

## Practice in organic chemistry reactions

- ✓ Addition
- ✓ Elimination
- ✓ Substitution

Remember:

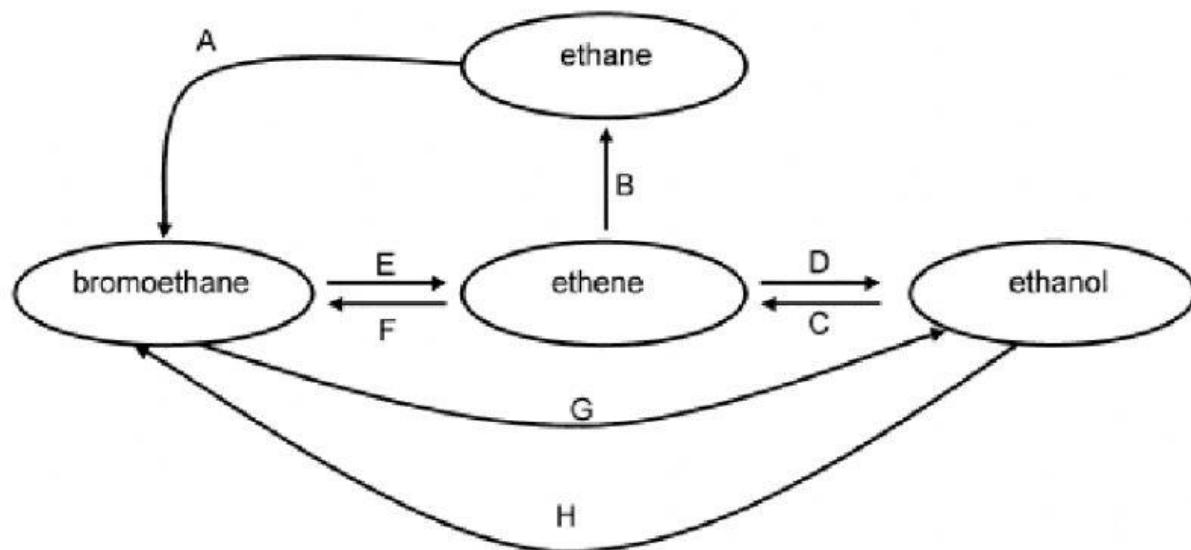
If a substance goes from unsaturated to saturated = Addition reaction

If a substance goes from saturated to unsaturated = Elimination reaction

If a substance goes from saturated to saturated = Substitution reaction

This section is often tested in the form of flow diagrams

### Exercise 1:



Label the following reactions as addition, elimination or substitution and then state the specific type

**Addition:** hydrogenation, halogenation, hydration or hydrohalogenation

**Elimination:** dehydrogenation, dehydration or dehydrohalogenation

**Substitution:** halogenation, hydrolysis, substitution with hydrogen halides

#### Instructions

- ✓ Always write the addition, elimination or substitution first and then the specific type
- ✓ When writing subscripts – just write them as normal values eg  $\text{H}_3\text{PO}_4$
- ✓ Spelling counts in organic chemistry

#### Exercise 1:

1.1 A

1.2 B

1.3 C

1.4 D

1.5 E

1.6 F

1.7 G

1.8 H

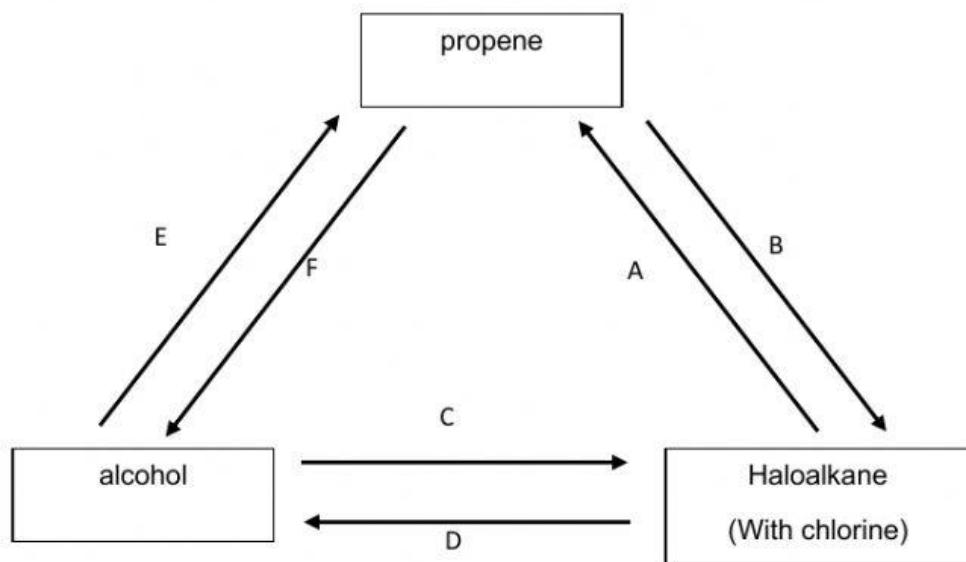
1.9 Write the name of the catalyst used in reaction C:

1.10 Write the formula of the **inorganic** compound needed for reaction A to take place:

1.11 Write the formula of the **inorganic** compound needed for reaction F to take place:

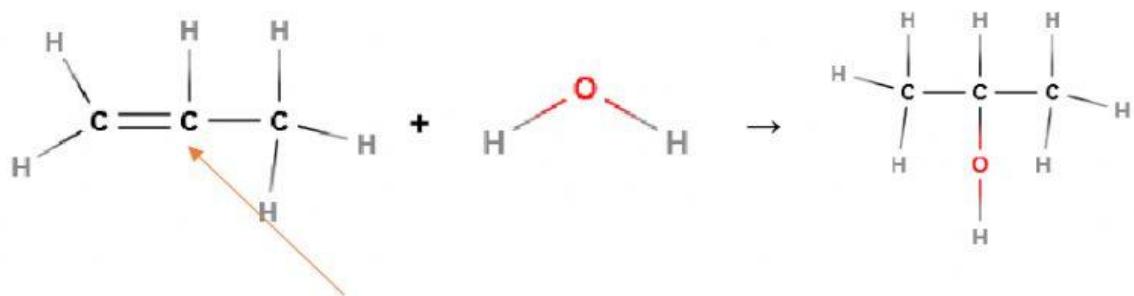
1.12 Write the name of the other compound that forms in reaction C:

## Worked example:



I'm not going to do them in order, because I'm not sure what the haloalkane looks like yet.

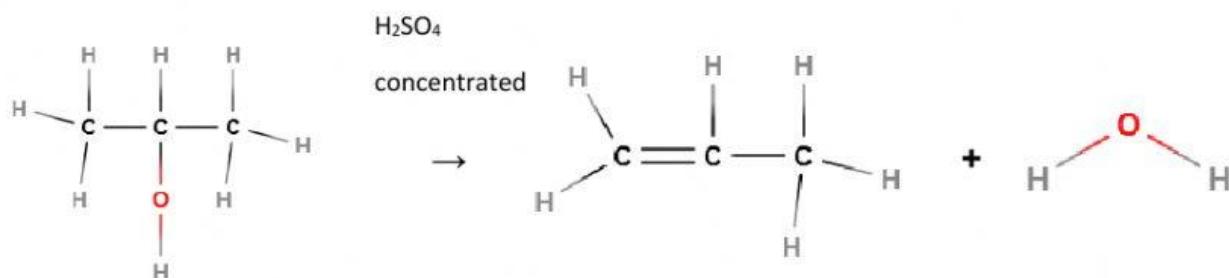
F: Addition (because substance is going from unsaturated to saturated), hydration



Follow Markovnikov's rule- and add the OH to the carbon that has the least hydrogen atoms attached to it

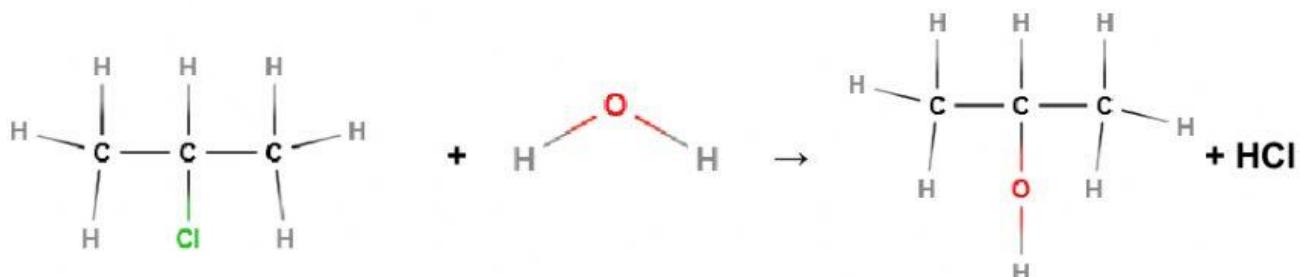
This way we can also see the OH is in the middle of the compound – for any future reactions.

**E: Elimination (elimination is always the reverse reaction of addition), dehydration**



**D**

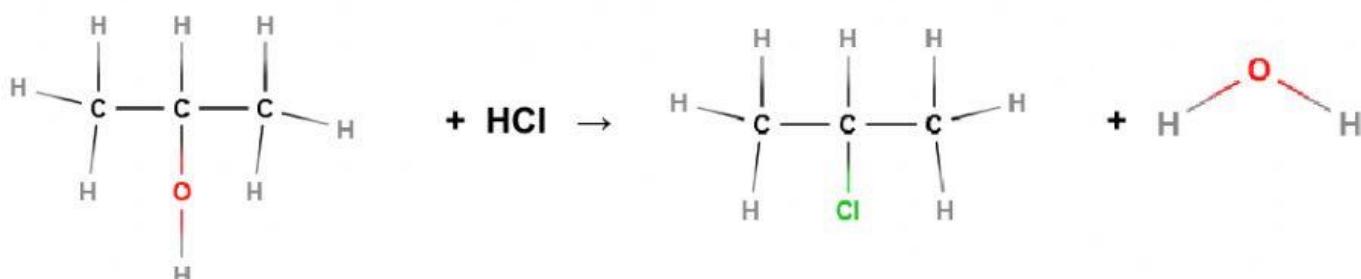
**Substitution (because it goes from a saturated to a saturated compound), hydrolysis**



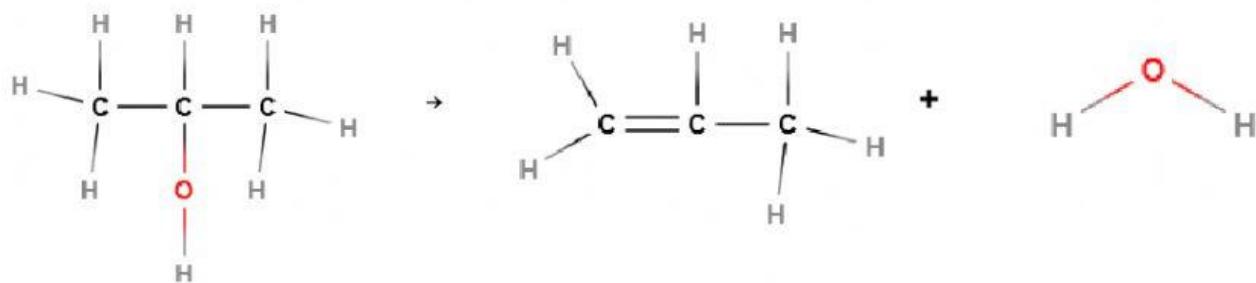
**\*you do not have a choice during substitution of where to place the OH from the water. It has to just replace the Cl**

If reaction D was a substitution reaction, then the opposite/reverse reaction C, will also be substitution

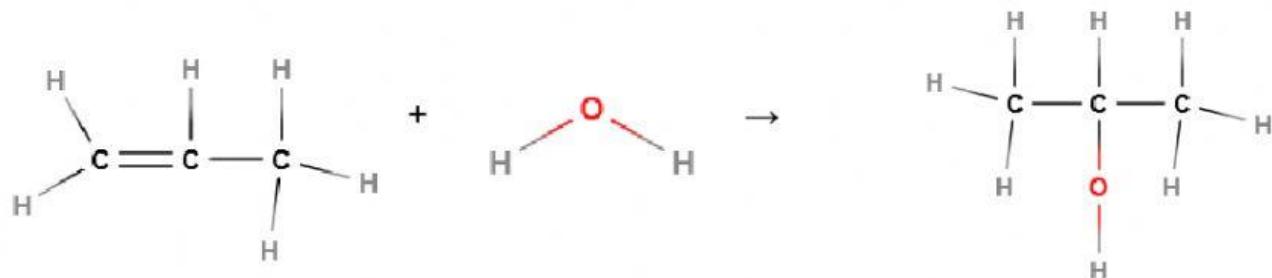
**C: Substitution (with hydrogen halides)**



A: Elimination (saturated compound is changing into a unsaturated compound), dehydration



B: Addition (hydration)



Notice:

The opposite/reverse of a substitution reaction is substitution

The opposite of addition reactions are elimination reactions

The opposite of elimination reactions are additions reactions

Then complete:

Pg 279 Q5

Pg 280 Q5

Pg 281 Q7

Pg 282 Q6

Pg 284 Q5

Pg 285 Q5

# Organic macromolecules

Organic macromolecules are massive organic molecules that form when smaller organic molecules join together in a reaction called addition polymerisation

The table below is all you need to know for macromolecules

The  $n$  outside the brackets just mean a large number of ethane or propene molecules reacting together and forming the macromolecule.

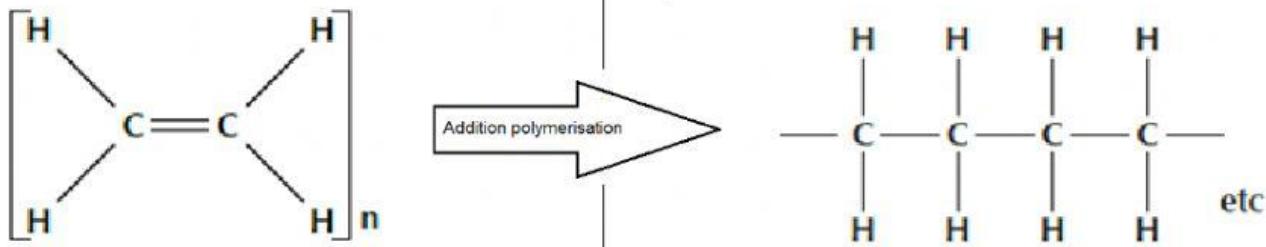
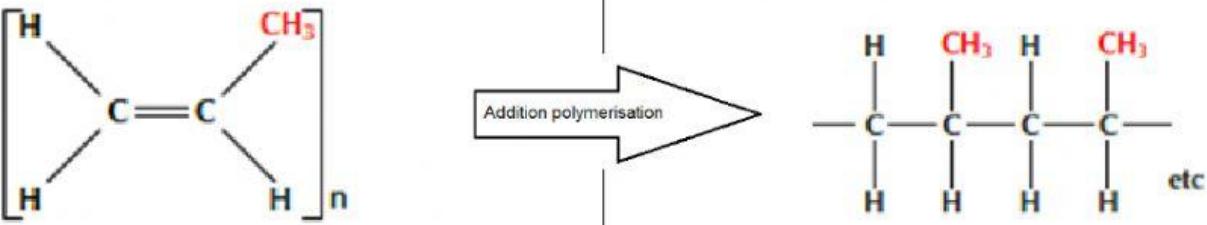
Notice that the double bond breaks during a **polymerisation** reaction, thus it is a type of **addition** reaction

## Macromolecule

A molecule that consists of a large number of atoms.

## Addition polymerisation

A reaction in which small molecules joint to form a very large molecule by adding on double bonds.

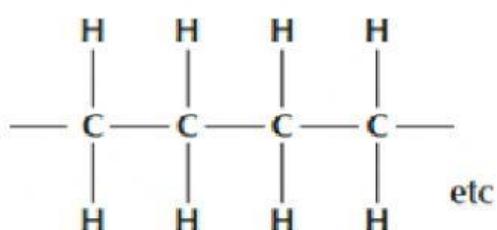
Monomer	Polymer
Small organic molecules that have can be covalently bonded to each other in a repeating pattern.	A large molecule composed of smaller monomer units covalently bonded to each other in a repeating pattern.
Ethene	<p>Polyethene/Polvethylene</p>  <p>Uses:</p> <ul style="list-style-type: none"><li>• Plastics</li><li>• Squeeze bottles</li><li>• toys</li></ul>
Propene	<p>Polypropene/Polypropylene</p> 

## Condensation polymerisation – you only need to know the definition

Molecules of two monomers with different functional groups undergo condensation reactions with the loss of small molecules, usually water

### Exercise 2

2.1 Name the macromolecule below:

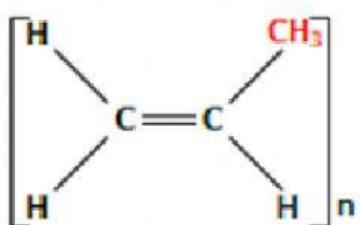


2.2 Name the monomer that was used to form the above polymer

2.3 Name the reaction that was used to form the above polymer

2.4 State 2 uses of this polymer

3.1 Name the monomer below



3.2 Name the polymer that forms when many of the monomers are added together