

## Topic: Materials

### Investigation: Irreversible Changes – Homemade Volcano

#### Introduction

An investigation demonstrating irreversible changes.

#### Suitability

Ages 9–11

#### Equipment and preparation

##### For the starter activity:

- A candle (new or used which will form an easily identifiable 'pool' of liquid wax; preferably one with a sturdy base so that it won't fall over if the table is knocked)
- Activity Sheet: Get Cooking With Beepy!

##### For the main activity (per group):

- The lid of a large aerosol-type container (this will need to hold around 150ml of liquid)
- 50ml vinegar
- 50ml water (warm water increases the rate of the reaction)
- Bicarbonate of soda (one tablespoon)
- A small amount of washing-up liquid
- A board to build the volcano on
- Modelling clay
- Red and orange food colouring
- Paints and small model trees (optional)
- Digital camera with video capability (optional)

#### Time

About 45 minutes

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## Activity

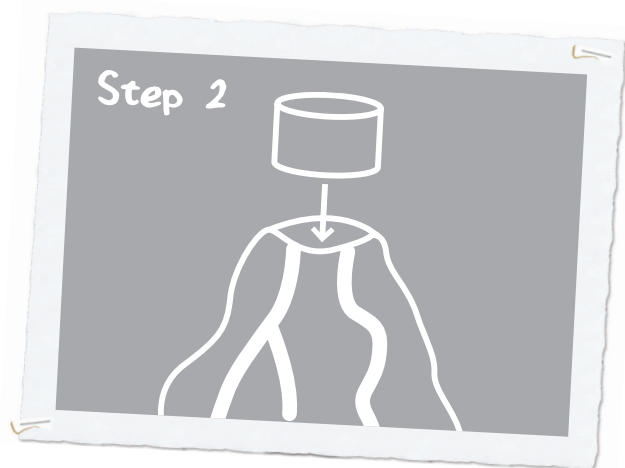
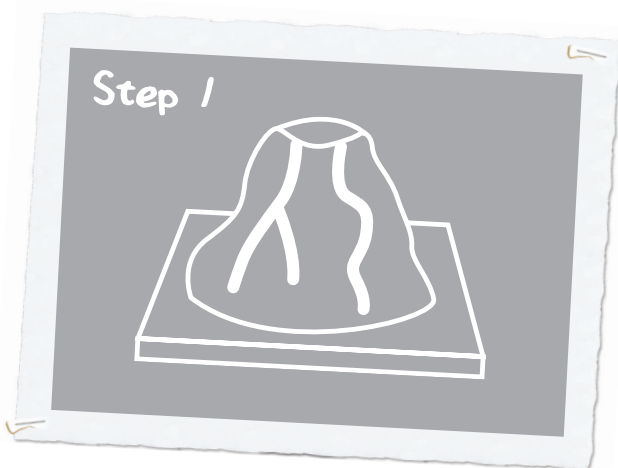
Light a candle and place it at the front in clear view. Ask pupils to gather round and observe the burning candle for a couple of minutes.

- What do they see happening? Tell them they are making a scientific observation when they say they can see smoke, a flame, rising heat or melting wax.
- Is the candle a solid, liquid or gas? In fact it is all three. The wax yet to be burned is solid, the melted wax is liquid and the smoke given off is a gas.
- Ask pupils what will happen when the candle burns down to the end. Can it be brought back? No, once the candle has been burned, all the energy stored in the wax has been transferred into heat and light. It is an **irreversible change**.

Can pupils think of any changes to materials that are reversible (e.g. water can be frozen and then melted back to its original state, or it can be boiled and the water vapour condensed back to water again; also chocolate can be melted in a saucepan then cooled back to a solid form).

They could complete Activity Sheet: Get Cooking With Beepy!

**Tell pupils they are going to do a chemistry demonstration that will involve an irreversible change by creating fake lava for a model volcano.**

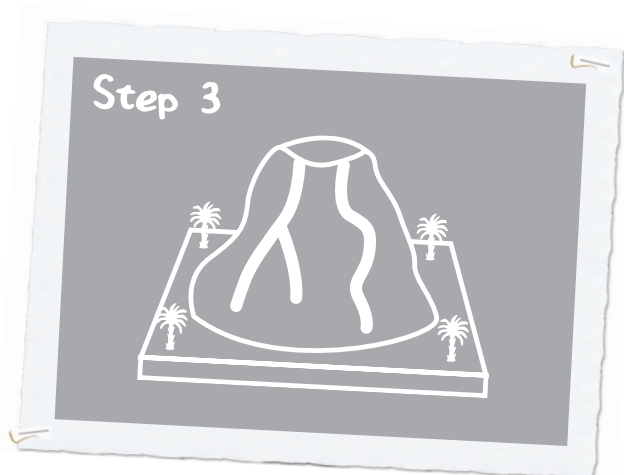


- Take the board and modelling clay. Mould the clay into the shape of a volcano and carve 'larva flow' type channels down the sides.

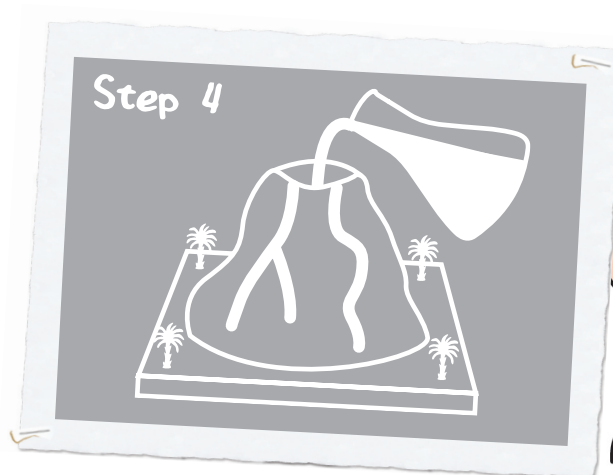
- Place the plastic lid at the top and push it into the clay so it sits level and firmly. This is the 'crater'.



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- Decorate the volcano by painting around the base and adding the trees if they're being used. The volcanoes are now ready to be 'loaded'!



- To make the volcano erupt, first add the water, food colouring, bicarbonate of soda and a dash of washing-up liquid. The 'eruption', or chemical reaction, occurs when you add the vinegar. (The class could add different amounts of ingredients for the different volcanoes to see which has the highest eruption.)

**Note: It is best for the volcanoes to erupt one at a time. If possible, film each 'eruption' with the digital camera for analysis and comparison afterwards. Alternatively, you can watch each eruption one at a time and discuss, comparing them one after the other.**

Ask the groups to record what happened and to discuss the results. Did all the volcanoes 'erupt' in the same way? Did the amount of vinegar/bicarbonate of soda/water differ between the models? Was it a slow gradual process or a rapid 'eruption'? Could they hear a gas being released during the 'eruption'?

Ensure everyone is aware that they created a chemical reaction between the bicarbonate of soda and vinegar, producing carbon dioxide. The fizzing noise was produced by the release of  $\text{CO}_2$  – carbon dioxide. Bubbles of carbon dioxide gas get trapped in the washing-up liquid, forming the lava. An irreversible change has taken place, which resulted in the formation of a new material (the 'lava').