Making esters – transcript

Esters are both natural and synthetic carbon compounds that can be found in a range of consumer products such as foods and perfumes.

For example, the natural ester 3-methylbutyl acetate is found in bananas and helps give them their distinct smell.

The synthetic ester methyl butanoate can be added to candy to give it the taste and smell of a pineapple. Synthetic esters are made from a reversible condensation reaction between a carboxylic acid and an alcohol.

This reaction is known as esterification.

In this experiment, four different ester compounds will be prepared.

A table like this will need to be constructed for recording the results.

Four test-tubes are labelled one to four and placed in a test-tube rack. The labels need to be at or near the neck of the test-tube.

One centimetre cubed of methanol is added to test-tube 1 using the pipette attached to the methanol bottle. Then, one centimetre cubed of ethanoic acid is added to test-tube 1 using the pipette attached to its bottle.

The pipettes should not be cross-contaminated.

The procedure is repeated for the other combinations in the results table.

Ethanol and propanoic acid is added to test-tube 2. Propan-1-ol and butanoic acid is added to test-tube 3. Butan-1-ol and methanoic acid is added to test-tube 4.

Five drops of concentrated sulfuric acid is then added to all four test-tubes.

Then, a piece of cotton wool is placed into the mouth of each test-tube.

To make a condenser, a paper towel is soaked in cold water, folded several times, wrapped around the neck of the test-tube and secured with a rubber band.

Repeat this procedure for the other test-tubes.

Using a kettle, a hot water bath is prepared. The beaker is filled up to the one hundred centimetres cubed mark.

The labelled test-tubes are then carefully placed in the water bath.

The timer is started and the test-tubes are left in the water bath for ten minutes.

During the condensation reaction, four small beakers are labelled one to four.

Twenty centimetres cubed of sodium carbonate solution is measured out and poured into beaker one.

This is repeated for all the other beakers.

After ten minutes, the test-tubes are put back into the rack using the test-tube forceps and are left to cool.

When cool, the cotton wool is removed from the mouth of each test-tube. The reaction mixtures are poured slowly into their correspondingly labelled small beakers. The contents are then swirled gently.

When any effervescence has stopped, the vapour from each beaker is gently wafted towards the nose. Esters are generally pleasant smelling compounds and it is often possible to identify specific fruit smells.

The vapours should not be inhaled directly and the beaker should be a suitable distance away from the nose.

The results are recorded in the results table.

Esters can also be identified by the presence of oily droplets floating on the surface. The beaker may need to be gently swirled in order to observe these oily droplets. Any observations are recorded in the results table.

Here is the completed results table.

All four condensation reactions produced a distinct smell of an ester compound. The ester from test-tube 1 smelt like glue whereas the esters from test-tubes two, three and four all smelt sweet, with fruit smells.

Oily droplets floating on the sodium carbonate solution are clearly visible for the esters from test-tube 3 and test-tube 4. They are very difficult to see from the esters in test-tubes 1 and 2.

The reaction in test-tube one produced the ester methyl ethanoate; test-tube two produced ethyl propanoate; test-tube three produced propyl butanoate and test tube four produced butyl methanoate.

Ester names have two parts. The part that comes from the acid and the part that comes from the alcohol.

Esters form from the reversible condensation reaction between an alcohol and a carboxylic acid in the presence of the catalyst concentrated sulfuric acid.