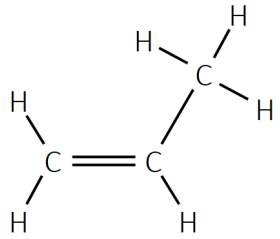
The steps needed to draw an addition polymer.

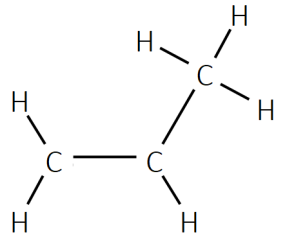
e.g. addition polymerisation of the monomer propene, C_3H_6, to form polypropene.

Addition reactions involve two (or more in the case of the polymers) molecules combining to make one molecule. An addition reaction occurs when double bonds are broken to form a single C–C bond, and two new single covalent bonds. In addition polymerisation, the monomers join in a long chain polymer, as the double bonds break and the C atoms from each monomer are able to bond to C atoms in other monomers.

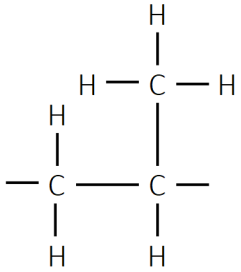
1. Draw the monomer with the C=C bond written horizontally.



2. Remove one bond of the C=C, making C-C.

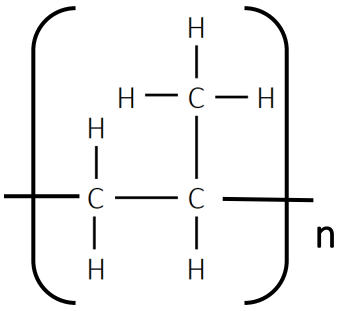


3. Add bonds out from each 'end carbon'.

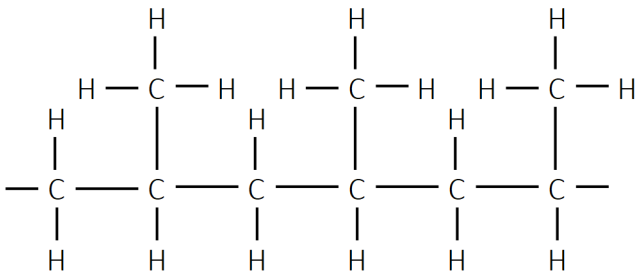


You might need to make them a bit longer – see picture 4.

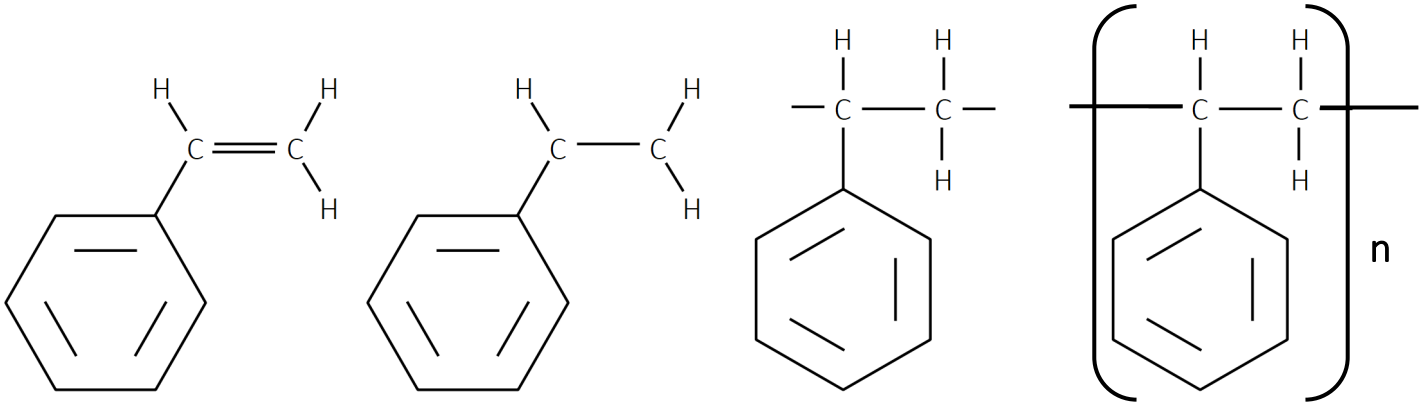
4. Add brackets [ ] and the letter n. The 'n' represents the number of repeating units. Make sure the bonds pass through the brackets because this shows that the polymer is continuing.



Alternatively, to show THREE repeating units, draw the section of polymer like this. Make sure the bonds show that the polymer is continuing.



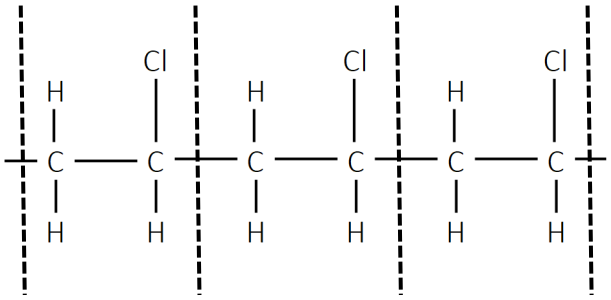
Use this strategy for any addition polymer e.g. styrene monomer to polystyrene polymer.



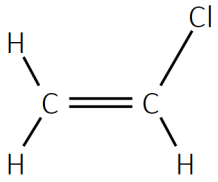
To work out the structure of a monomer from a section of polymer, just work in reverse!

- Identify the repeating unit.
- Add a bond to the C-C to make it into C=C

E.g.

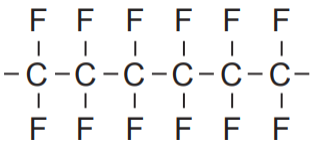


has the momomer



<u>Past NCEA Examination questions</u>

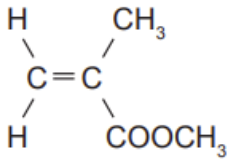
2020: A section of the Teflon polymer chain is shown. Teflon is best known for its use in coating non-stick frying pans and other cookware.



Draw and name the structure of the monomer used to make this polymer.

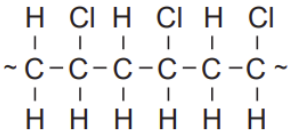
2019: No polymer question asked.

2018: Perspex® is a polymer used as an alternative to glass as it is transparent, lightweight, and shatter resistant. It can be made from the monomer shown.



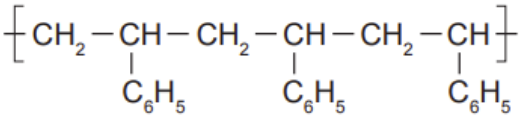
Draw THREE repeating units of the polymer formed.

2017: Polyvinyl chloride (polychloroethene) is often used to make artificial leather. This can then be used to cover chairs, cover car seats, and make clothing. A section of a polyvinyl chloride molecule is shown.



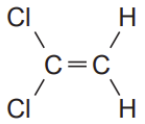
Draw the monomer from which the polymer polyvinyl chloride would be made.

2016: Polystyrene is a polymer with the structure:

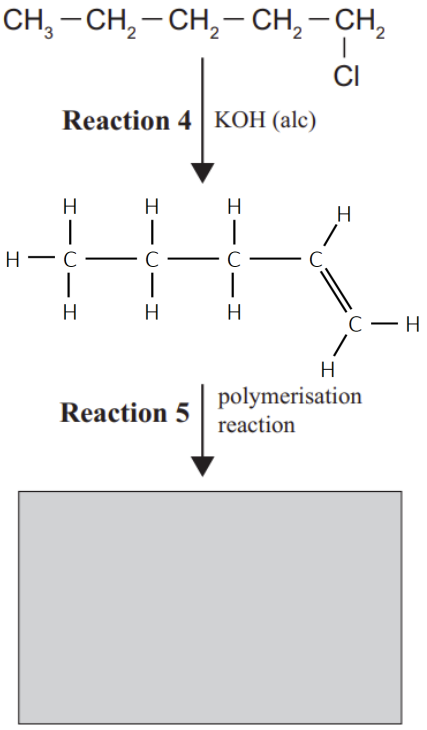


Draw the monomer used to make the polymer polystyrene.

2015: Cling Wrap is a polymer that can be made from the monomer 1,1-dichloroethene.
Draw THREE repeating units of the polymer formed.

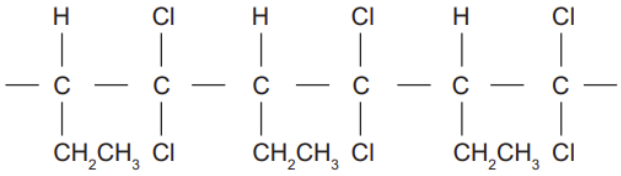


2014:



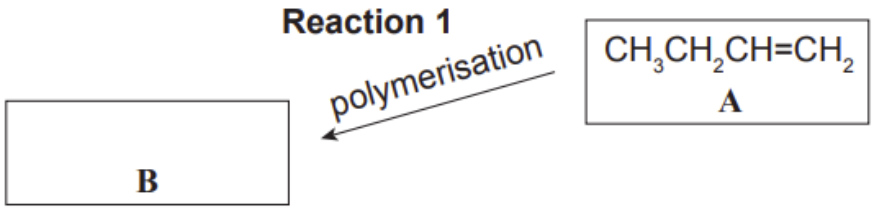
2013: The molecule tetrafluoroethene, shown below, is the monomer for the polymer commonly known as Teflon. $CF_2=CF_2$ Draw TWO repeating units for the Teflon polymer.

The following diagram shows three repeating sections of *another* polymer.



Draw the structural formula of the monomer molecule used to make this polymer.

2012: But-1-ene is used in the reaction sequence shown below. Draw two repeating units of the polymer, B, formed in Reaction 1.



Hint: Draw but-1-ene as