Dissolve coloured sweets to create a rainbow

These notes accompany the video demonstration **Sweet rainbow science: dissolve coloured sweets to create a rainbow** from *Education in Chemistry* which you can view at: rsc.li/4eXA2XS

This demonstration shows how coloured sweets can provide an easy and speedy experiment that will intrigue learners and act as a great hook for your lessons.

Curriculum links

Use this demonstration when teaching the particle model, diffusion and density to learners aged 14–16.

Equipment

- M&Ms, Smarties, Skittles or similar coloured sweets
- White plate or shallow dish
- A beaker of water, enough to cover the base of the dish

Setting up the experiment

Ensure there is a white backdrop below the experiment either by working in a white dish or by placing white paper beneath a glass dish. Place your sweets around the edge of the dish.

In front of the class

Add water from the beaker slowly and carefully to the centre of the dish to almost submerge the sweets without allowing the water to swish around too much. The sugar and food colouring around the outside of the sweet dissolve, sink and spread along the base of the plate leading to clearly defined bands of colour that tend not to blend with one another.

Note if you're using M&Ms or Smarties, the effect will be slower; Skittles' sugary centres seem to move more quickly than the chocolatey centres of M&Ms and Smarties.

Health, safety and disposal

- Remind learners they cannot eat in the lab and shouldn't taste their rainbow.
- Pour used solutions down a foul-water drain.
- Dispose of solids in the general waste.

Teaching goal

Particles in a liquid still move very fast (although slower than in a gas) at room temperature, but because the liquid state is much more dense than the gaseous one, the particles are much closer to their neighbours. Therefore, they barely get to move at all before colliding. Consequently, liquids diffuse at a rate approximately 100,000 times slower than a gas.

This means that diffusion of small molecules, like our food colouring and sugar, typically happens at millimetres per minute at room temperature. If you carefully add a drop of food colouring or a crystal of potassium manganate(VII) to a larger beaker, the motion of the material might not be obvious within the time frame of a lesson.

While waiting for something obvious to occur with food colouring alone, coloured sweets can generate bulk fluid motion as they dissolve, meaning your learners can see the effects in much shorter time frames. Alongside the colouring the sugar also dissolves, which increases the local density of the solution. The denser solution then sinks to the bottom of the container and spreads along the base until it meets fluid of a similar density and momentum. It is this movement that leaves the coloured bands in the dish.

Tips

Try these two variations on this demonstration:

1. Compare warm with cool water to show how the rate of dissolution increases in warm water.
2. Demonstrate the importance of sugar to generate the effect by swapping some of the sweets for sugar cubes or sweets whose coloured shells have already dissolved. The remaining, coloured sweets still give sharp bands of colour.