Issue 55 – 03/11/21

www.scienceinschool.org

Examples of Demonstrations

The art of science demonstration

Examples of experiments that could be worth running as demos:

1. A teacher might demonstrate how to extract chlorophyll from a leaf prior to students doing it themselves, especially if they are not skilled in following multi-stage procedures. This could be supported by the teacher using a visualizer, so that students can easily see what is happening, and the teacher asking students why each stage is being carried out. This would be even more effective if the teacher were seen to be following the same instruction sheet that the students will be using.

2. A teacher might demonstrate Newton's second law of motion, as applied to the effect of changing force upon a fixed mass. This is often done as a demonstration due to a shortage of equipment, but, in fact, it is a good opportunity to ask probing questions about aspects such as emerging patterns in data, the need for repeat readings, and aspects such as keeping the total mass of the system constant. There is also scope for asking more leading questions: How could we design the experiment so that the time intervals are greater – and why? What would happen if we used model railway track and a wagon instead of a trolley on a ramp?

A worked example

Demonstrating the reactions between alkali metals and water.

This is an abridged version to illustrate the points made in this article. A full protocol is available from the Royal Society of Chemistry.

Step	Visual support	Suitable questions
1. Half fill the trough with water. Add universal indicator (UI) solution until colour is visible. At least two safety screens should be used, as close to the trough as possible.	Webcam or visualizer setup, so that an image of the surface of water is displayed on screen.	What is the purpose of the UI solution? What would it show if the solution turned red/yellow/blue/purple?

2. Using tweezers, drop a small piece of lithium onto the water surface in the trough. It should float and fizz, giving off hydrogen. The water in the trough turns alkaline.	As above. Have a still image of the reaction and display it as a record immediately after the demonstration. Depending on the learning objectives, construct a word/symbolic equation.	What evidence is there that a reaction has taken place? What might the gas be? What does this suggest about lithium? What do you think the reactants are? Suggest what we know about the products.
3. Using fresh water, repeat with sodium. It should float, move around more vigorously, and fizz. It may catch fire, burning with a yellow flame and giving off smoke.	As above. Add an image of the sodium reaction. Depending on the learning objectives, construct a word/symbolic equation.	What evidence is there of a reaction? What do you think the reactants are? Suggest what we know about the products. How do the two reactions compare? What does this suggest about sodium? Where are the two elements on the periodic table?
4. Replace the water and repeat with potassium. It moves around vigorously, melts, fizzes, catches fire, and burns with a lilac flame.	As above. Add an image of the potassium reaction. Depending on the learning objectives, construct a word/symbolic equation.	What evidence is there of a reaction? What do you think the reactants are? Suggest what we know about the products. How do the three reactions compare? What does this suggest about potassium? The lithium and sodium demonstrations are sometimes done by floating the metal on a piece of filter paper. What difference might this make? Why is this not recommended with potassium? Where are these elements on the periodic table? Why do you think these metals are never found naturally as elements? When cut, these metals have a bright surface, but this soon tarnishes – why do you think this is? Why do you think these metals are kept under oil?