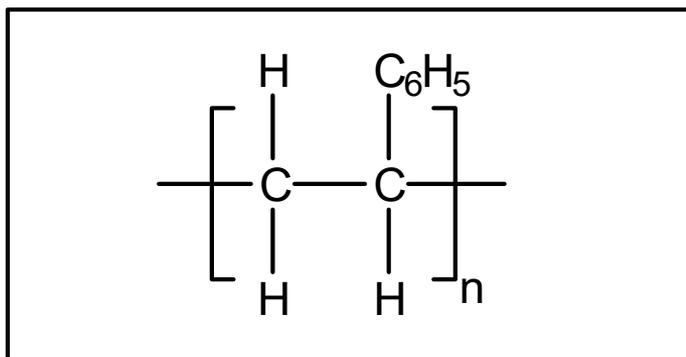
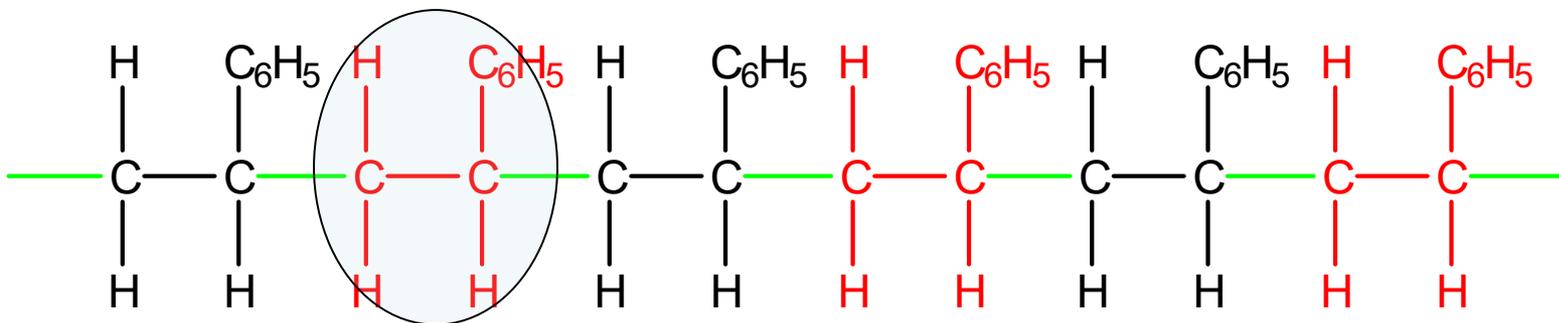
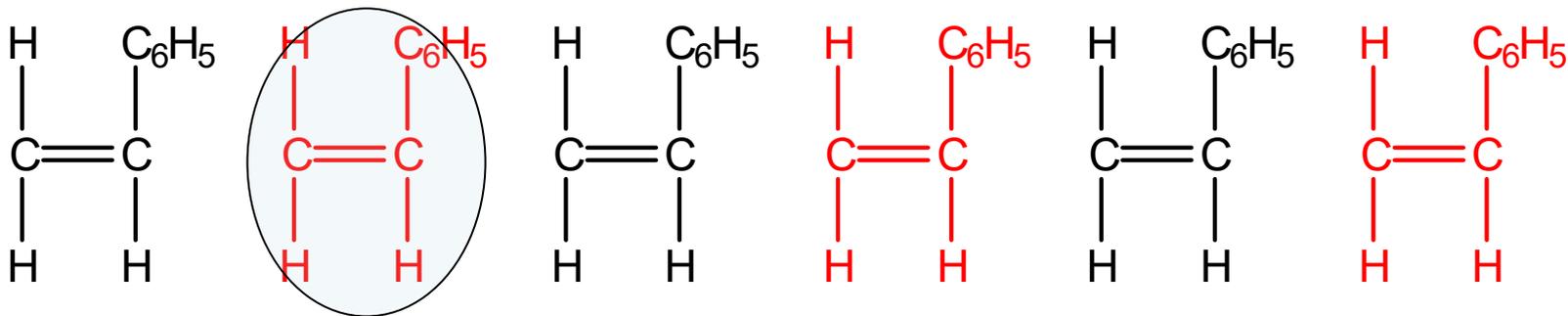
monomer
structure

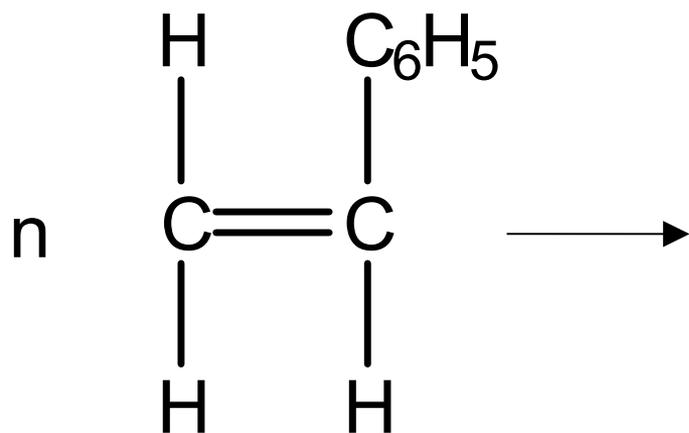


polymer
structure

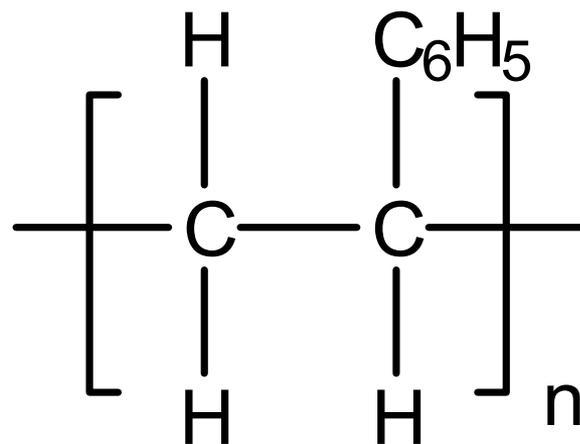


repeating
unit





phenylethene



poly(phenylethene)

polystyrene

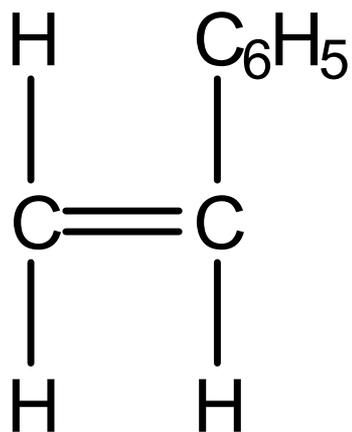


Polystyrene

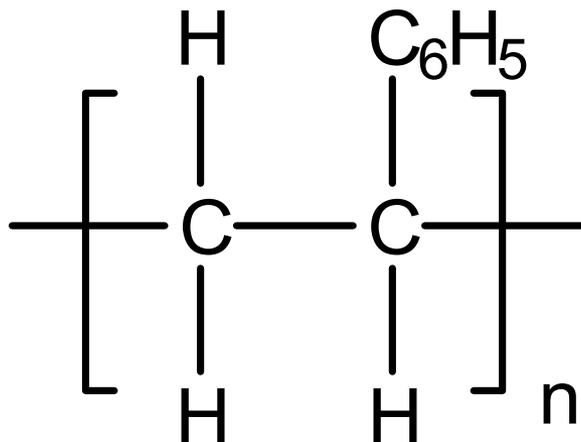


Poly(phenylethene)

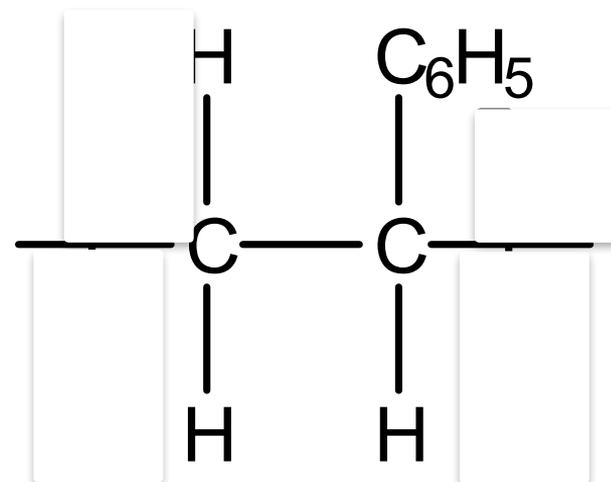
polystyrene



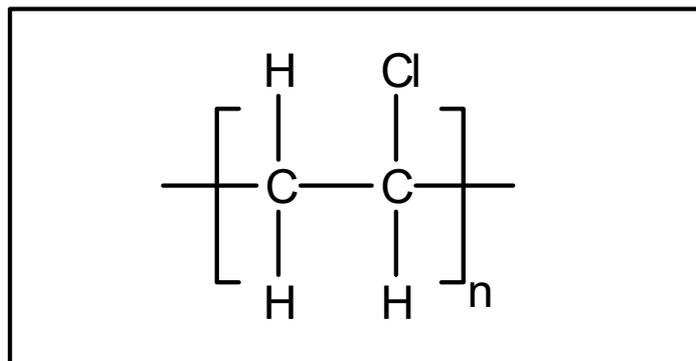
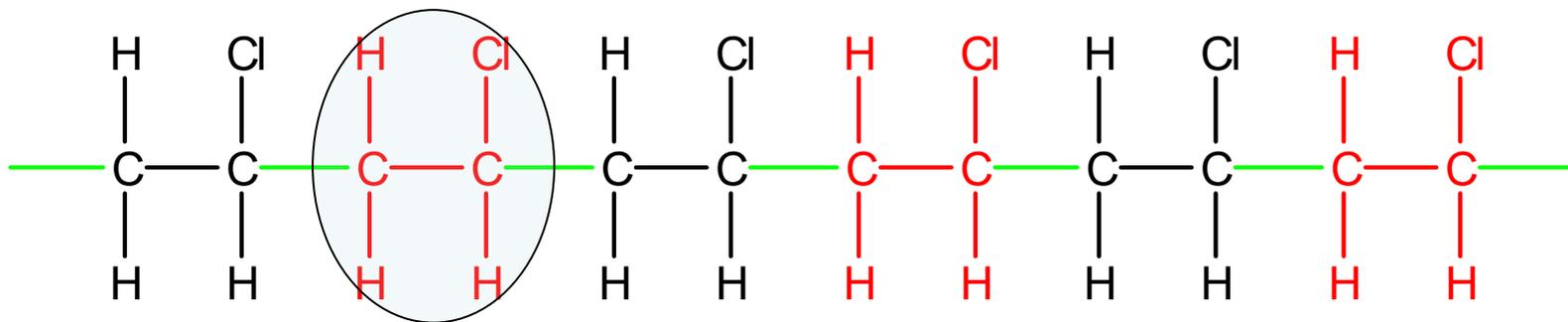
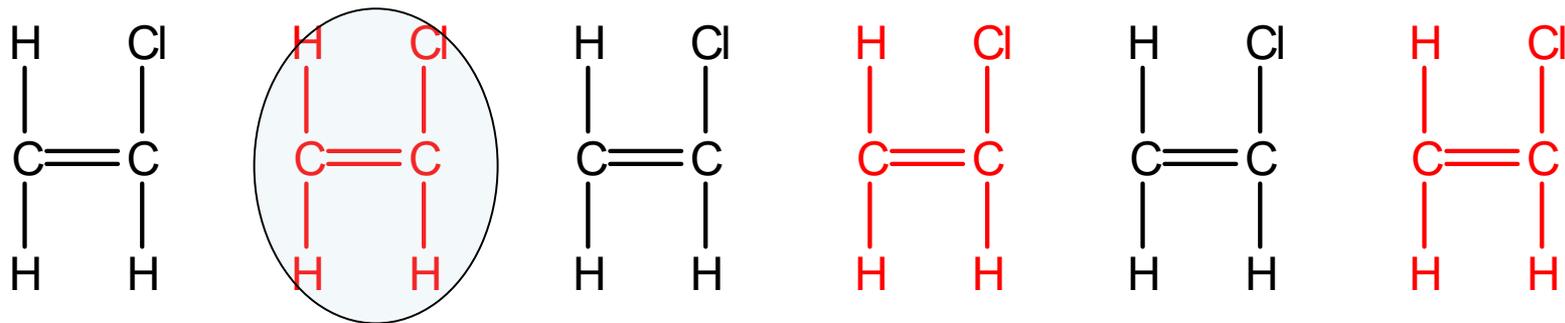
monomer
structure

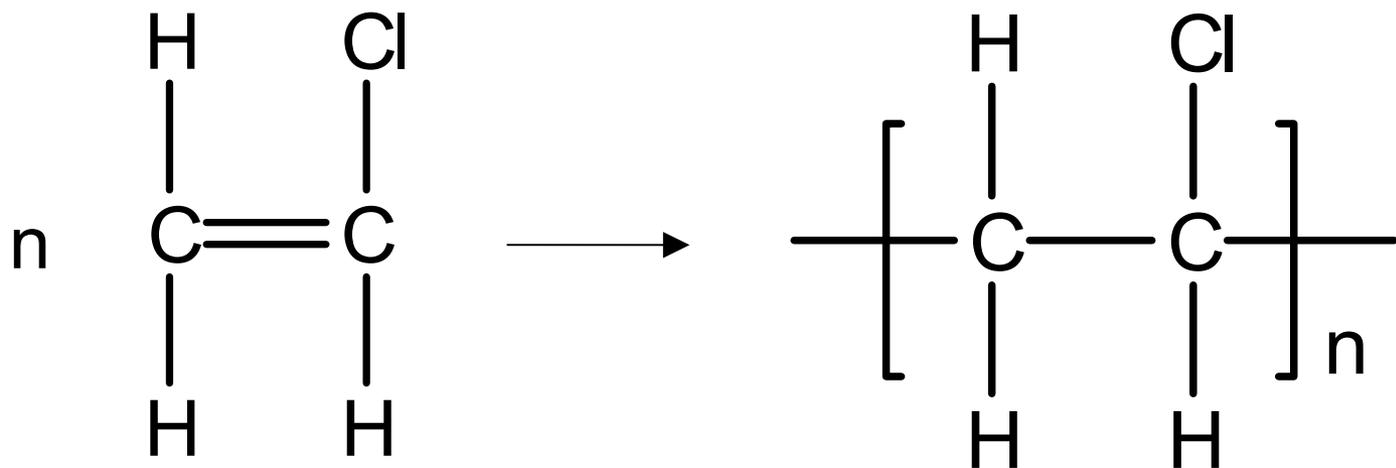


polymer
structure



repeating
unit





chloroethene

poly(chloroethene)

PVC

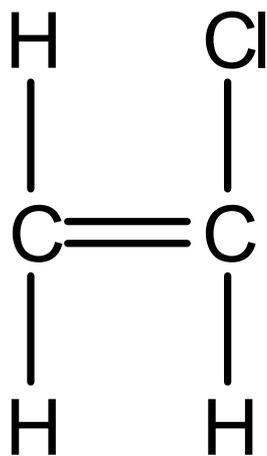


PVC

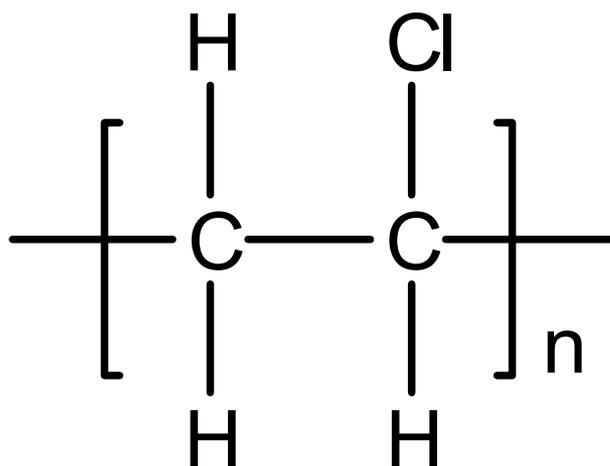


Poly(chloroethene)

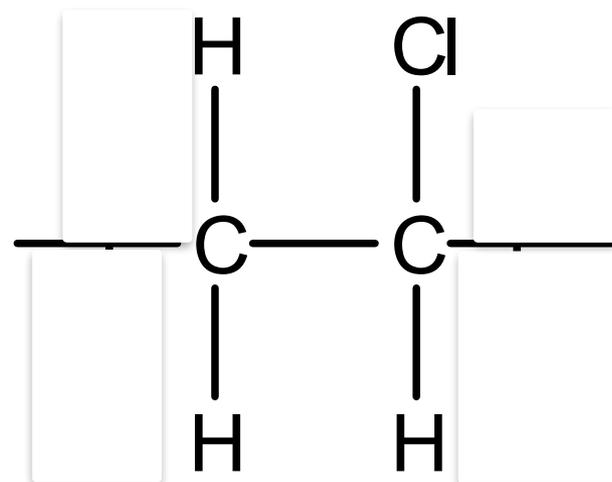
PVC



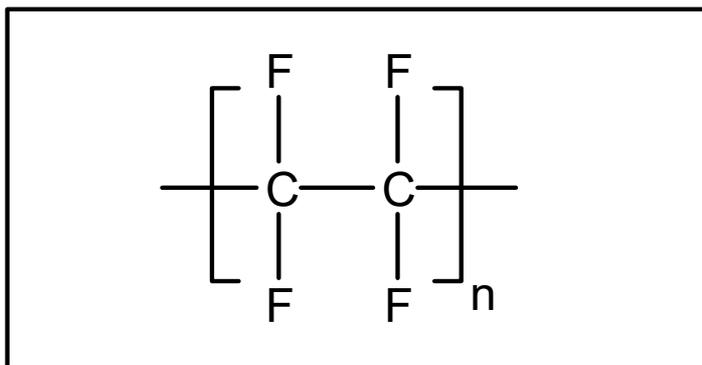
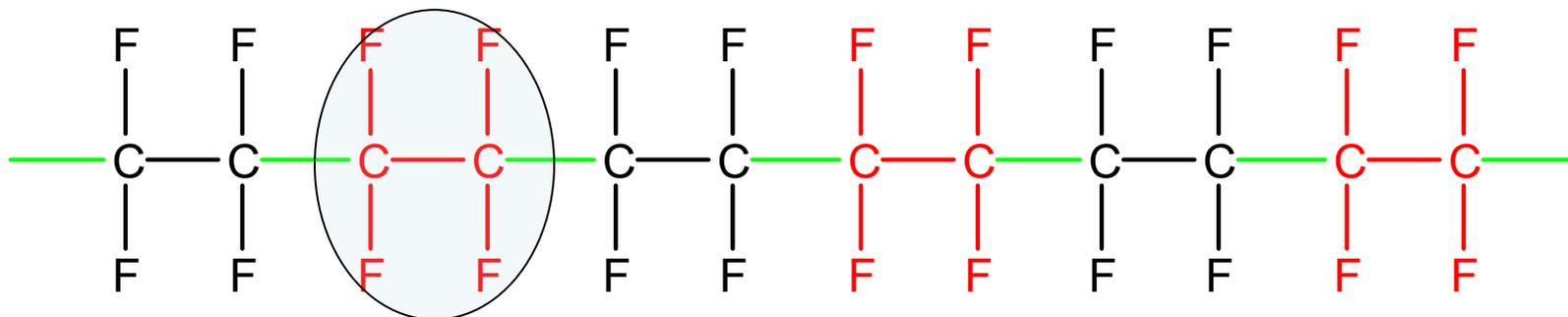
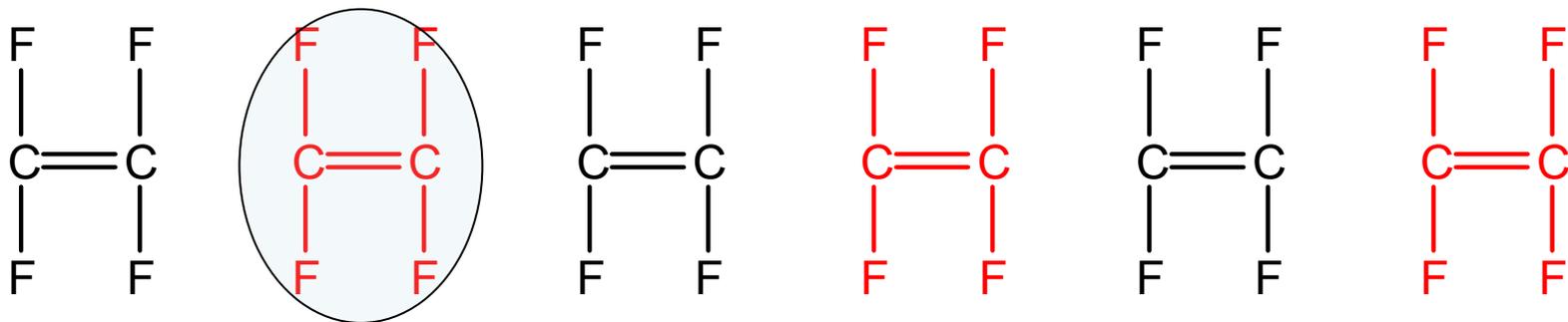
monomer
structure

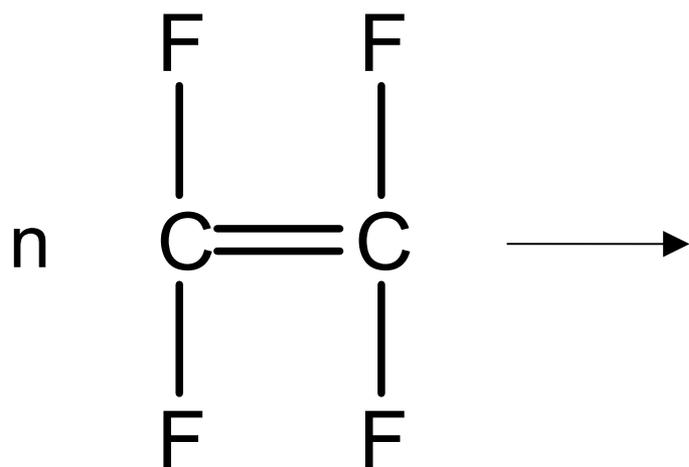


polymer
structure

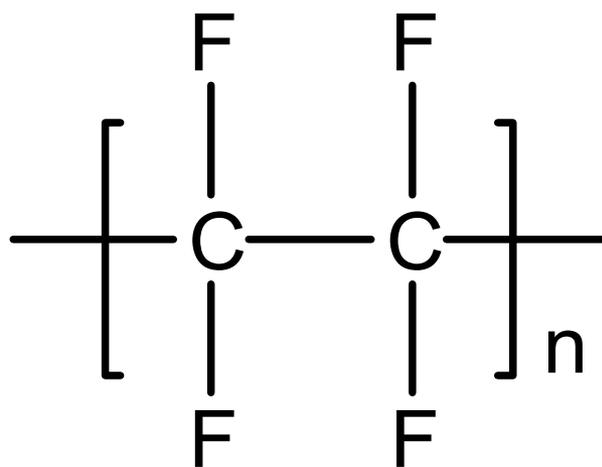


repeating
unit





tetrafluoroethene



poly(tetrafluoroethene)

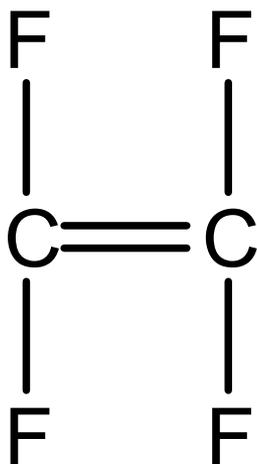
PTFE / Teflon

PTFE / Teflon

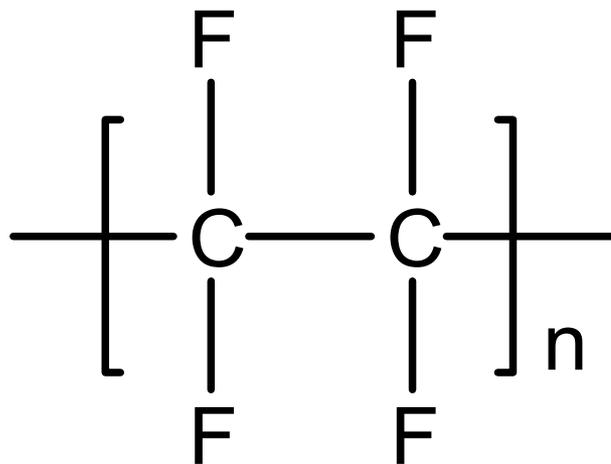


Poly(tetrafluoroethene)

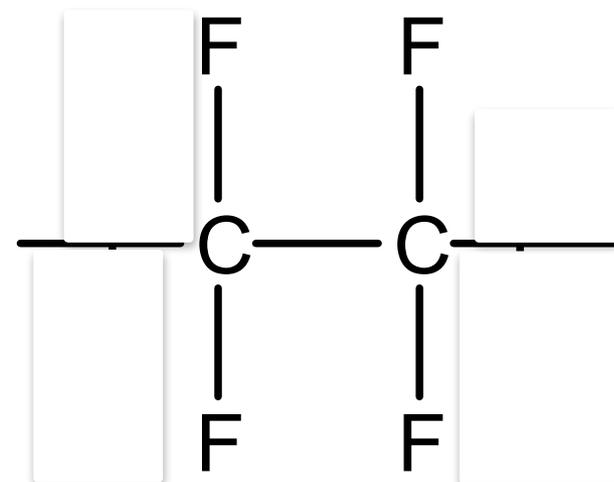
Teflon



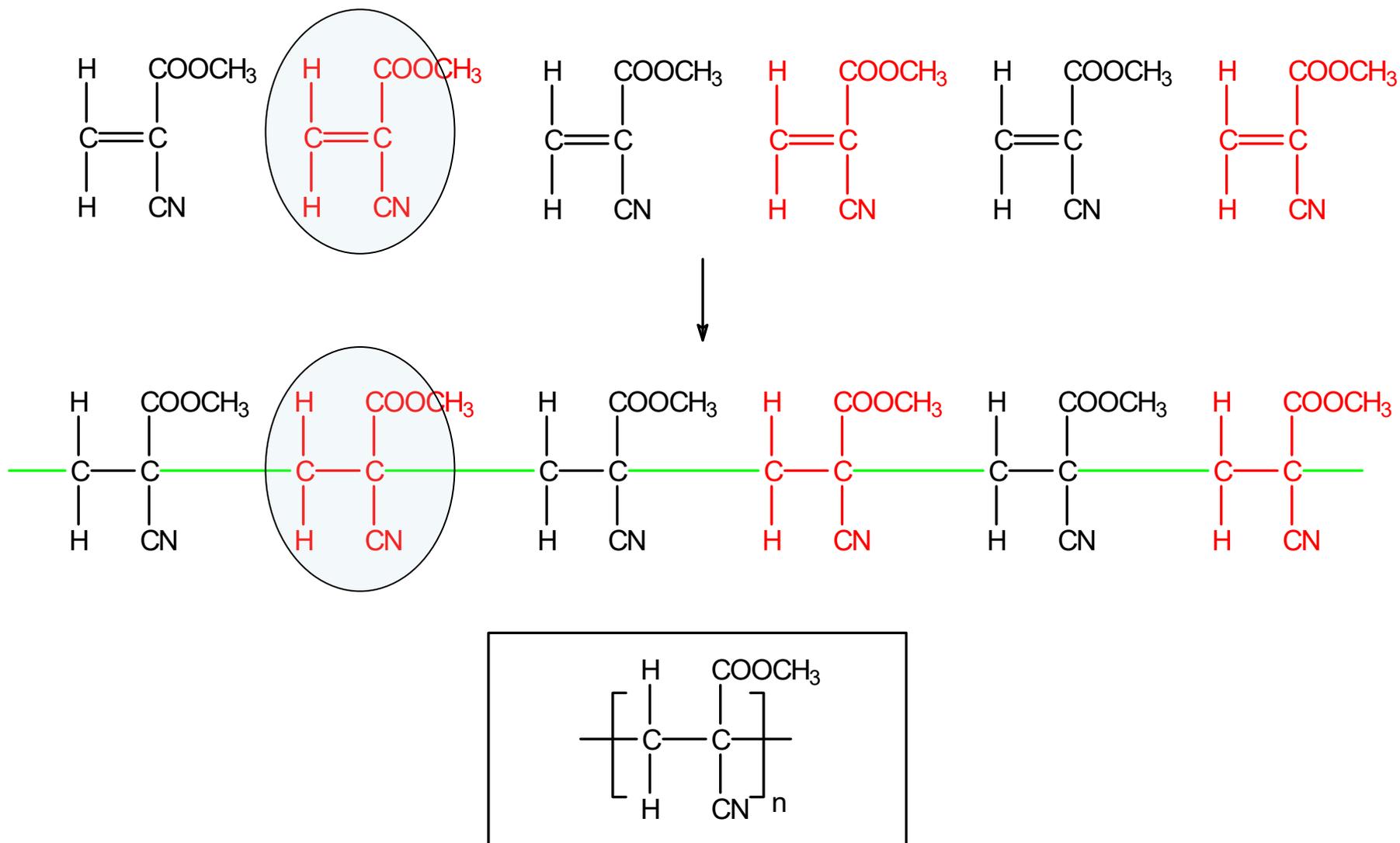
monomer
structure

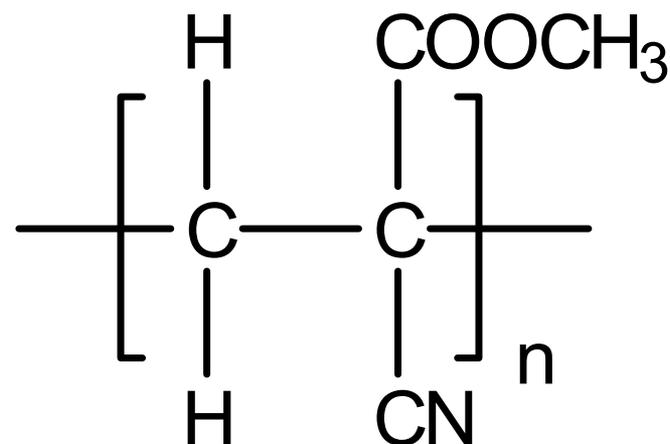
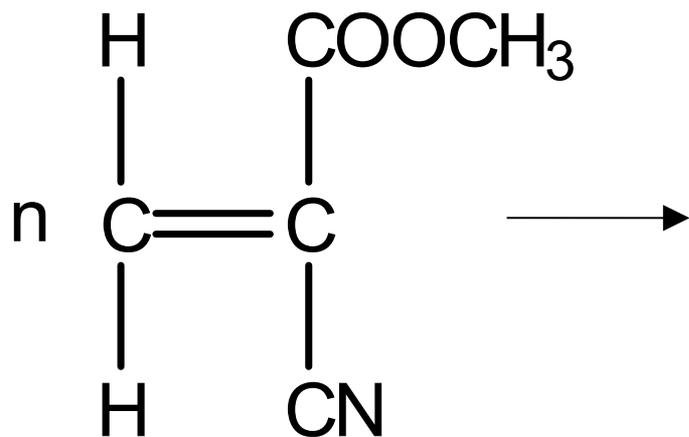


polymer
structure



repeating
unit





methyl 2-cyanopropenoate

poly(methyl 2-cyanopropenoate)

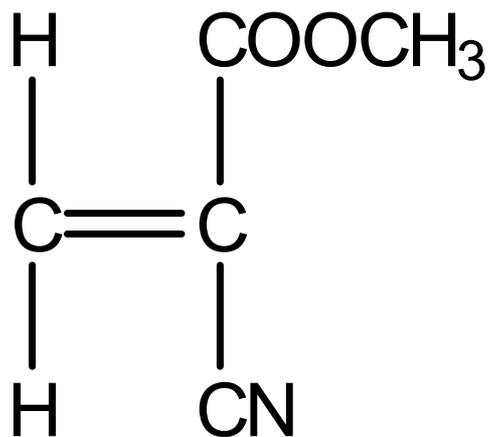
superglue

superglue

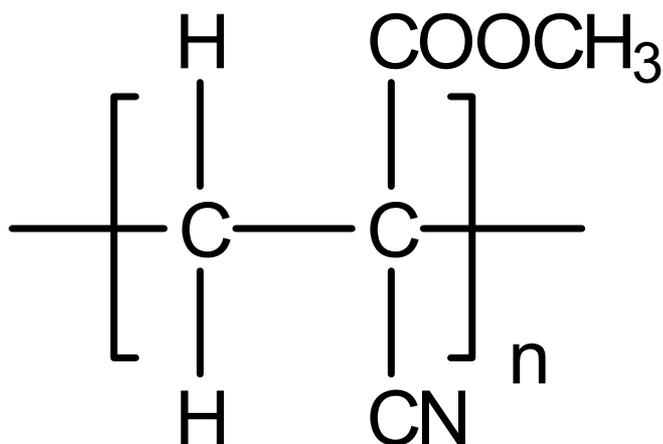


poly(methyl 2-cyanopropenoate)

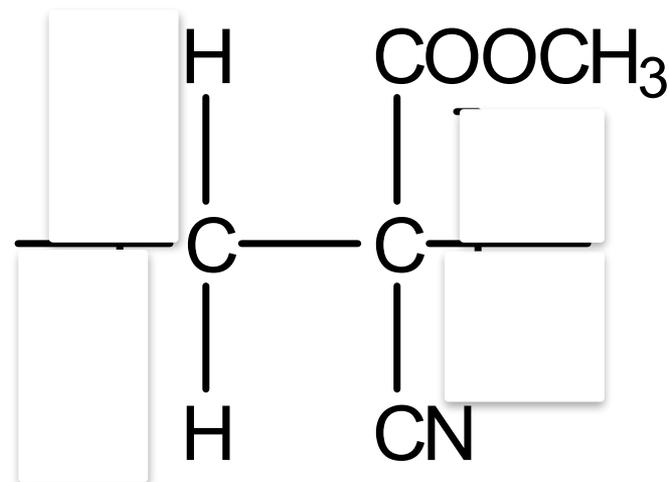
superglue



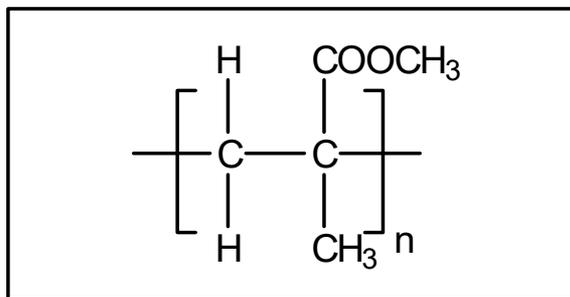
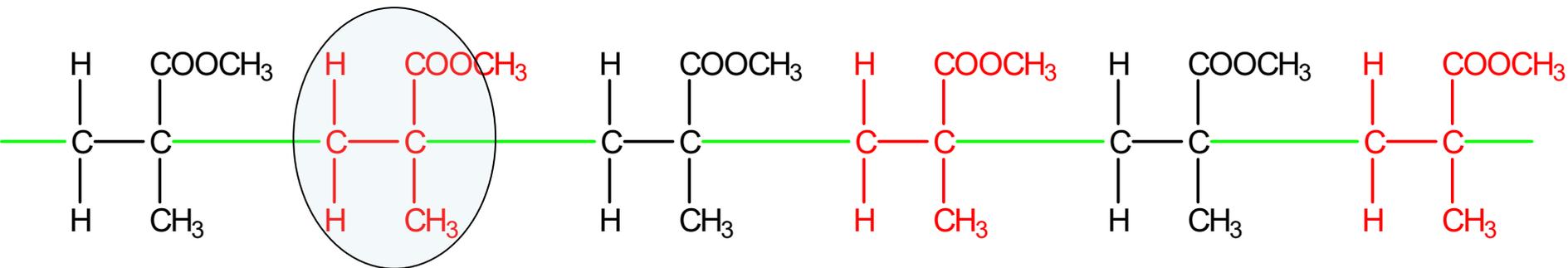
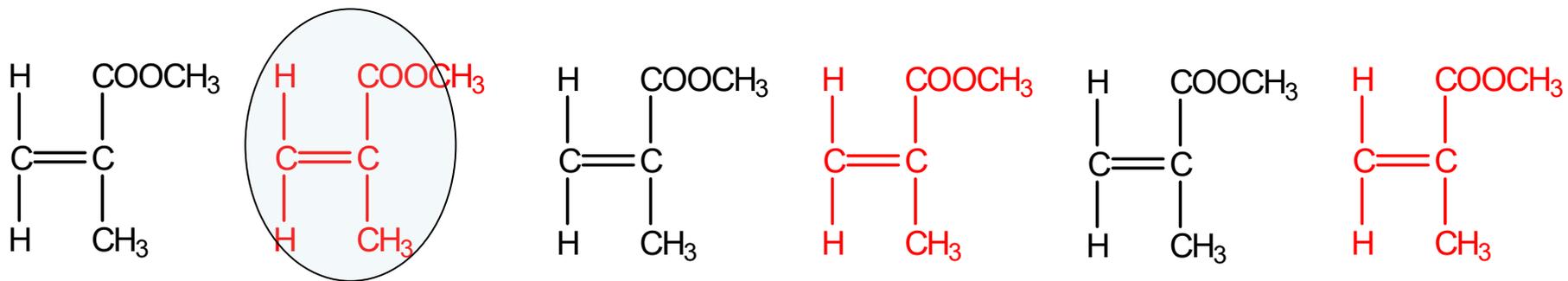
monomer
structure

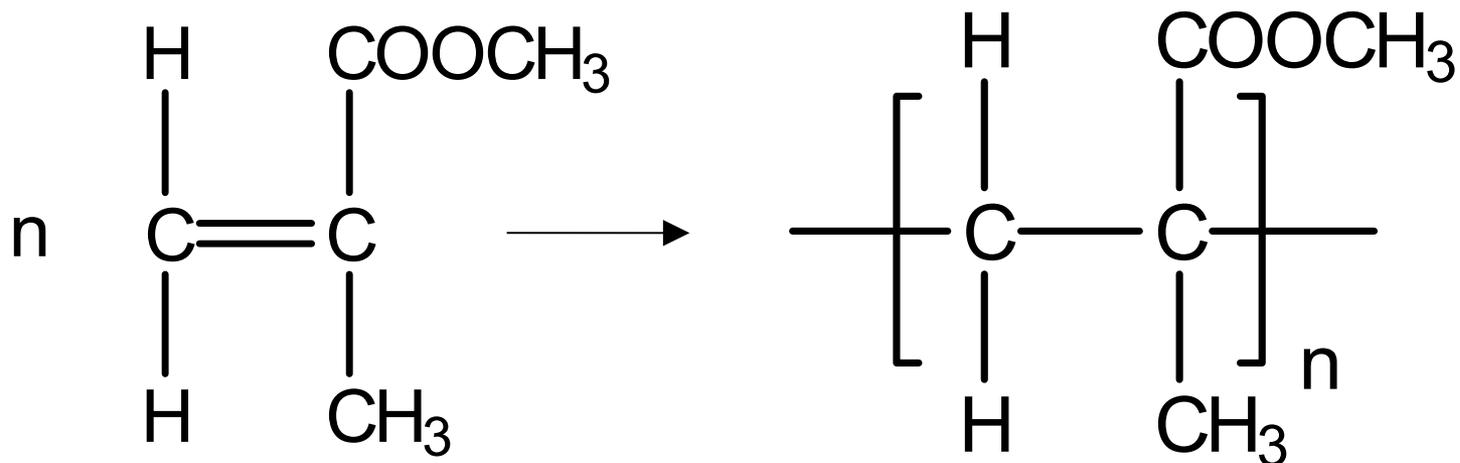


polymer
structure



repeating
unit



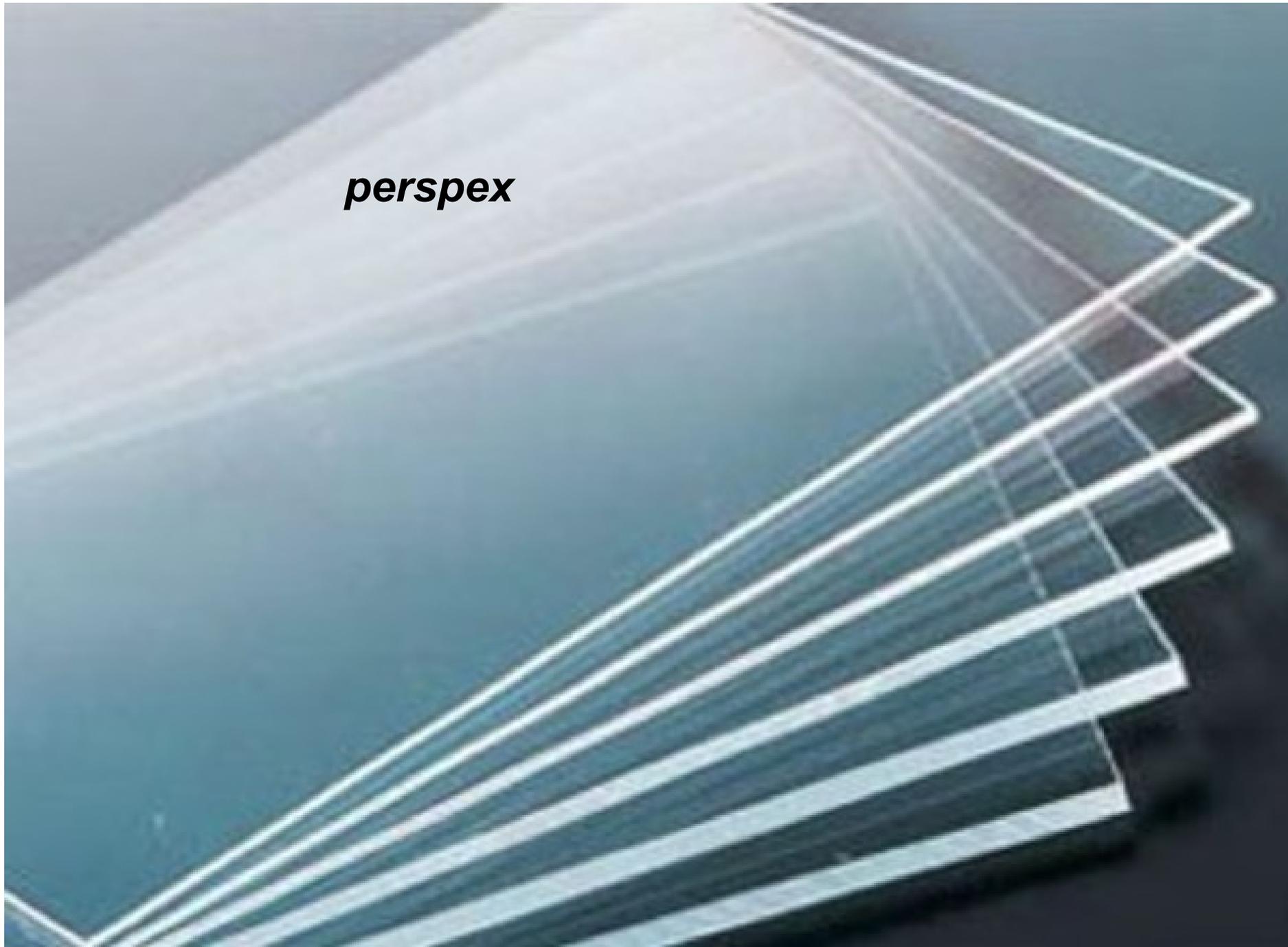


methyl 2-propenoate

poly(methyl 2-propenoate)

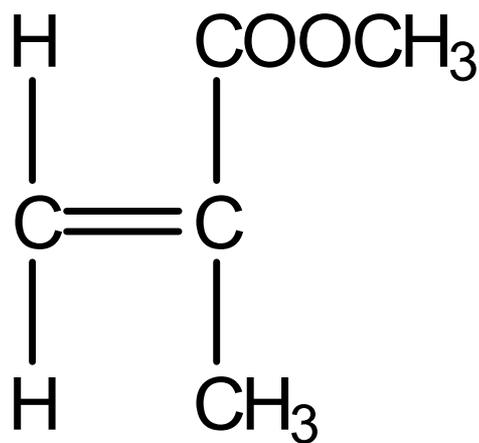
perspex

perspex

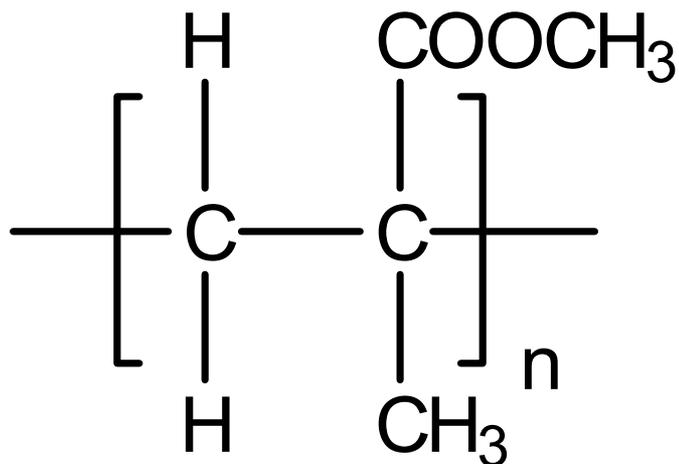


poly(methyl 2-propenoate)

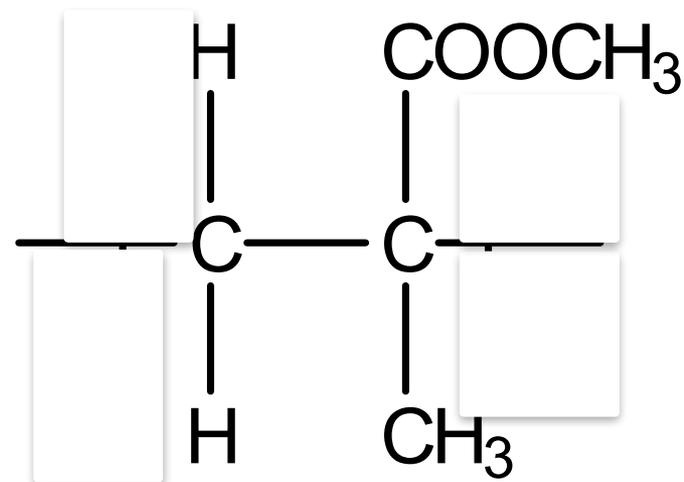
Perspex



monomer
structure



polymer
structure



repeating
unit



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CONDENSATION POLYMERS

Some definitions

Addition Polymerisation

formation of long chain molecules from lots of small molecules joining together **with no other products**

Condensation Polymerisation

formation of long chain molecules from lots of small molecules joining together **with another small molecule (e.g. water) produced as well**

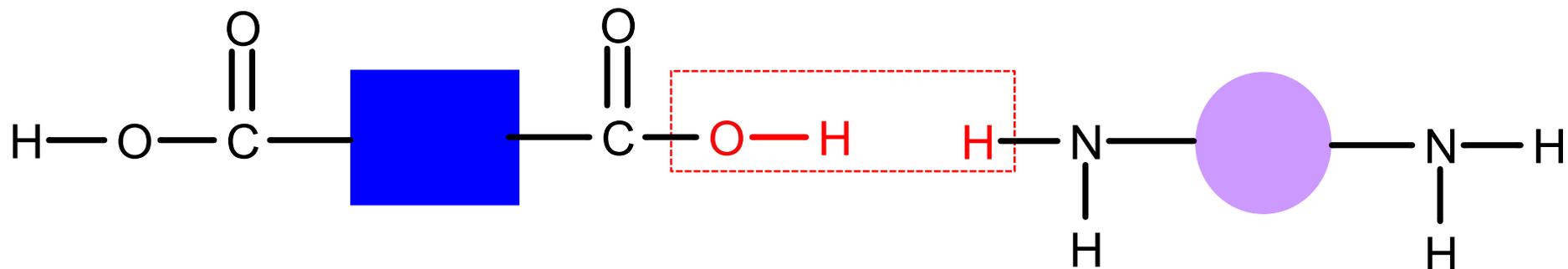


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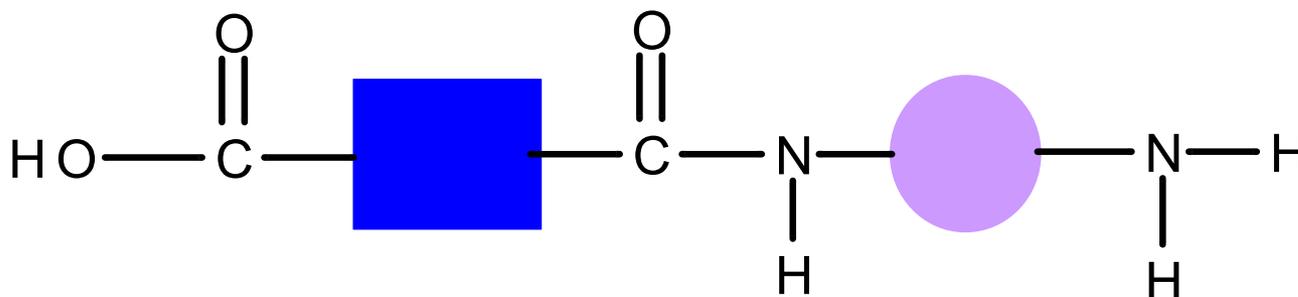
POLYAMIDES

dicarboxylic acid

diamine

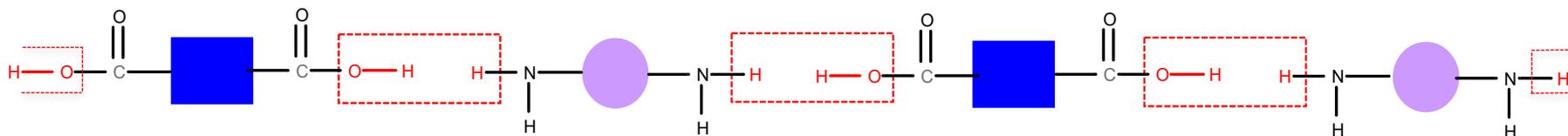


$-\text{H}_2\text{O}$

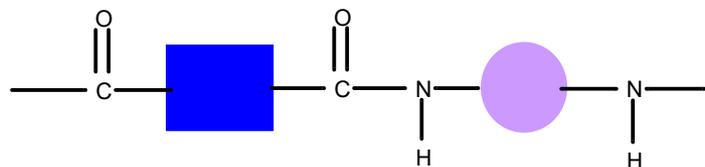
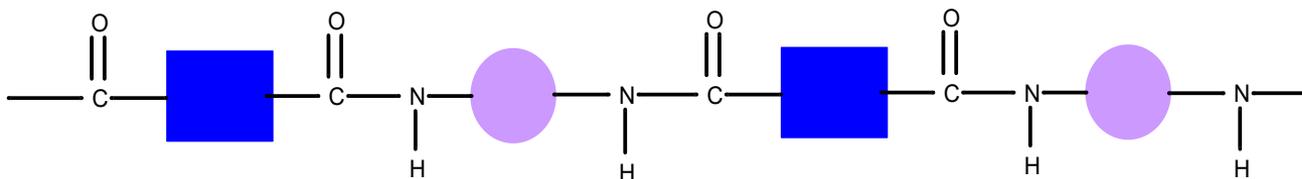


Polyamides

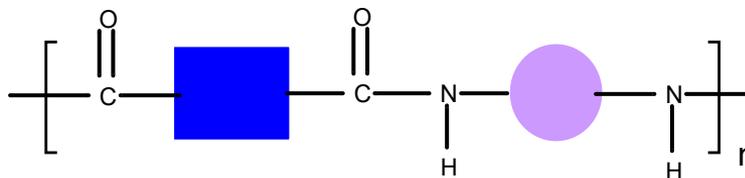
Dicarboxylic acid + diamine



$-\text{H}_2\text{O}$



repeating unit



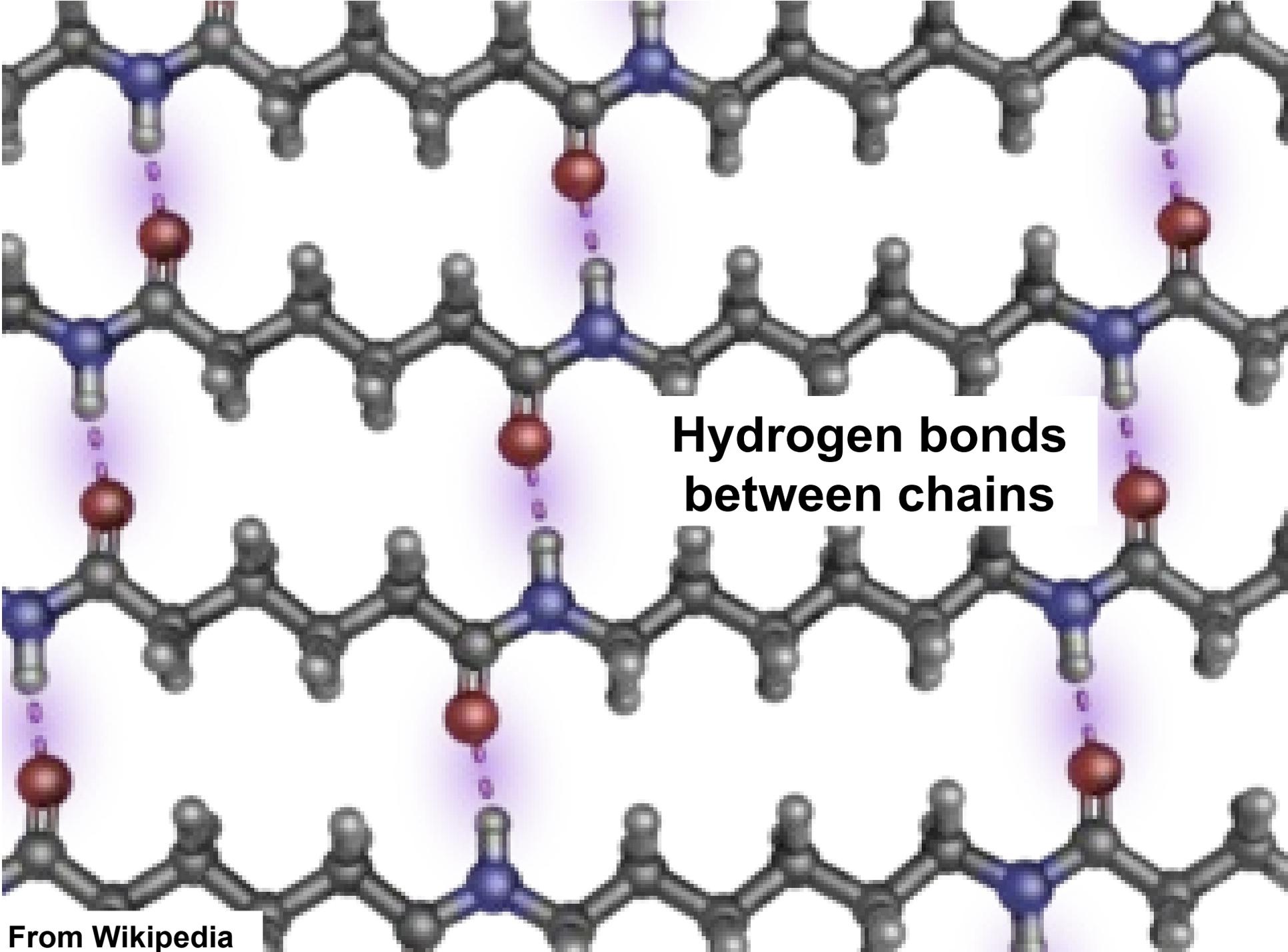
polymer structure

Polyamides

e.g. nylon-6,6

1,6-diaminohexane	$\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2$
hexane-1,6-dioic acid	$\text{HO}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$
repeating unit	$\text{---}\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{HN}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}\text{---}$
polymer structure	$\left[\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{HN}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH} \right]_n$

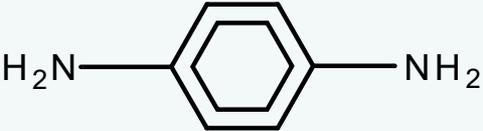
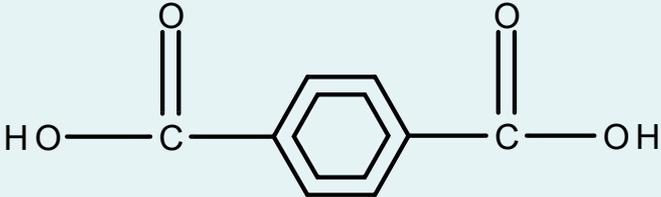
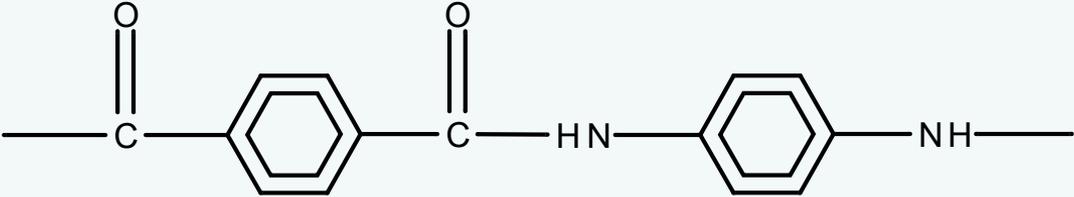
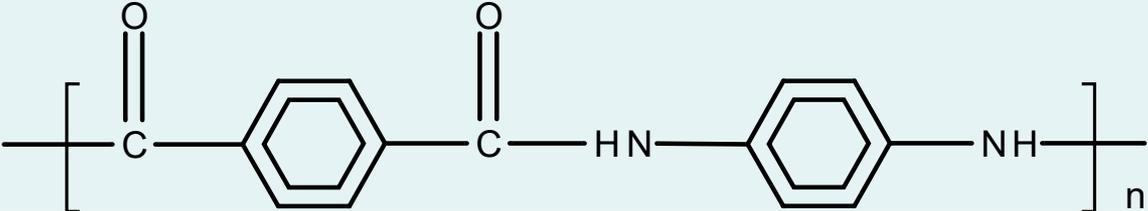




**Hydrogen bonds
between chains**

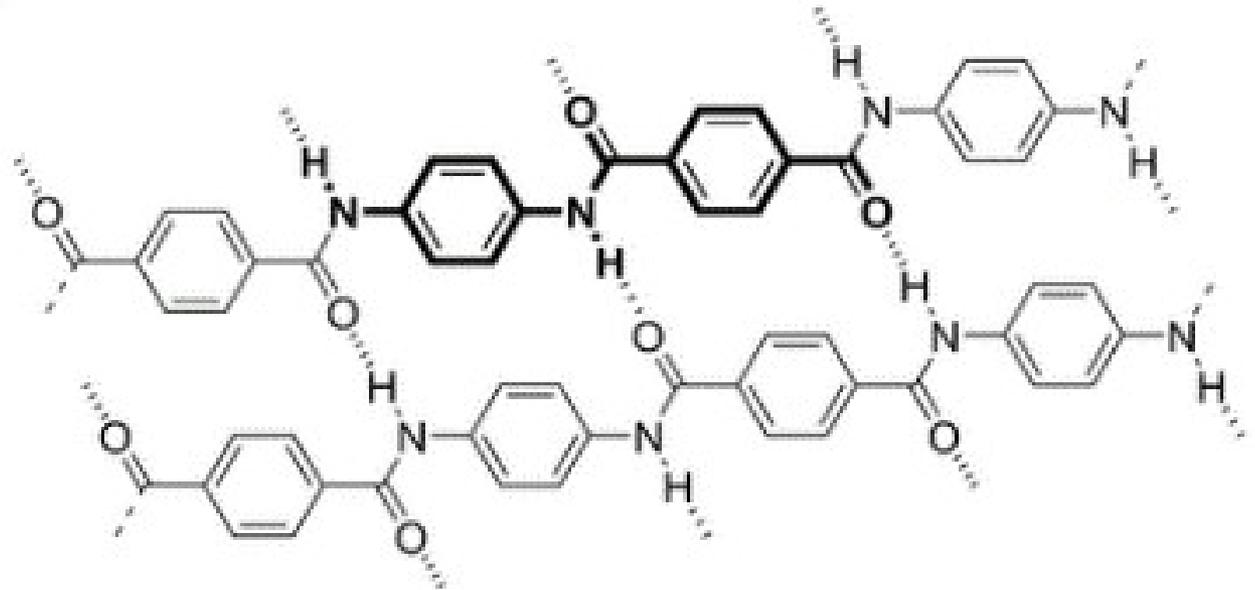
Polyamides

e.g. Kevlar

1,4-diaminobenzene	
benzene-1,4-dicarboxylic acid	
repeating unit	
polymer structure	



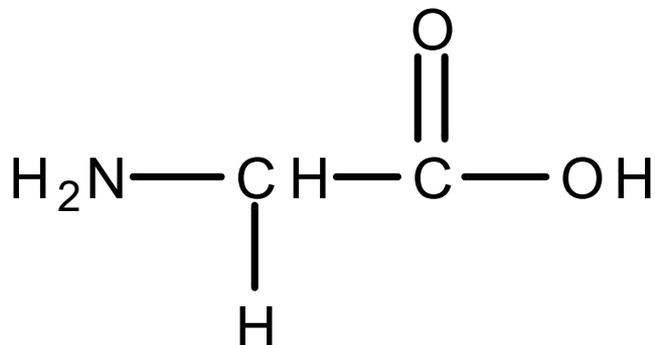
e.g. Kevlar



Amino acids

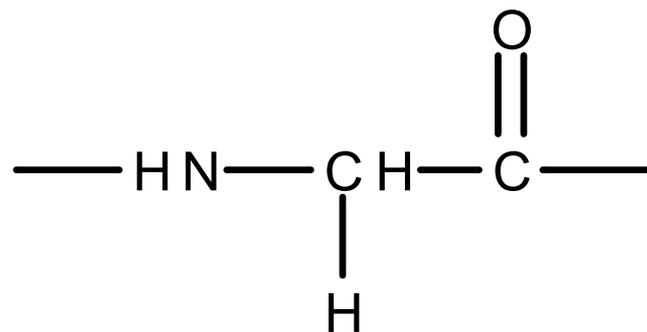
Polyamides

MONOMER

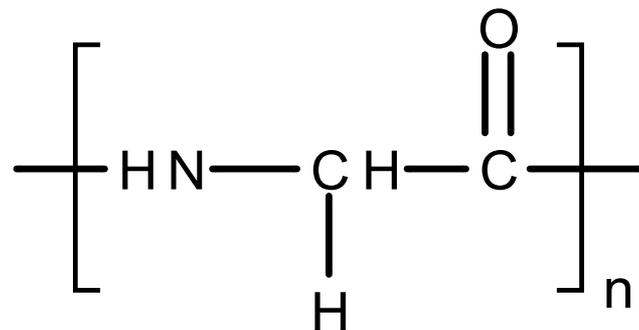


contains both acid
+ amine group

POLYMER



repeating unit



polymer structure

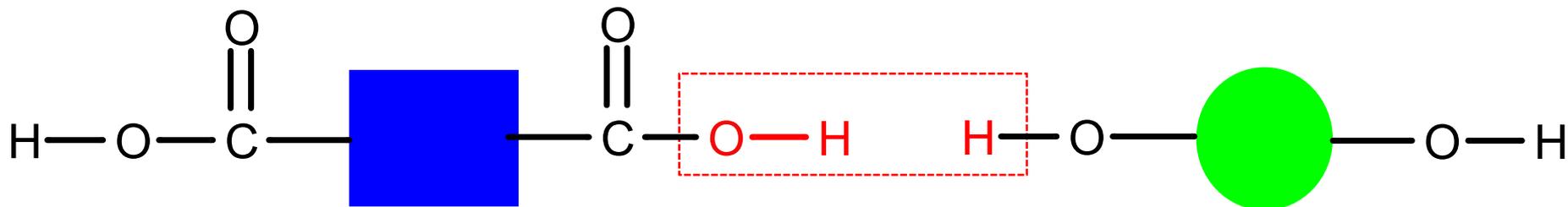


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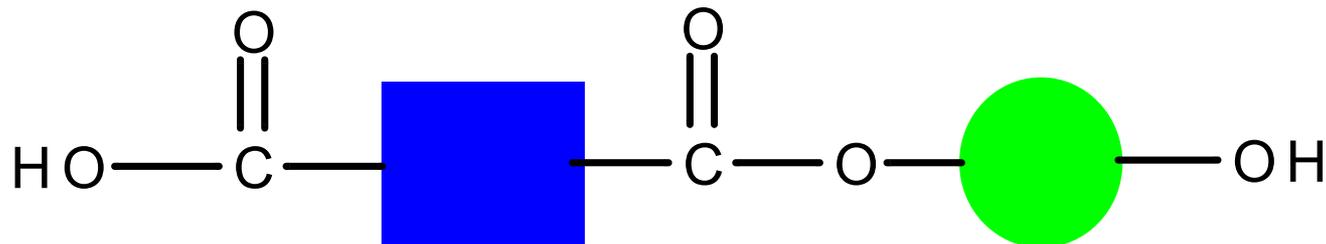
POLYESTERS

dicarboxylic acid

diol

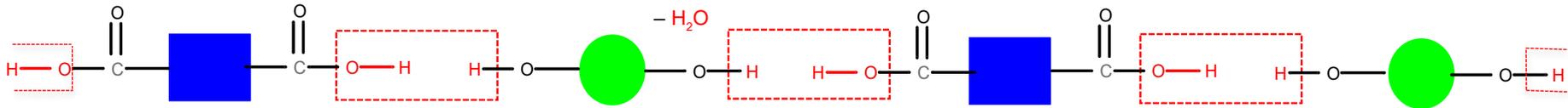


$-\text{H}_2\text{O}$

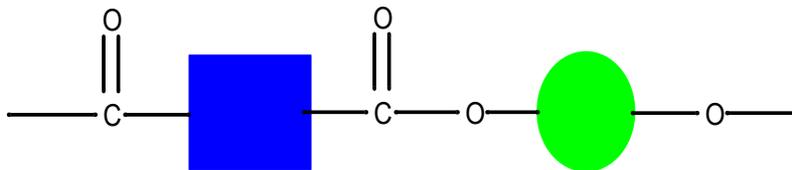
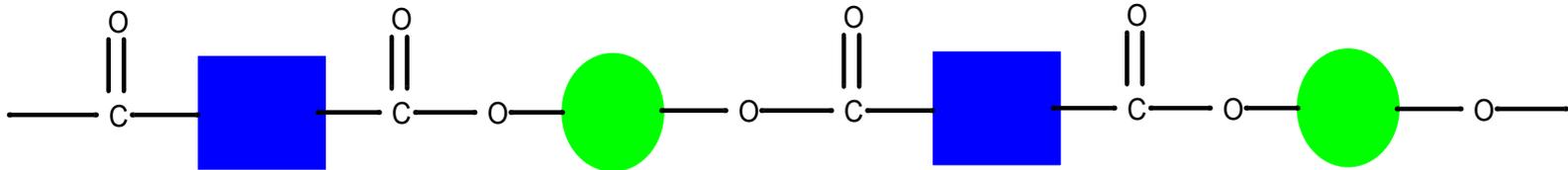


Polyesters

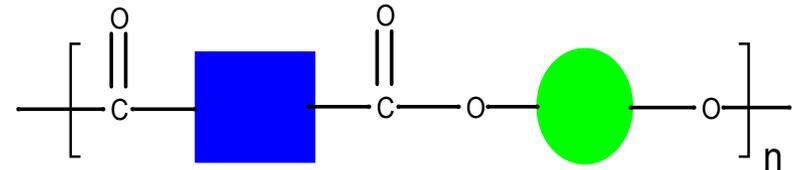
Dicarboxylic acid + diol



$-H_2O$



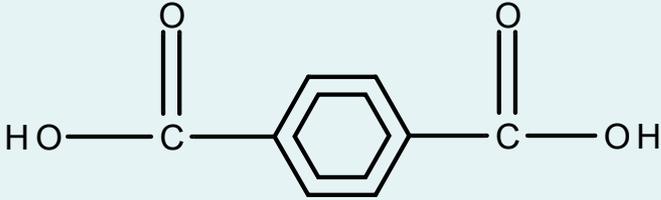
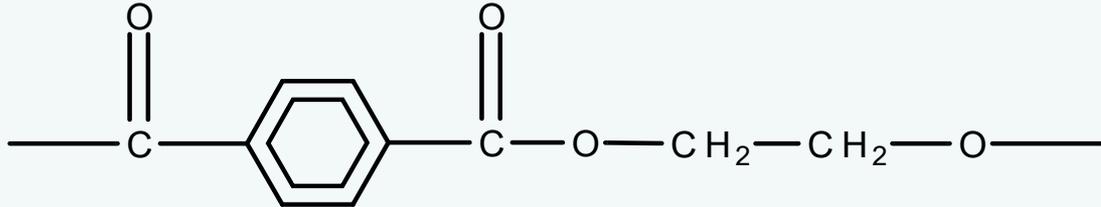
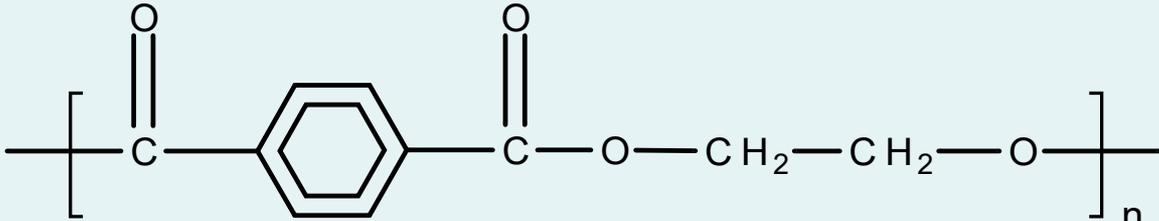
repeating unit



polymer structure

Polyesters

e.g. terylene (PET)

ethane-1,2-diol	$\text{HO}-\text{CH}_2-\text{CH}_2-\text{OH}$
benzene-1,4-dicarboxylic acid	
repeating unit	
polymer structure	



**e.g. terylene
(PET)**