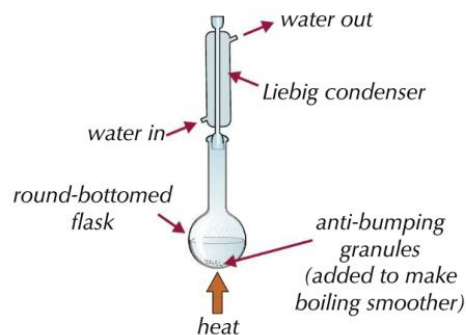


Reflux

A reflux reaction can be used to react reactants when they are heated before they catch fire or evaporate. The mixture is heated in a flask fitted with a vertical Liebig condenser so the mixture can be continuously boiled, and as the vapours evaporate into the condenser they condense and are recycled back into the flask, giving them time to react.

The chemicals used in organic reaction are often hazardous so a risk assessment needs to be carried out before any reactions take place in the lab.

Organic liquids can be prepared and purified using:



Redistillation

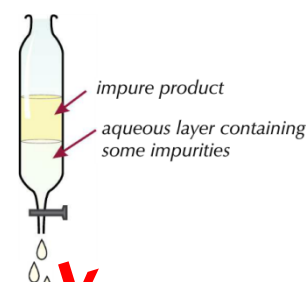
Redistillation is the technique where mixtures containing volatile liquids are purified. Redistillation can be used to separate products and impurities if they have different boiling points. The same distillation apparatus is used but the impure product is heated instead of the reaction mixture.

The desired liquid is placed in a flask at the open end of the condenser when it has boiled and the flask is ready to collect the product. When the thermometer shows the temperature is changing, another flask is placed at the end of the condenser because a different liquid is about to be delivered.

Separation

If a product is insoluble in water, then a separating funnel can be used to remove any impurities that do dissolve in water, such as salts or water-soluble organic compounds e.g. alcohols.

Once the reaction is completed, the mixture is poured into the separating funnel, and water is added. The funnel is shaken and allowed to settle. The organic layer is normally less dense than the aqueous layer and floats at the top. Most of the water-soluble impurities are dissolved in the aqueous layer. The stopper on the separating funnel can be opened to allow the aqueous layer to run off and collect the desired product.



The product may not be pure after separation – any organic impurities that don't dissolve in water will still be in the organic layer alongside the product. They need to be removed by redistillation.

Drying agents

Using separation can cause trace amounts of water to end up with the organic layer. Anhydrous salts such as magnesium sulphate (MgSO_4) or calcium chloride (CaCl_2) can be used to dry it. The salt is used as a drying agent – it binds to any water present to become hydrated. The drying agent becomes lumpy when first added to the organic layer – more needs to be added. All the water has been removed once you are able to swirl the mixture and it looks like a snow globe (cloudy). The mixture goes clear when it's dry and the drying agent settles at the bottom. The mixture can be filtered to remove the solid drying agent.

Synthetic routes

Homologous series	Functional group	Prefix/suffix	Properties	Typical reactions
Alkane	only C–C and C–H	-ane	Non-polar, unreactive	Radical substitution
Alkene	C=C	-ene	Non-polar, electron-rich double bond	Electrophilic addition
Alcohol	C–OH	-ol (or hydroxy-)	Polar C–OH bond	Nucleophilic substitution/ Dehydration/ Elimination/Oxidation
Haloalkane	C–X	halo- (e.g. chloro-)	Polar C–X bond	Nucleophilic substitution
Ketone	C=O	-one	Polar C=O bond	—
Aldehyde	HC=O	-al	Polar C=O bond	Oxidation
Carboxylic acid	-COOH	-oic acid	Electron-deficient carbon centre	—

The properties of functional groups influence reactivity. The table gives a summary of the homologous series.