



FIZZ, BOOM, BANG

Welcome to Generation Science

Brought to you by Edinburgh Science Learning, *Generation Science* shows and workshops spark pupils' curiosity and bring science to life.

With more than 30 years of experience delivering high quality, engaging shows and workshops, we are leaders in our field.

What we do

Each show or workshop is fully equipped and delivered by trained science communicators. We create fun, interactive environments where everyone gets out of their seats and gets involved. Our inspiring demonstrations and engaging activities are linked to the Curriculum for Excellence, explaining key concepts in a unique and memorable way.

Event Description

Fizz, Boom, Bang is a highly interactive workshop that encourages pupils to explore the mysteries of mixtures and learn about colour changes and solutions. As part of the Generation Science Exploratory Laboratory pupils are briefed on the challenge ahead and protocols in the lab.

Pupils are divided into teams, each with their own workstation. Each team works through a range of experiments to create a cool, colourful, chemical reaction. P4-5 classes are guided through the experiments, while P6-7 classes are introduced to the scientific method and explore the experiments freely.

Curriculum Links

Fizz, Boom, Bang complements the following experiences and outcomes:

SCN1-16a: I can make and test predictions about solids dissolving in water and can relate my findings to the world around me.

SCN2-15a: By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed.

SCN2-16b: By investigating common conditions that increase the amount of substance that will dissolve or the speed of dissolving, I can relate my findings to the world around me.

SCN2-19a: I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made.

Learning Outcomes

- Describe that pH is an indication of how acid or alkali something is
- Explain that indicator is a chemical which can tell us the pH of a chemical
- Define a chemical reaction as when two or more things are mixed together, they change and produce something new
- List the indications of a chemical reaction that can include production of heat, light, colour changes or gas production
- Recall that a solid will dissolve or react faster in a solution if it is broken up into smaller pieces

FOLLOW-UP CLASSROOM ACTIVITY 1

Dancing Sultanas

You will need:

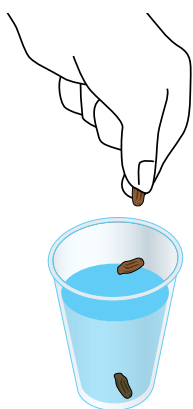
- A clear plastic cup
- Tap water
- Some sultanas
- A tablespoon
- Bicarbonate of soda
- White vinegar



1. Fill the plastic cup with warm tap water until it's about three-quarters full.



2. Stir in two big spoonfuls of bicarbonate of soda until it's dissolved.



3. Drop a few sultanas into the cup.



4. Pour two or three big spoonfuls of vinegar into the cup. What happens to the sultanas?

Explanation

There are two things happening in this activity. Firstly, bubbles are being produced by the vinegar mixing with bicarbonate of soda. When these two chemicals are combined it causes a chemical reaction which produces a gas called carbon dioxide. You can

see this gas as bubbles that fizz up in the liquid.

Secondly, the sultanas are moving. When you first added the sultanas into the cup they sank to the bottom of the cup because they are denser than the water around them. When the vinegar was added and the gas bubbles were

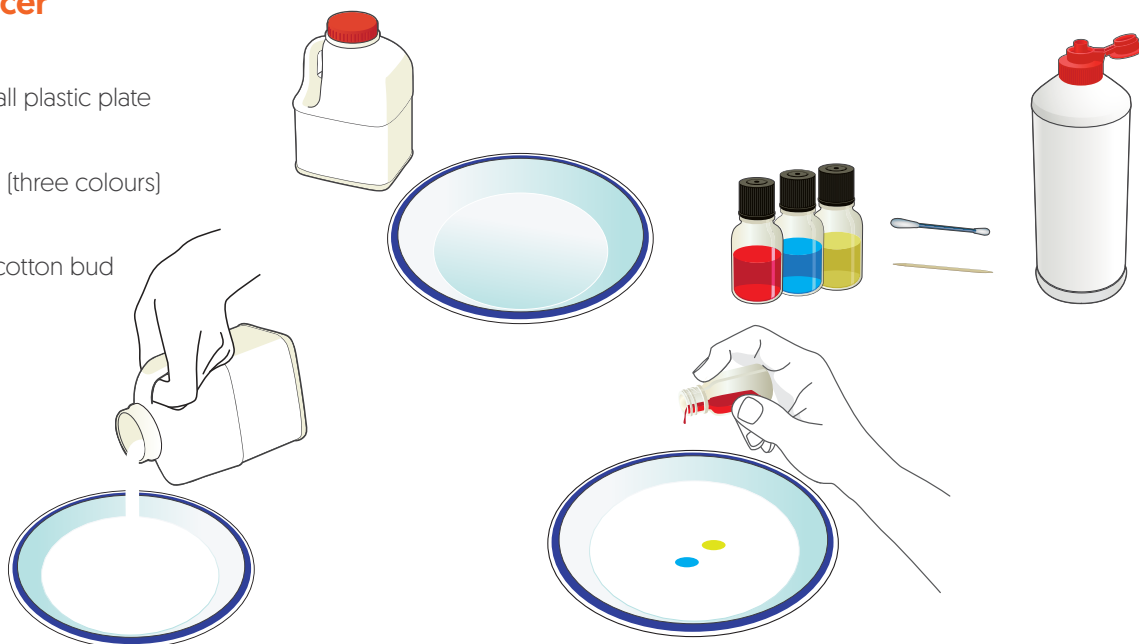
produced, some of them stuck to the outside of the sultanas. Because carbon dioxide gas is less dense than water, these bubbles floated up to the surface bringing the sultanas up with them. When they get to the top, the bubbles burst and, without the less dense carbon dioxide gas, the sultanas sink back down again.

FOLLOW-UP CLASSROOM ACTIVITY 2

Storm in a Saucer

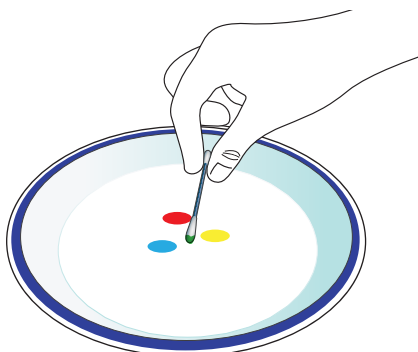
You will need:

- A saucer or small plastic plate
- Full cream milk
- Food colouring (three colours)
- Detergent
- A toothpick or cotton bud



1. Pour some milk onto the saucer/plate until the surface is covered (0.5cm – 1cm deep).

2. Carefully add one drop of each type of food colouring into the milk near the centre of the plate – they should be close together but not touching.



3. Dip the cotton wool bud/toothpick into the washing up liquid and place this end into the centre of the milk dish but not touching the food colouring. Hold it here (do not stir) for at least 15 seconds.



4. Observe what happens.

Extension

Try the experiment with other kinds of milk (powered, skimmed, whole, low fat, soya) and see if you get different results. Why do you think the results were different?

Explanation

Milk is mostly made up of water with small amounts of proteins and fat. Water and fat (or oils) don't usually mix together but the proteins in milk enable the fat and water to blend together into an emulsion (a mixture of liquids which are usually unblendable). Adding washing up liquid to the milk breaks bonds in the chemical structure of the emulsion causing the fats and proteins

to move around. This movement creates currents in the milk which we can see thanks to the food colouring. This is most noticeable in milk with a high fat content – in milk with a lower fat content, less disruption is caused by the washing up liquid and therefore smaller currents and disruption to the food dye.

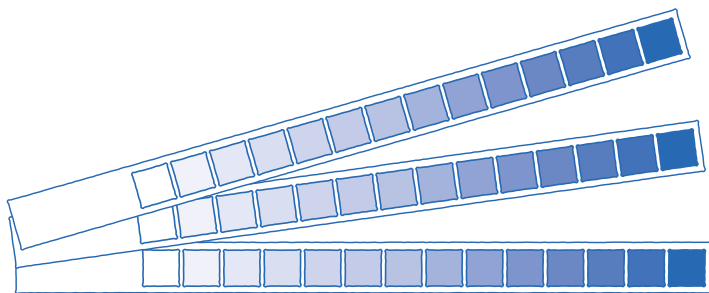
The addition of the washing up liquid also causes changes to the milk's surface tension. At the surface of all liquids the molecules pull together more tightly than the molecules in the body of the liquid. In this experiment the washing up liquid lowers the surface tension of the milk by pushing apart the molecules at the surface. The result is a big swirling pattern that spreads out from the middle of the detergent drop.



THE SCIENCE BEHIND THE SHOW

Acidic and alkali are two extremes that describe chemicals, just like hot and cold are two extremes that describe temperature. Mixing acids and alkalis can cancel out their extreme effects; much like mixing hot and cold water can even out the water temperature. A substance that is neither acidic nor alkali is neutral.

The pH scale measures how acidic or alkali a substance is. It ranges from 0 to 14; a pH of 7 is neutral, a pH less than 7 is acidic and a pH greater than 7 is alkali. Vinegar and lemon juice are acidic substances, while laundry detergents and bleach are alkali. Pure water is an example of a neutral substance with a pH of 7.0.



An indicator is a special type of chemical which changes colour depending on the pH of the substance it is mixed with. Different indicators work on specific pH ranges. Universal indicator is an example of an indicator that works across the entire pH range from pH 0 – pH 14. It has many different colour changes, from red for strong acids to dark purple for strong bases. For neutral solutions, the universal indicator is green.

A chemical reaction happens when two or more substances are mixed together and they interact and change, producing one or more new substances.

To be classed as a chemical reaction this change must be a chemical change, meaning the compound you start with must turn into another compound during the reaction. A nail rusting is an example of a chemical reaction. The rusting happens because the iron in the metal combines with oxygen in the atmosphere and there is a chemical change which produces rust. However, when a refrigerator or air conditioner cools air, there is no reaction between the air molecules. The change in temperature is just a physical change. Another example of a physical change is when you melt an ice cube.

Signs that indicate that a chemical reaction has occurred include colour changes and the production of heat, light or gas.

A catalyst is a substance that speeds up the rate of a chemical reaction without being changed by the reaction or affecting its result.

The rate of a chemical reaction can be increased by increasing the surface area of a solid reactant for example, grinding a solid into a fine powder. The greater the surface area, the greater the amounts of chemicals in contact at once and the faster the reaction can occur.

Some Useful Links

edu.rsc.org/primary-science