



## Method

See pupils' sheet.

## Safety advice

Make sure pupils have a large empty space in front of them **before** they add the vinegar to their bottle. Emphasise they must aim the cork away from the windows, themselves and other people.

## Chemical background

The cork 'cannon ball' is propelled by the expansion of carbon dioxide gas, produced by the reaction between sodium hydrogencarbonate and ethanoic acid.



eye protection  
must be worn

## 5: King Kong's Hand

● Basic level      ● 30 minutes

N.B. This activity demonstrates in a different way the same reaction as 4: A Gas Cannon

## Requirements

50 cm <sup>3</sup> colourless vinegar	funnel
10 g sodium hydrogencarbonate, NaHCO <sub>3</sub>	
50 cm <sup>3</sup> measuring cylinder	eye protection
150 cm <sup>3</sup> beaker	
disposable latex glove	
permanent felt tip pen in black or brown	

## Method

See pupils' sheet.

Pupils must hold the glove closed to prevent the now fizzing and foaming mixture from spilling out. If the pupils keep the glove tightly sealed, the gas will be trapped and the glove will inflate. Eventually the reaction slows down, the gas begins to escape and the glove returns to its normal size.

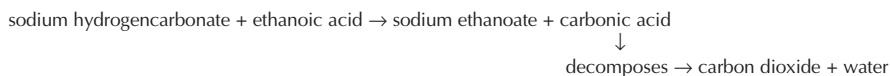
## Safety advice

Eye protection should be worn.

Pupils must be carefully supervised to prevent inappropriate behaviour, e.g. squirting at each other. Although the chemicals are relatively low hazard, vinegar in the eyes might necessitate a trip to hospital.

## Chemical background

This is an exothermic reaction - pupils should notice a change in the temperature of the 'hand'.



IRRITANT  
citric acid



eye  
protection  
must be  
worn

## 6: Bath Bombs

● Basic level      ● 30 minutes or less

## Requirements

20 g bicarbonate of soda (sodium hydrogencarbonate)	dropper
10 g citric acid ( <b>irritant</b> )	cling film
sunflower oil (a few drops per pupil)	large bowl of water
2 x 250 cm <sup>3</sup> beakers	
glass stirrer	eye protection

## Method

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See pupils' sheet.

## Safety advice

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Eye protection must be worn.

## Chemical background

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Citric acid is a solid carboxylic acid. Although its structure is a little more complicated than that of the more familiar hydrochloric acid, in aqueous solution its reaction with hydrogencarbonates is similar in that it forms salts and, at the same time, produces carbon dioxide gas. Bath bombs are made by mixing citric acid crystals and sodium hydrogencarbonate without any water being present (the oil helps the mixture to stick together). When the mixture is dropped into water the chemicals dissolve in the water and their solutions react with each other. The products are water, a soluble salt and carbon dioxide gas. The 'fizz' is the carbon dioxide gas escaping. The reaction is endothermic - takes in heat.

## Extension

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Recipes are readily available on the Internet to make 'bath bombs'. The recipes usually use almond oil (or similar) instead of sunflower oil, and also add borax, colourings and fragrances and sometimes petals or lavender.

Instead of a ball shape, try using cling-film lined containers (e.g. small coffee jar lids) as moulds, or making bath cubes in an old ice cube tray.

# 7: Custard Behaving Strangely

● Basic level

● 20 minutes

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## Requirements

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300 g custard powder  
400 cm<sup>3</sup> glass beaker (squat form)  
250 cm<sup>3</sup> measuring cylinder  
glass rod (or spoon)

## Method

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See pupils' sheet.

As an alternative to custard powder, use cornflour and a few drops of food colouring.

## Safety advice

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Pupils must not eat the custard suspension.

## Chemical background

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Custard powder and water are mixed to form a colloidal suspension. When pushed, it feels hard like a solid; when poured it flows like a liquid. It is a non-Newtonian fluid.

## Reference

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'Outrageous Ooze' from *Enlivening Chemistry*, produced by Department of Chemistry and Chemical Engineering, Paisley University.



food (custard) must not be eaten in the laboratory