

Health and safety

- Do not eat the food colorant!
- Some people might be intolerant of the food dye. If it comes into contact with skin, wash it off with lots of water.
- Avoid getting the food dye on clothes - it will stain!

You will need

- Some scented (this is important) food colouring
- A Pasteur pipette
- Nine test-tubes (from the kit) carefully filled with 9 ml of water and numbered 1 to 9

What you can do

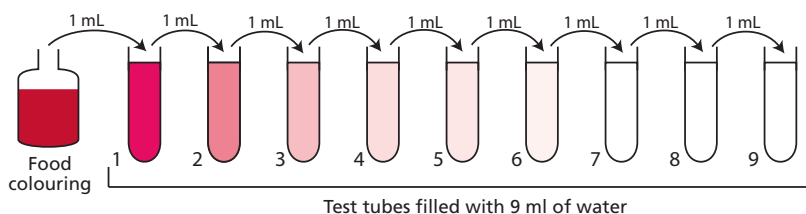
- With your Pasteur pipette, carefully measure 1 ml of your food colouring and add it to tube number 1.
- Mix the tube thoroughly so that the colour is even throughout.
- Smell the tube? What does it smell of? Does it smell the same as the original food colouring?
- Now take 1 ml of liquid from tube 1 and add it to the next tube. Keep doing this: dilute tube 1 into tube 2, tube 2 into tube 3, and so on, until you dilute tube 8 into tube 9. At each stage, repeat steps 2 and 3 before doing the next dilution.

At what point can you no longer see any red in the tubes?

At what point can you no longer smell anything in the tubes?

How can you explain the difference?

If you had not done the dilution like this and wanted to dilute 1 ml of the food dye to the same concentration as the last tube, how much water would you need?



What's happening?

In each tube the food colouring is ten times more dilute than the previous tube. By the time you reach the ninth tube the original food colouring has been diluted by a billion times, so for every part of food colouring there are a billion parts of water.

This experiment illustrates the sensitivity of our senses. Our sense of smell allows us to detect very dilute amounts of food colouring after we're no longer able to see any trace of it. We can only see relatively large objects, but our sense of taste and sense of smell can detect individual molecules which are just tens of nanometres in size.



To find out more

- <http://www.nanoandme.org/nano-products/food-and-drink/>
- http://www.nanooze.org/english/articles/5senses_noseknows.html
- <http://web.mac.com/drshawn1/iWeb/Site/Serial%20Dilutions.html>
- http://en.wikipedia.org/wiki/Colloidal_gold

What does it mean?

A **dye** is a chemical that changes the colour of something. Different dyes exist to change the colour of different things, so food dyes are different to clothing dyes which are different to dyes used in stained glass windows.

A **serial dilution** is the type of dilution that you just did. You use the diluted solution that you just made as the source for your next dilution. Using serial dilutions is much easier when you want to dilute something a lot.

Olfaction is the proper name for your sense of smell. A part of your brain called the 'olfactory bulb' is responsible for interpreting the smells that your nose detects. Interestingly, the olfactory bulb is strongly linked to a part of your brain that is responsible for remembering things. That's why certain smells can make you remember specific things clearly.