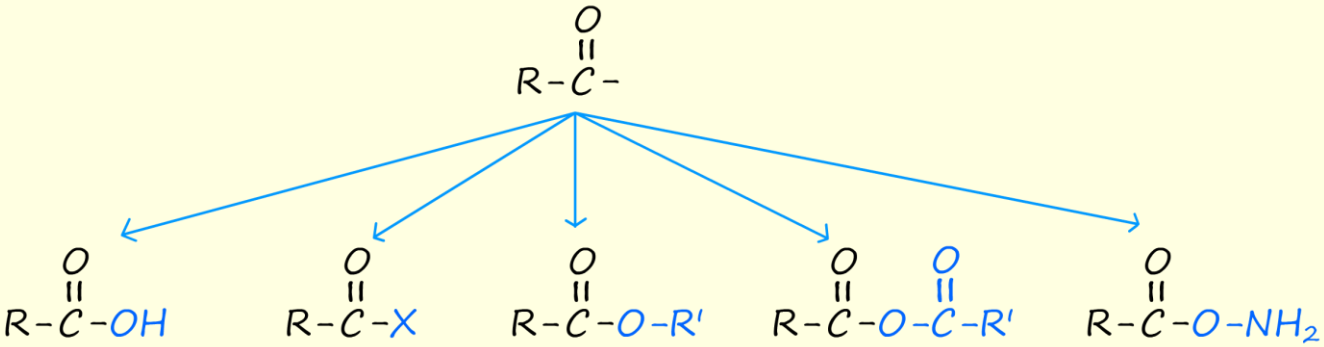
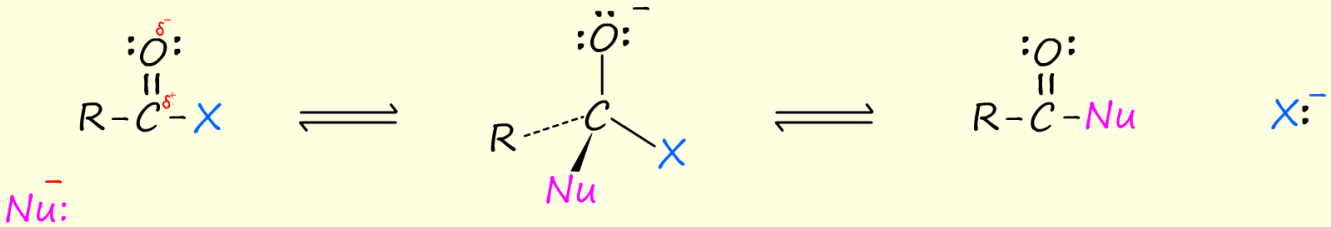
Answer all the questions below as fully as you can then check your answers

1. Draw an acyl and a carbonyl group.
2. Name the functional group present in each of the molecules shown below:



3. What is a nucleophile and what is an electrophile?
4. Add curly arrows to the diagram below to show how the nucleophile (Nu) can attack the acid halide molecule in an addition-elimination reaction

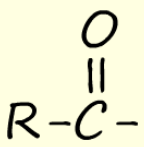


b. Describe in words how the addition-elimination mechanism takes place.

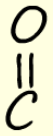
c. What makes a leaving group a good leaving group?

Answers

1. Draw an acyl and a carbonyl group.

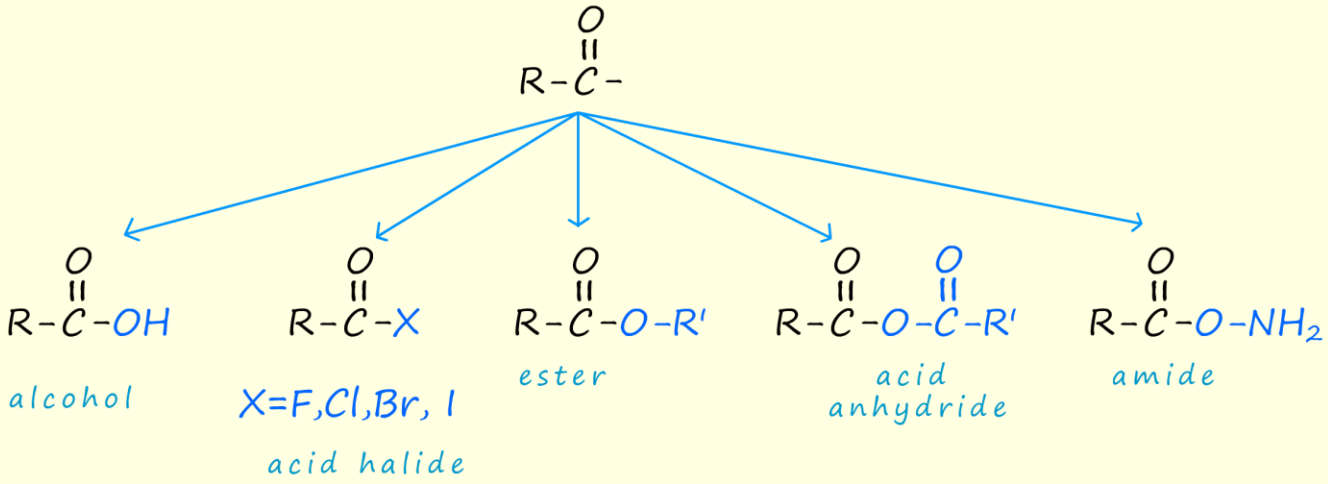


acyl group



carbonyl group

2. Name the functional group present in each of the molecules shown below:

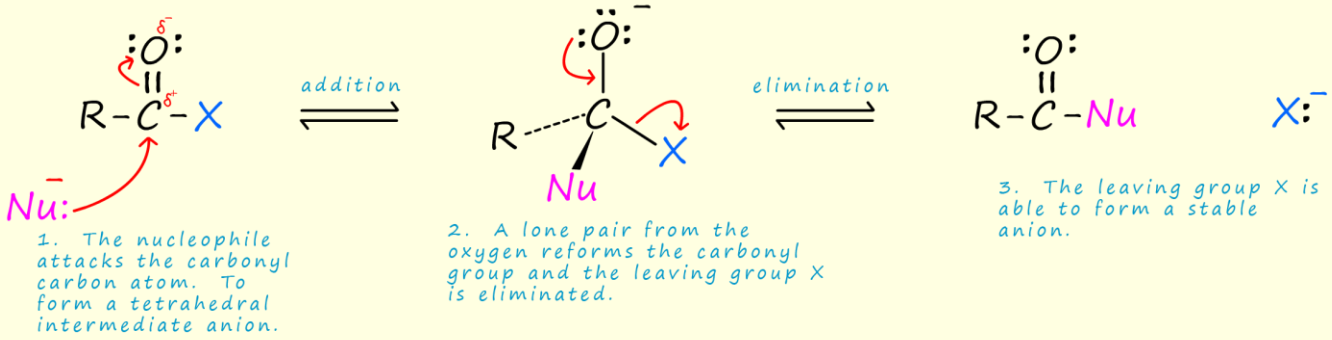


3. What is a nucleophile and what is an electrophile?

A nucleophile is an electron rich species; they provide a pair of electrons to form a new covalent bond. Nucleophiles will contain lone pairs and some will have a negative charge.

An electrophile is an electron deficient species; they will accept a pair of electrons from a nucleophile.

4. Add curly arrows to the diagram below to show how the nucleophile (Nu) can attack the acid halide molecule in an addition-elimination reaction



Overall the mechansim involves addition followed by elimination. This addition then elimination is equivalent to an overall substitution reaction.

b. Describe in words how the addition-elimination mechanism takes place.

A nucleophilic addition- elimination mechanism, it is outlined below but it can be thought of as occurring in a number of steps:

- A nucleophile attacks the δ^+ carbon atom in the acyl group.
- The attacking nucleophile forms a new bond to the δ^+ carbon atom in the carbonyl group creating a tetrahedral intermediate with a negatively charged oxide ion.
- A lone pair of electrons on the oxide ion then reforms the C=O bond and a leaving group is eliminated.

c. What makes a leaving group a good leaving group?

There are a number of factors to consider but generally good leaving groups are:

- able to stabilise a negative charge, this could be by forming resonance structures.
- As the electronegativity of an element increases its ability to act as a leaving group increases e.g. For the halogens the ability to act as a leaving group increases as F>Cl>Br>I.