

Density Tower Experiment

Safety and First Aid

This section will only deal with the specific safety issues regarding the chemicals involved and used in the video. There are likely to be other safety issues that will need to be addressed outside the scope of this section. A full risk assessment should be performed prior to undertaking the experiment.

- Students should not ingest any of the experiment; good lab practice starts young!
- There are no specific safety hazards associated with any of the chemicals used in this experiment
- *First Aid* – wash the affected area with water. Standard burn first aid should be followed.

Glossary

- $Density = \frac{Mass}{Volume}$
- *Specific gravity* – the ratio of density of a measured liquid to the density of a reference liquid

Suggested Teaching Points

- *Density* – this experiment measures and compares the density of a selection of common household liquids
- *Physical properties* – this experiment can be used to introduce the idea liquids will have different physical properties
- *Practical skills* – this experiment requires students to carefully add one solution onto another without causing excessive mixing
- *Problem solving* – this experiment can be expanded to provide students with problem solving exercises (see suggested improvements / student challenge section)

What to Expect

Please see the video for a detailed depiction of the experiment.

In this experiment, students will construct a density tower by using a selection of salt solutions with different concentrations. The density of a substance is a measure of the amount of mass that is present in a given volume. Generally, the higher the concentration of a solution, the higher the density; this is not always true however. A simplified explanation for this observation is because

there is more salt dissolved in the same volume of water, there is therefore more mass present occupying the same volume of space.

As shown in the video, the solution with the highest concentration of salt (i.e. the most dense) is added to the tube first. After this, the next highest density solution is carefully added to the top of the previous layer. If care is taken to avoid mixing of the two layers, then the second layer will float on the top because it is of lower density.

Equipment and Chemicals

- Water
- Table Salt
- Teaspoon
- Food colouring
- Containers for the different salt solutions

Optional equipment:

- Test tube
- Pipettes
- Drinking straws
- Cellotape

Supplementary Instructions

- Ensure that all of the salt has dissolved in each solution prior to use.
- The lowest level of the density tower should be the solution that has the highest amount of salt (i.e. the most dense)
- Be careful when first adding the next layer of solution. Try and keep mixing to a minimum.
- We recommend using a low fibre density paper for the cone. Higher density paper does not allow the salt solution to pass through easily

Suggested Questions for Students

- *Why don't the different salt concentrations mix?* – provided that care is taken to ensure minimal mixing of the layers upon addition, the two different solutions will not mix. This is because the solution with more salt dissolved has a higher density and so sinks below the first.

- *What happens if you mix the different solutions together? Do they separate into individual layers again?* – if the different layers are mixed together, then they will not separate into individual layers. This is because all of the salt solutions are dissolved in water will simply mix together.

Suggested Improvements / Student Challenge

- *Use sugar* – this experiment would work just as well if sugar was used instead of salt. Students could investigate whether salt or sugar solutions are better for this experiment
- *Unknown density* – students could be given a selection of salt solutions varying in concentration but not told the order. Students could then be challenged to work out the density order by experimenting with adding layers together.

Clean up and Waste Disposal

No specific waste protocols are required for this experiment; all of the waste can either be washed down the sink or disposed of in a bin.

Spillages can be cleaned with water and paper towel.