

4. WHERE IS THAT SMELL COMING FROM ?

Many artificial scents and flavours as well as natural ones are made up of chemicals that evaporate easily, and react with special receptor molecules in our noses. Artificial scents can be manufactured by reacting two different types of chemical, with the addition of a few drops of acid to make things go faster.

WHAT YOU NEED

- A few mL of an organic acid eg: acetic acid (vinegar) and a dropper
- A few mL of organic alcohol eg: isopropanol (rubbing alcohol) or ethanol (methylated spirits) and a dropper
- Capped plastic vial
- Styrofoam cup (to cut up and make a float)
- Heatproof container (a saucepan works well)
- Hotplate with thermostat (temperature of 50-60°C required)
- A few drops of concentrated hydrochloric acid, and dropper

WHAT TO DO

1. Cut the bottom off a styrofoam cup, or find a flat piece of buoyant material 4-5cm diameter that you can make a hole in easily.
2. Cut a hole in the float big enough to take the plastic reaction vial, and push the vial into the float.
3. Use a dropper to add 1mL of your organic acid to the reaction vial (about 20 drops).
4. Use a clean dropper to add 1mL of the organic alcohol to the same reaction vessel.
5. Using a clean, dry dropper, add a couple of drops of concentrated hydrochloric acid to the reaction vial, close the lid and mix.
6. Fill a saucepan or other heatproof container with water to a depth of 10cm to make a water bath.

7. Place the water bath on your hotplate, and set it to heat to 50-60°C. Do not let the bath boil or the cap will pop on the reaction vial.
8. Put the float with the reaction vial into the water bath so the mixture is surrounded by hot water.
9. Allow the reaction to proceed for 30-60 min, checking to make sure the water level remains enough to keep the reaction vial floating freely (add water if necessary).
10. Carefully remove the reaction vessel from the water bath, and pop open the cap.
11. Hold the vial 5cm from your nose and waft any vapour towards you (try waving over the top of the vial with your hand). A new scent should be obvious, depending on which combination of acid and alcohol you used (see Appendix 2 for examples).
12. Some concentrated acid will remain in the mixture, so dispose of with care (eg: flush down the sink with plenty of water).

WHAT IS HAPPENING?

The acid and alcohol react to make a new compound called an ester, a type of chemical which often has a strong odour. The structure and shape of the ester molecule determines which receptor in your nose it can react with, and so what you smell. Some people have different nose receptors to others, so not everyone can smell the same things. Many natural scents and flavours are esters (see Appendix 2), and these are made in nature using a wide variety of organic acids and alcohols found in living organisms.

This reaction happens very slowly at room temperature (which is why you need to heat it up), and the extra hydrochloric acid also helps make the reaction go faster. The extra acidity from the hydrochloric acid helps start the reaction, but is released again when the reaction is completed (and so it remains in the liquid). Something like this which makes a reaction go faster, but does not get used up is called a catalyst.

