

## Taking it Further: Addition Polymerisation

**Answer the questions below.**

1. State the general formula of alkenes.



2. Explain why alkenes are described as unsaturated.

**They contain a C=C double bond**

3. Describe how bromine water could be used to identify an alkene.

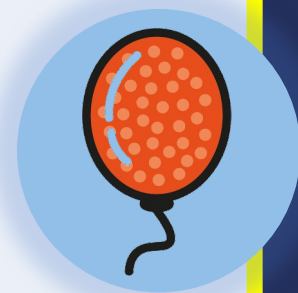
**Bromine water would turn from orange to colourless when added to an alkene.**

4. Define a polymer.

**A long molecule made up of many repeating units.**

5. Explain the difference between thermosetting and thermosoftening polymers.

**Thermosetting polymers contain crosslinks, so they do not melt when heated. Thermosoftening polymers melt when heated.**



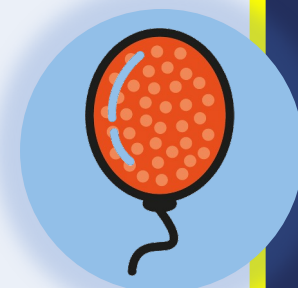
## Taking it Further: Addition Polymerisation

### **Do Now:**

1. State the general formula of alkenes.
2. Explain why alkenes are described as unsaturated.
3. Describe how bromine water could be used to identify an alkene.
4. Define a polymer.
5. Explain the difference between thermosetting and thermosoftening polymers.

### **Drill:**

1. Draw the displayed formula for ethene.
2. Draw the displayed formula for butene.
3. Compare the structure of butene and butane.

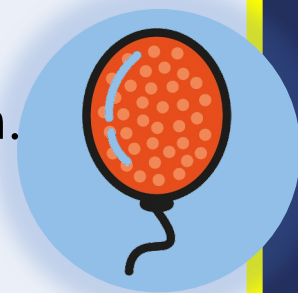


## Taking it Further: Addition Polymerisation

### Read Now:

Polymers are long molecules made up of repeating units called monomers. One of the most common polymers used by humans is poly(ethene), which is made in both high-density and low-density forms. Poly(ethene) is made through the joining of many ethene monomers, a reaction which is called addition polymerisation. The double bond of the ethene molecules is broken, allowing the carbon atoms to bond with neighbouring molecules. However, it is not just poly(ethene) that can be made through addition polymerisation. Other polymers such as poly(propene) or poly(chloroethene) are also made through addition polymerisation. In addition polymerisation, the only product is the polymer.

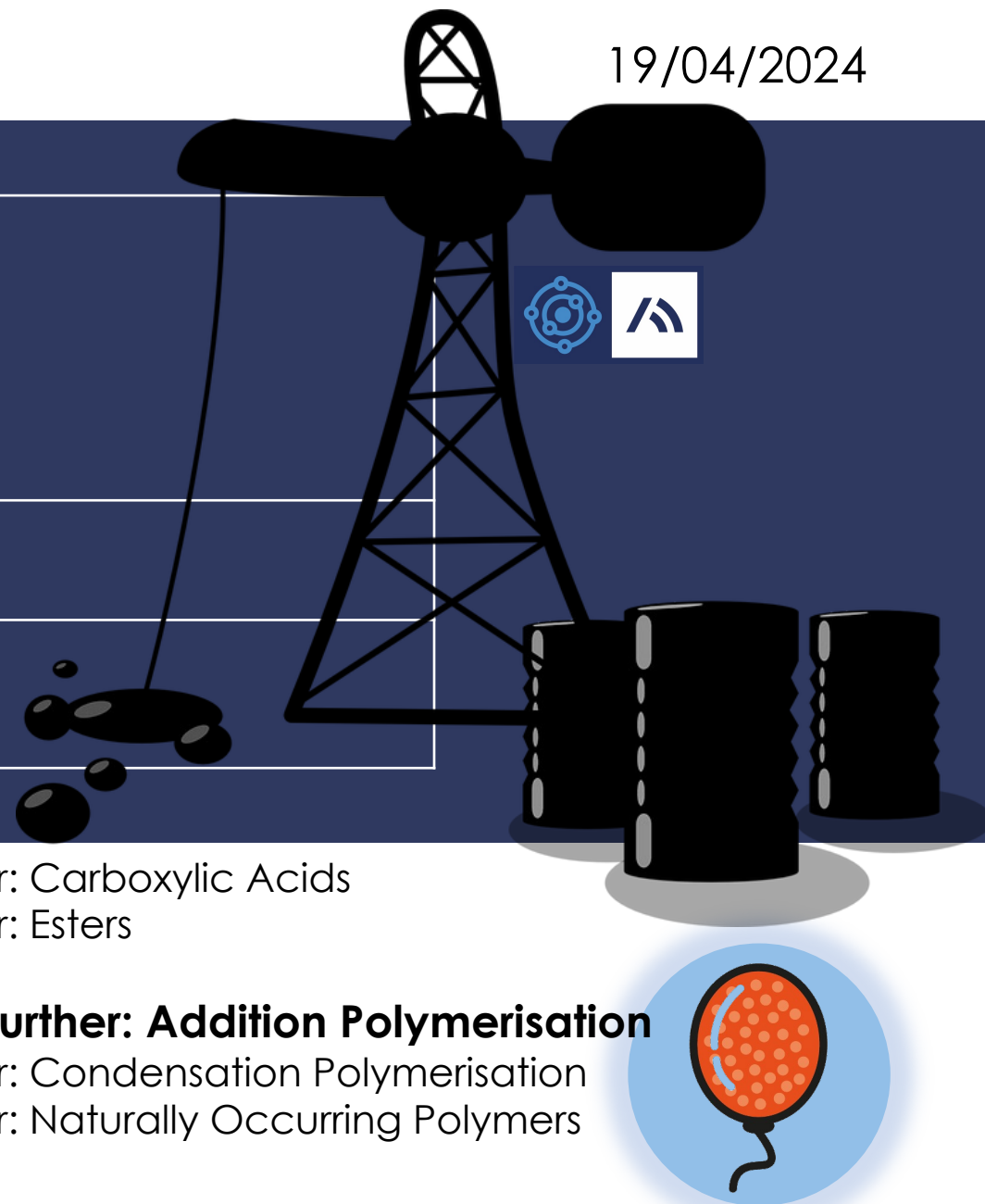
1. Define a polymer.
2. Identify the monomer that makes up poly(ethene).
3. Describe how poly(ethene) is formed.
4. Give an example of another polymer made through addition polymerisation.



# Taking it Further: Addition Polymerisation

C5.1.13

Science  
**Mastery**



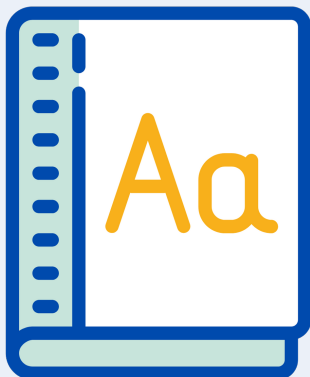
C5.1.1 Prior Knowledge Review  
C5.1.2 Crude Oil and Hydrocarbons  
C5.1.3 Fractional Distillation  
C5.1.4 Combustion of Hydrocarbons  
C5.1.5 Cracking  
C5.1.6 Taking it Further: Alkenes  
C5.1.7 Taking it Further: Alcohols  
C5.1.8 Taking it Further: Producing Ethanol by Fermentation  
C5.1.9 Taking it Further: Producing Ethanol from Ethene

C5.1.10 Taking it Further: Carboxylic Acids  
C5.1.11 Taking it Further: Esters  
C5.1.12 Polymers  
➤ **C5.1.13 Taking it Further: Addition Polymerisation**  
C5.1.14 Taking it Further: Condensation Polymerisation  
C5.1.15 Taking it Further: Naturally Occurring Polymers

## Following this lesson, students will be able to:

- Identify monomers used to make given polymers
- Describe the process of addition polymerisation

## Key Words:



**polymer**

**monomer**

**poly(ethene)**

**addition**

**polymerisation**

# This is the fix-it portion of the lesson

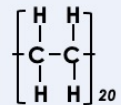
The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the **pre-unit quiz**.

- The teacher should customise this slide as needed, to facilitate
  - **reteach, explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.

Answer the questions below.

1. How many carbon atoms will the polymer represented by this diagram have?

- ☐ A. 20
- ☒ B. 40
- ☐ C. 80



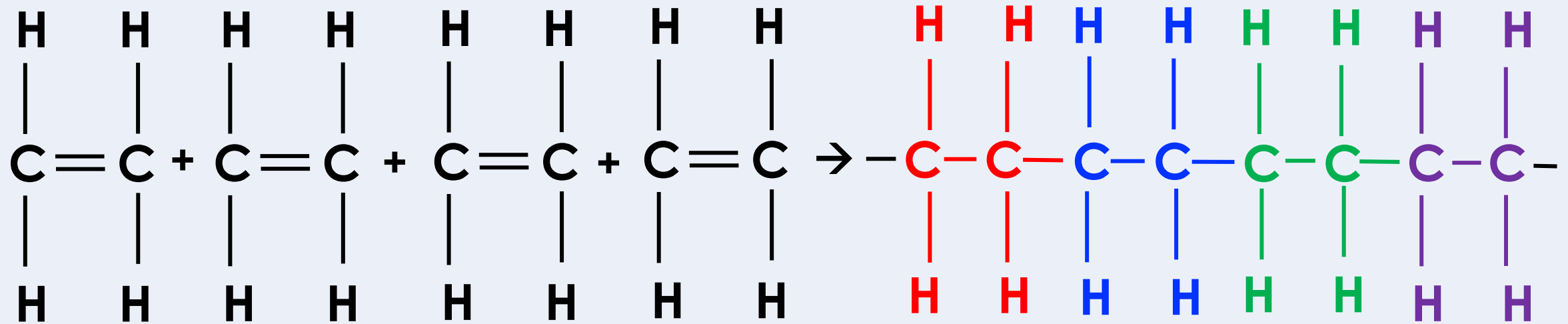
2. What is between polymer molecules?

- ☐ A. Covalent bonds
- ☒ B. Intermolecular forces
- ☐ C. Electrostatic attraction

3. What is the difference between thermosetting and thermosoftening polymers?

- ☒ A. Thermosoftening polymers melt when heated
- ☐ B. Thermosetting polymers melt when heated
- ☐ C. Thermosoftening polymers contain crosslinks

# Addition Polymerisation

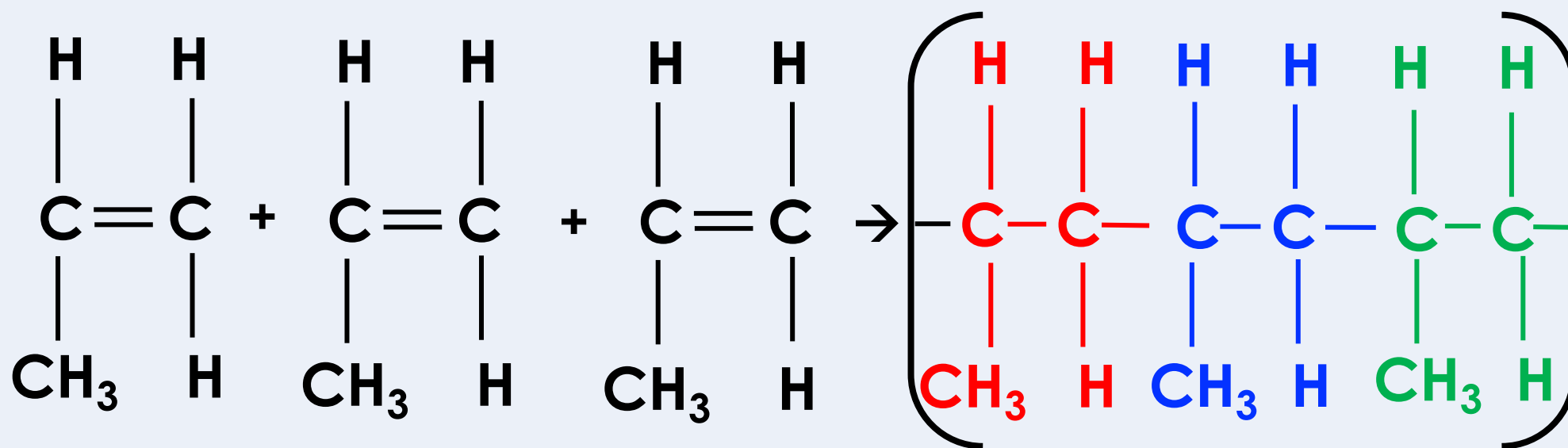


In **addition polymerisation**, monomers are added together to form a polymer.

For example: Ethene monomers are added together to make poly(ethene)

The polymer contains all the atoms of the monomers, so there are no other products.

# Addition Polymerisation



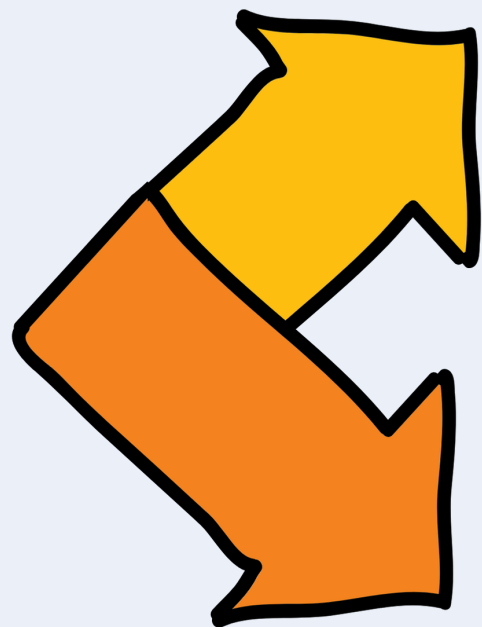
Propene monomers

Poly(propene) polymer



**Can you explain the difference between these two terms?**

Monomer



Polymer

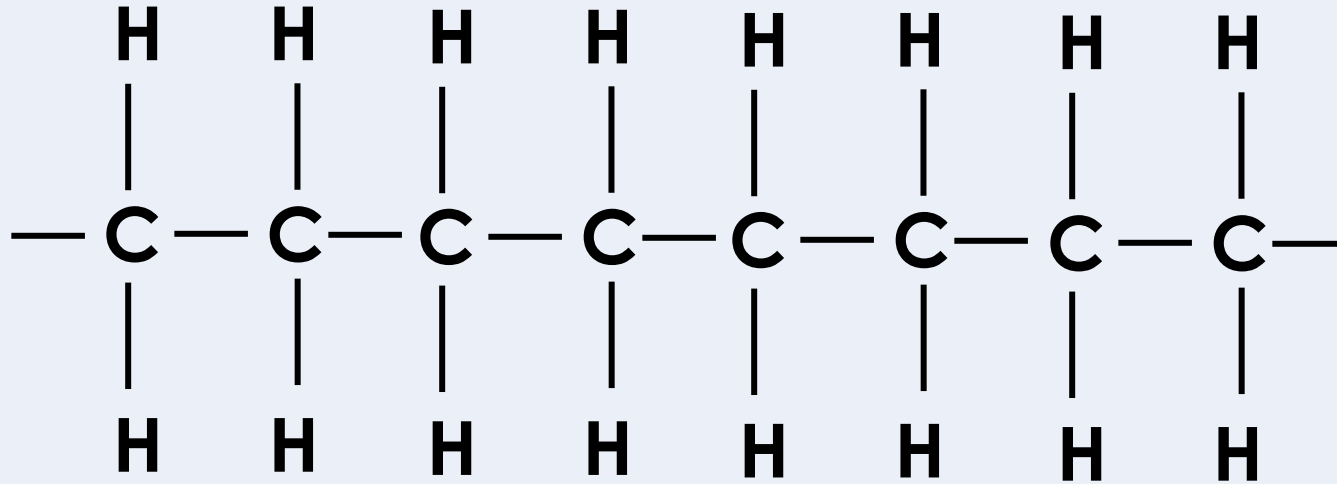
*What are the reactants and products of an addition polymerisation reaction?*

*What is the relative size of each?*

*Which contains a double bond?*

*How do we write the names of each?*

Why is this called polyethene not polyethane?



# Drill

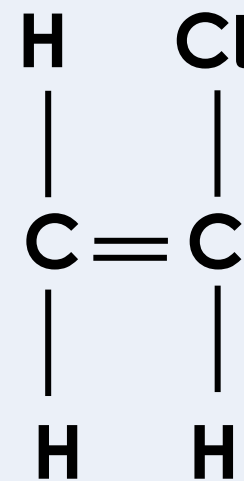
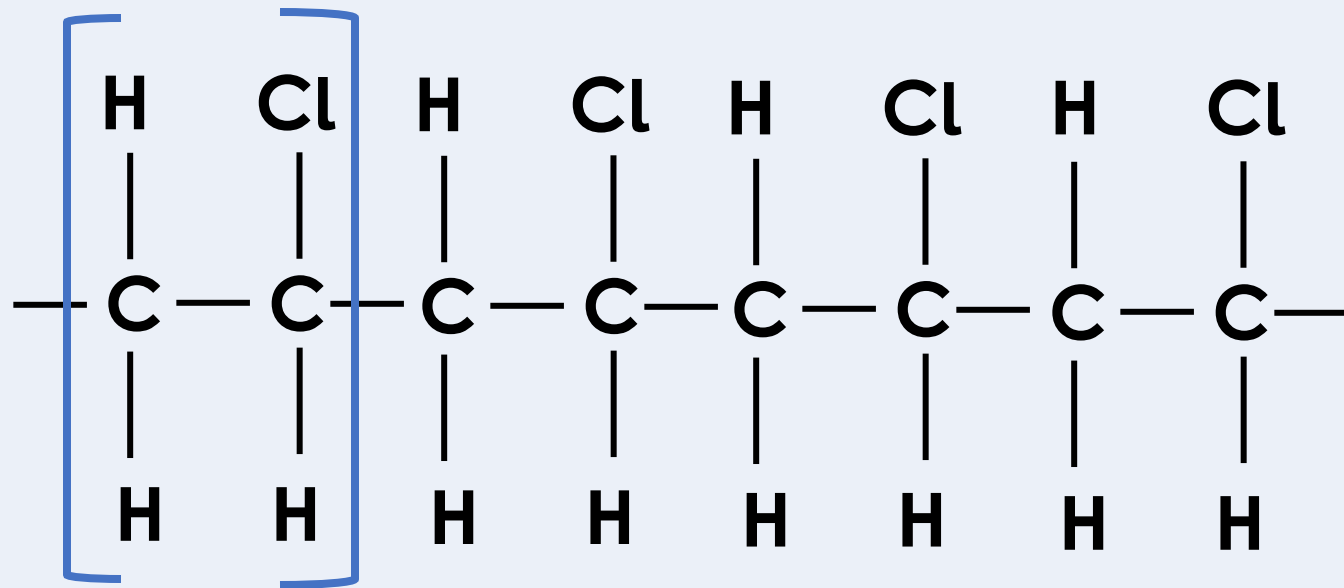
1. Define a polymer.
2. Define a monomer.
3. Describe what happens during an addition polymerisation reaction.
4. Identify the product(s) that are formed in an addition polymerisation reaction.
5. Ethene molecules join to form poly(ethene). Identify the monomer and the polymer.
6. Name the polymer that would be formed through addition polymerisation of propene molecules.
7. Name the monomer that would have been used to form the polymer poly(butene).

## Drill answers

1. Long chain molecules made of many units
2. Small molecules that can be joined together to make a polymer.
3. Monomers are joined together when their double bonds are broken.
4. Only a polymer is formed
5. Ethene is the monomer and poly(ethene) is the polymer.
6. Poly(propene)
7. Butene

# I: Identifying monomers

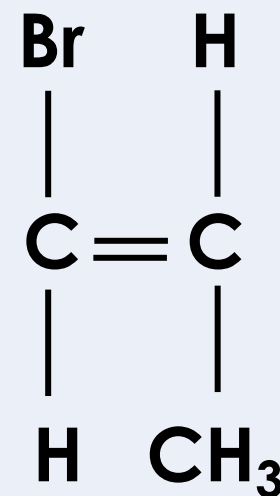
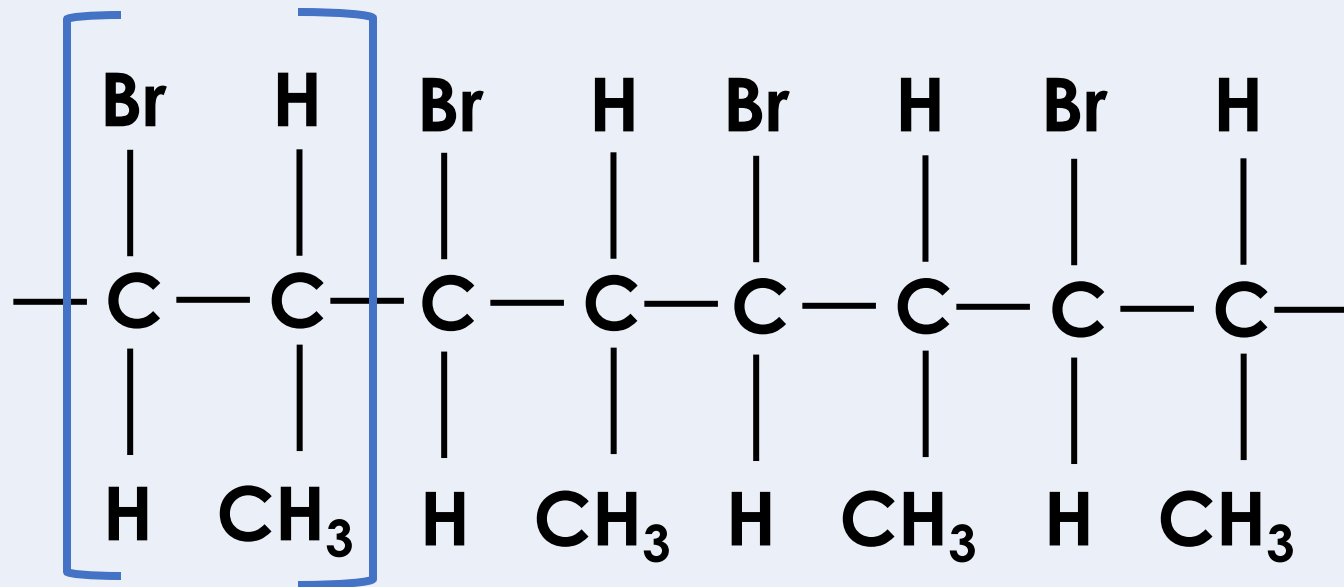
The displayed formula below shows part of a polymer. Draw the displayed formula of the monomer.



1. Identify the repeating unit
2. Draw the structure of the repeating unit
3. Replace the double bond that was broken during polymerisation

## We: Identifying monomers

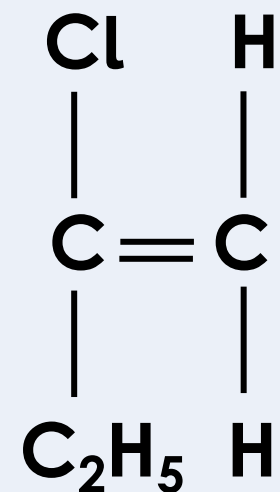
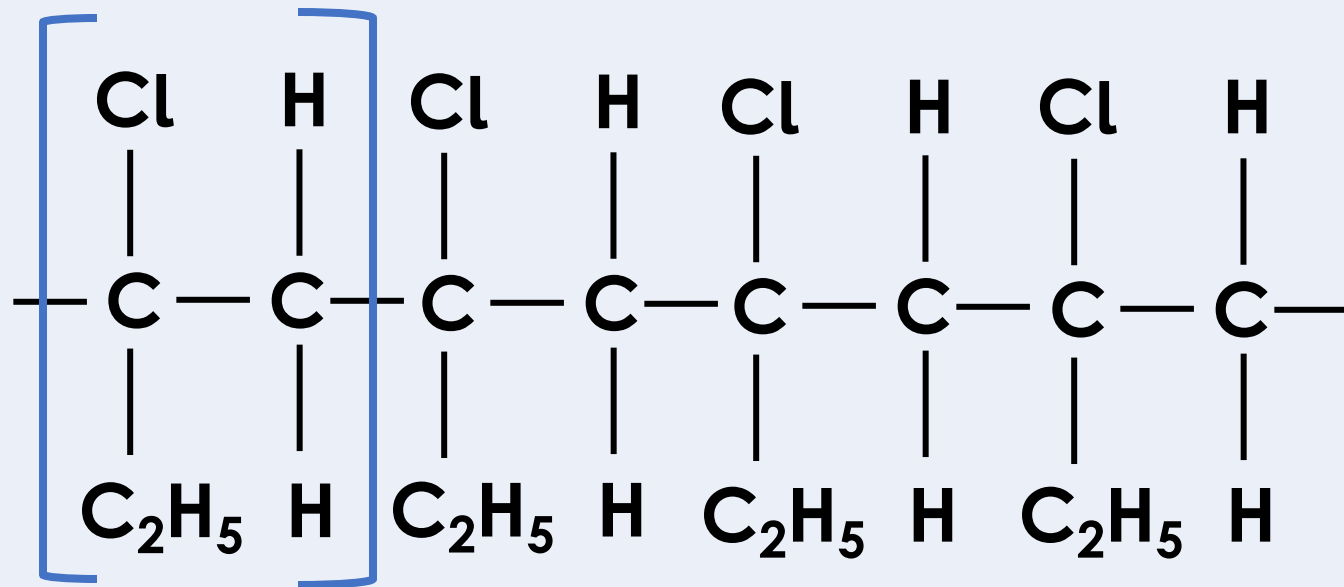
The displayed formula below shows part of a polymer. Draw the displayed formula of the monomer.



1. Identify the repeating unit
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## You: Identifying monomers

The displayed formula below shows part of a polymer. Draw the displayed formula of the monomer.



1. Identify the repeating unit
2. Draw the structure of the repeating unit
3. Replace the double bond that was broken during polymerisation

## Answer the questions below.

1. What is the name of the polymer formed through the addition polymerisation of propene?
  - ☐ A. Poly(ethene)
  - ☒ B. Poly(propene)
  - ☐ C. Poly(propane)
2. What happens to the atoms of monomers in addition polymerisation?
  - ☐ A. Some atoms are lost
  - ☐ B. Extra atoms are produced
  - ☒ C. Atoms are not lost or produced
3. What is made during an addition polymerisation reaction?
  - ☐ A. A polymer and another product
  - ☐ B. A polymer and different monomers
  - ☒ C. A polymer only



## Lesson C5.1.13

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)  
or by emailing [sciencemastery@arkonline.org](mailto:sciencemastery@arkonline.org)  
Thank you!