

Volcano Experiment

Safety and First Aid

This section will only deal with the specific safety issues regarding the chemicals involved; 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
- Depending on your brand of food colouring, spillages may stain surfaces, clothes and upholstery
- This experiment will generate a large amount of foam; suitable containment will be required
- *First Aid* – wash the affected area with water

Glossary

- *Effervescence* – to give off bubbles of gas

Suggested Teaching Points

- *States of matter* – this experiment involves solids, liquids and gases.
- *Acids and bases* – this experiment involves the reaction of an acid and a base
- *Effervescence* – this experiment involves the release of gas
- *Surface area* – introduce the idea of surface area effects on rates of reaction

What to Expect

Please see the video for a detailed depiction of the experiment. It should be noted that this experiment is not an accurate representation of the mechanism by which volcanoes erupt.

This experiment demonstrates the classic chemical reaction between an acid (namely acetic acid present in the vinegar) and a carbonate (namely sodium hydrogen carbonate present in the baking soda). When exposed to acids, carbonate undergoes a decomposition reaction in which carbon dioxide is released as a gas. In our experiment, this release of carbon dioxide is what results in the “eruption”. We recommend that washing up liquid is added to the vinegar before addition to the

baking soda as this aids in the formation of a foam occupying a large volume making the eruption look much better!

Equipment and Chemicals

- A large container to contain the foam. A plastic tray or bin liner should be sufficient.
- Two glasses or disposable plastic cup for the reaction
- A spoon
- Vinegar
- Baking soda
- Washing up liquid
- Food colouring

Supplementary Instructions

- The exact ratio of baking soda to vinegar is not essential. However, we found that 3 teaspoons of baking soda to approximately $\frac{1}{2}$ cup of vinegar. The amounts of both reactants needed will also be dependent on the size of the containers used.
- It is recommended that the vinegar / washing up liquid mixture is poured rapidly into the baking soda to mix the chemicals together.
- Ensure the resulting foam is contained to prevent excessive mess

Suggested Question for Students

- *What is the role of the washing up liquid?* – as the gas is formed from the reaction between the vinegar and baking soda, the washing up liquid forms lots of small bubbles to provide the foam needed for the eruption.
- *What would happen if you added the baking soda to the vinegar instead?* – in theory, the same reaction would happen. However, in practise, the foam generated from the initial reaction would push the baking soda away from the vinegar and stop the reaction.
- *What would happen if we used a solid block of baking soda rather than a powder?* – in order for a reaction to occur, the reactant molecules need to collide with each other. As a result, only the molecules on the surface of a solid can react with the vinegar. By using a solid block of baking soda, the number of molecules exposed on the surface would be less (reduced surface area) and so the gas would be released slower.

Suggested Improvements / Student Challenge

- *Papier-mâché volcano* – students could be allowed to design and build a volcano prior to performing the experiment.
- *Investigate the ratio of baking powder to vinegar* – students could investigate the effects of altering the ratio of baking soda to vinegar has on the volcano effect. This could be used to introduce the idea of rates of reaction etc.
- *Investigate the shape of the container* – students could investigate the effect of altering the shape of the container the reaction is performed in.

Clean up and Waste Disposal

No specific waste disposal protocols are required for this experiment; all waste can be washed down the sink with water.

Spillages can be cleaned with water and paper towel.