Chemistry in the Community

Chemistry on the High Street

Supported by Royal Society of Chemistry

See Science

Chemistry Busking Activities

Chemistry Busking Activities are informal but educational and interactive ways of encouraging members of the community of any age to think about the way we perceive the world around us

The Activities

All the activities are based on cheap and easy-to-find household objects, or high street goods such as string, balloons, soap, hairspray and sweets. Chemistry busking activities are simple ways of getting members of the community to engage with science.

Over the years, See Science have developed different suites of science busking activities to suit different audiences and provided training to groups. The activities can then be used in festivals and events to engage the public with informal science learning. They are a great way of catching people's attention at events and allowing people to experience how we interpret the world and our senses.

Top tips:

- Make sure you have tried the experiments yourself several times and demonstrated them to family or friends
  before attempting them in front of a public audience.
- Build up some dialogue with your audience before you introduce the activity
- Don't forget to explain the science behind each activity using simple explanations and be aware of the diverse range of understanding
- Make sure that you are having fun too

When using these demonstrations, See Science and the Royal Society of Chemistry must be credited. When used online a link to www.see-science.co.uk should also be given.

Due care and attention should be given to health and safety and all demonstrations should be fully risk-assessed by the individual. Neither See Science nor the Royal Society of Chemistry take any responsibility for any injury or harm caused as a result of performing these demonstrations.

1. The Boiling Balloon

Question: What would you expect to happen if you hold a balloon above a candle flame? Offer some suggestions – it will pop; it will float away; it will melt.

Demonstrate this with a balloon that is inflated (full size) and show that it pops. Tie the balloon to a wooden dowel if you wish.

Now use an identical balloon. But make sure that there is about 25ml of tap water inside the balloon before you blow it up. Do not blow the balloon up too much. Show them a balloon with water inside and ask if they would like you to repeat the experiment. What do they think is going to happen this time?

You can ask the audience for a volunteer to sit under the balloon before you demonstrate the experiment. You could offer. The volunteer an umbrella or a rain coat in order to create more interest.

Use a candle to heat the balloon and make sure that no wax drips from the candle. This time the balloon will not burst.

Explanation: A balloon is a flexible bag that can be inflated with a gas or liquid, such as helium, hydrogen, oxygen, air or water. Modern balloons are made from materials such as rubber, latex, polychloroprene, or a nylon fabric, and they come in many different colours and shapes. Find out more about the chemistry of balloons here.

The inflated balloon is stretched so that the heat from the flame of the candle is passed into the balloon very quickly. The balloon partially melts or burns, which causes it to burst.
However, the water can absorb heat from the flame of the candle. The water at the bottom of the balloon stops the balloon reaching a temperature which is high enough to melt or burn. You will be able to see the water boiling inside the balloon and there should not be any unexpected downpours!

Practical notes: Tell the audience in advance that the first balloon is going to pop just in case they are not comfortable with the noise and do not pop balloons near anyone's ear. Clear guidance should to be issued about using candles in the home the dangers of playing with fire.

It is also important if the audience is young to underline the importance of ensuring adult supervision when using matches.

Keep the flame underneath the balloon and move it around to avoid damaging the balloon surface.

Equipment needed: One fully inflated balloon, another balloon filled with some water and inflated, wooden dowel, candle, candle holder, match/lighter, raincoat (optional)

2. Freezing and Boiling

Question: What is the boiling point of water? Water boils at 100 0C.

Demonstrate water boiling in a kettle or if there is no access to electricity boil some water in a bottle top using a candle or in a small pan. Each substance has a freezing/melting point and a boiling point. Hand out higher or lower cards
Ask the audience what the freezing point of water is – is it higher or lower than 100 ^{0}C.

Explanation: if the temperature is below the melting point then the substance is a solid and if f the temperature is above the boiling point then the substance is a gas. Other liquids have different boiling points and suggest some examples to see if their boiling points are higher or lower than water - large playing cards with the name of the substance would be useful or slides on a screen (see print out on resources).

	Boiling point /°C	Melting Point /°C
Alcohol	78.0	-114.0
Sea Water	100.7	-2.0
Olive oil	300.0	-6.0
Ketchup	100.0	0.0
Coca Cola	100.2	0.0
Nail polish remover	56.0	-95.0
chocolate	100.0	36.0
glycerol	290.0	17.8
milk	100.1	-0.5
petrol	95.0	-60.0
Acetic acid	118.1	16.6
syrup	113.0	-5.0

Demonstration: Hold examples of 5 different metals and ask the audience which has the highest boiling point and suggest 5 different gases asking the same question – the examples of gases could be on cards.

Solid	Boiling pt/°C	Melting pt/ °C	Gas	Boiling pt/ °C	Melting pt/ °C
Aluminium	2,519	660.3	Argon	-185.8	-189.34
Copper	2,562	1,085	Carbon Dioxide	-57.0.	-78.0
Magnesium	1,091	650.0	Oxygen	-1830.	-218.8
Silver	2,162	961.8	Nitrogen	-195.8	-210.0
Zinc	907.0	419.5	Radon	-61.9	-71.2

Demonstration: Show the audience a small hand boiler and ask a volunteer to come and hold the boiler . The boiler should be placed in the palm of the hand.

Explanation: A hand boiler is a toy made out of hand-blown glass and filled with a special liquid called ethyl alcohol. The boiler consists of a larger lower bulb and smaller upper bulb, joined together by a glass tube. This liquid inside the boiler is special because it appears to boil at a low temperature. And all it needs to do so is the heat of your hand. With a hand boiler, the temperature of your hand is enough to cause the liquid to bubble and appear to boil.
Ask the audience to try and explain what is happening here

Further Explanation: When holding the bottom of the boiler with your hand, the liquid inside becomes exposed to the heat of your hand and it begins to evaporate. The pressure increases and therefore the liquid begins to expand. As the liquid expands it will travel quickly up the glass tube to the top bulb which is sealed. Then the vapor bubbles travel up from the bottom bulb and into the liquid in the top bulb and force themselves through the liquid and cause it to bubble, giving the appearance of boiling. This process continues as long as the heat of your hand is applied to the bottom bulb.

If the volunteer has cold hands or you are outside on a cold day the hand boiler will not work as well since the heat from your hand is not high enough to cause the liquid to evaporate and boil.

Practical notes: Clear guidance should to be issued about using candles in the home the dangers of playing with fire if you are using a candle instead of a kettle.

It is also important if the audience is young to underline the importance of ensuring adult supervision when using matches.

Equipment needed: kettle, water, candle, match/lighter, hand boiler pen, metals, supermarket items, game cards

3. Mallow Man

Question: Ask the audience to guess what will happen to the marshmallows when you start taking air out of the canister or bottle.

Demonstration: Put some marshmallows in a “Vacu Vin” coffee canister or similar (a wine bottle or other clear glass bottle can be used). Attach the pump to the vacuum sealer into the top of the canister and use the pump to take air out.

The marshmallows will get bigger. To prove this open the seal letting the air back in. The marshmallows will rapidly shrink back to their original size.

Ask a volunteer to create a mini figure using marshmallows, cocktail sticks and a pen and repeat the experiment.

Explanation: Marshmallows are very light because they have lots of tiny bubbles inside them. When air is taken out of the canister the air pressure in the bubbles is now higher than the air pressure in the canister so they expand and the marshmallows grow. When the air is let back into the bottle the pressure in the bubbles is now lower so they contract back to their original size.

Practical notes: Large marshmallows are better than smaller ones but bring a variety of different sizes and colours along.
Equipment needed: Clear Vacu Vin coffee canister or similar, cocktail sticks, marshmallows, black and red pen, wine sealer and pump

4. The Stacking Tower

Question: Will one liquid float above another? Do different liquids have different densities? Different solutions have different densities. This depends on the mass and the volume. The density of a substance is a measure of how much mass is present in a given volume.

The greater the mass the higher the density, The greater the volume the lower the density. This activity compares the density of a selection of common household liquids. All liquids will have different physical properties

Demonstration: On a table have 5 different coloured liquids with an add a different amount of salt (or sugar) to them labelled A-E. Ask a volunteer to place the liquids in order high to low density. You could also use weighing scales to do this. Ask the volunteer why the liquids were placed in the particular order. Then show 5 common household products and ask the volunteer to stack these products in the cylinder in order of density. Pour the same volume of each liquid into 5 plastic cups. You may want to colour the liquids such as vegetable oil with some food colouring. Ask the volunteer to put the liquids in order and then pour into the cylinder.

Explanation: there is more salt dissolved in the same volume of water therefore there is more mass present occupying the same volume of space and therefore the density is higher. All liquid has a density number. Water, for example, has a density of 1.0 g/cm3 Here are the

Material	Density (g/cm3)
Alcohol	0.79
Lamp oil	0.81
Baby oil	0.83
Vegetable oil	0.92
Ice cube	0.92
Water	1.00
Milk	1.03
Washing up liquid	1.06
Corn syrup	1.33
Maple Syrup	1.37
Honey	1.42

Practical notes: The data in the table is an approximation as densities may vary from brand to brand. Beware of spillages and make sure that you have enough kitchen towel etc to dry.

Equipment needed: Large tall container, cups, salt, stirrers, water , food colouring, common supermarket items, weighing scales, clear containers

5. So it's soap

Question: What is soap made of? We have all seen and used soap everyday and it comes in all sorts of shapes and sizes- it has evolved from a boring square bar from to liquid and foam. Soaps are often are made from fats and oils that react with lye (sodium hydroxide). Solid fats like coconut oil, palm oil, tallow (rendered beef fat), or lard (rendered pork fat), are used to form bars of soap that stay hard and resist dissolving in the water left in the soap dish

Demonstration: Show the audience your shopping bag with different soaps in it and ask when they think soap first appeared. A soap-like material found in clay cylinders during the excavation of ancient Babylon is evidence that soap making was known as early as 2800 B.C. Discuss when liquid soap was first sold on the high street – offer 1940, 1960, 1970, 1990. Liquid soap was not sold until the 1970's and foaming soap has only just become popular.

Question: Which soap do you use at home?
Liquid soap is used in most places because if it's cleanliness, sustainability and value for money. If liquid soap was such an improvement in the 1980's why do we need foaming soap? Have you seen foaming soap? Does it really work?

Demonstration: To make foaming soap use a large flat dish and add some water and liquid soap. Cut the bottom off a 250ml water bottle and cover the end with material. Hold in place with an elastic band. Dip the bottle in the flat dish and then blow through the bottle - foam should appear through the material. A thin film of soap attaches to the material and then the air from blowing creates a foam

Explanation: Foaming soap is a form of liquid soap. It is made from a dilute form of liquid soap and is mixed with air to create foam as it leaves the dispenser. A special dispenser is required to use foaming hand soap properly. Sometimes the soap is kept in a pressurised container or it is mixed with air in the dispensing unit. The pressurised container is refilled with a sealed packet or cartridge of pressurized soap. It has become more popular over the last 5-10 years because manufacturers have to produce less soap, it is environmentally friendly, cost effective and sustainable

Historical background: Until the Industrial Revolution, soap making was conducted on a small scale and the product was very primitive. In 1780, James Keir established a chemical works at Tipton, to manufacture alkali from the sulphates of potash and soda, to which he afterwards added soap. Andrew Pears started making a high-quality, transparent soap in 1807 in London. The first liquid soap was patented in 1865, by William Shepphard but despite its popularity throughout the early 1900's, it wasn't until 1980 that liquid soap was mass-produced for domestic use. The Minnetonka Corporation of Minnesota sold "Softsoap" in 1980, and this product was in high demand because it was the first of it's kind..

Practical notes: Beware of spillages and make sure that you have enough kitchen towel etc to dry. Be aware of any allergies or reactions to soap products

Equipment needed: examples of bars of soap, liquid soap and foam soap, small water bottle, large flat dish, elastic band, thin material

6. Does the bag leak?

Question: What is the bag made of? Take a few different polythene bags and shopping bags along and explain that they are all made of polymers. The word “polymer” means “many units”. A polymer can be made up of many repeating units, which are small monomer molecules that have been bonded covalently. A polymer can contain hundreds of monomers, and therefore thousands of atoms. Every year we buy around 3.7 million tonnes of plastic products in the UK. Much of this plastic is packaging, with only 842,000 tonnes being recycled. How many plastic bags are used in the UK – about 1.75 billion which has decreased significantly. A UK levy of 5p per bag introduced in 2015 has already reduced single-use plastic bags given out by major retailers by 85% – down from 140 to 25 bags for the average person each year. Much of the plastic we use ends up in landfill. This is either because it is currently not possible to recycle, individuals don’t take it to be recycled or local authorities don’t accept it.

Find out which types of plastic are currently not possible to recycle - and why - and which could be recycled if we wanted to.

Demonstration: Have four different plastics and ask a volunteer to name the one that can't be recycled. Find out which types of plastic are currently not possible to recycle - and why - and which could be recycled if we wanted to.
Water bottle – are made from a thermoplastic called PET. It can be recycled and is usually accepted by local authority schemes.
Plug- Plug sockets are often made from urea formaldehyde resin. This is a thermosetting plastic – it's chemical structure makes it virtually impossible to recycle.
Cling film – is mostly made of polyethylene. It's possible to recycle but not many authorities take it due to the likelihood of food contamination.
Expanded polystyrene is used in packaging and cups, and is chemically an mechanically possible to recycle. But many local authorities will not accept it for logistical reasons

Question: Ask the audience what they think will happen if a pencil was stabbed through the bag?
Demonstration: Use a resealable bag and fill it 2/3 full with water and carefully remove the air. Then seal the bag tightly
Use the sharp end of one pencil and push it quickly through the bag. It should go in one side and out the other without spilling a drop of water.
The same can be applied to a balloon - but this time use a kebab stick and blow the balloon up to 2/3 of it's full size – ask a member of the audience to push the kebab stick through the balloon without making it pop.

Explanation: Plastic bags are made of a polymer called low-density polyethylene. Polymers are long chains of molecules. The tip of the pencil squeezes between the chains without breaking them but the chains' flexible property helps to form a temporary seal against the edge of the pencil. This enables a pencil to pierce the bag without losing even one drop of water!
Plastic is a type of synthetic polymer. Currently, more than 60,000 plastics are manufactured for industrial and commercial purposes. Roughly 75% of the plastics used in this country can be categorized as one of six types. These polymers are listed in the table below. These six polymers are thermoplastic: they can be melted and reshaped, or recycled. Numbers are used to ease identification of the plastics, so that they can be separated for recycling.

Most thermoplastics are:
- recyclable
- insoluble in water
- resistant to most chemicals
- lightweight yet strong
- can be shaped
- can be coloured with pigments
- usually made from petroleum

Used to make items that have no alternatives from other materials

Practical notes: Make sure that the pencil used is very sharp and is not used at eye level. Beware of spillages and make sure that you have enough kitchen towel etc to dry.

Equipment needed: plastic bags, pencils, water, cloth, water bottle, plug socket, cling film, expanded polystyrene

7. Paperclip chemistry

Question: What is the difference between a natural polymer and a man- made polymer?

The word “polymer” means “many units”. A polymer can be made up of many repeating units, which are small monomer molecules that have been bonded covalently. A polymer can contain hundreds of monomers, and therefore thousands of atoms. Chemists often build molecular models using rods and balls to represent different atoms and their bonding but there are other alternatives. Examples of naturally-occurring polymers are silk, cotton, wood, cotton, starch, natural rubber, skin, hair and DNA. In the early 1900s, chemists began to replicate natural polymers, and create synthetic polymers, beginning with nylon which is like silk in its strength and flexibility.

Demonstration: Ask a volunteer to separate the man made and the natural polymers in the shopping basket into two categories and then each individual can now build their own model of a polymer.

Use paperclips of the same size or colour. They will represent the same molecule. Joining them together shows that a monomer can be used to form a polymer chain. If you had lots of these chains next to each other they would pack close together giving you a high-density polymer.

If you add some paperclips at regular intervals to act as side chains to the polymer chain this would represent a lower-density polymer.

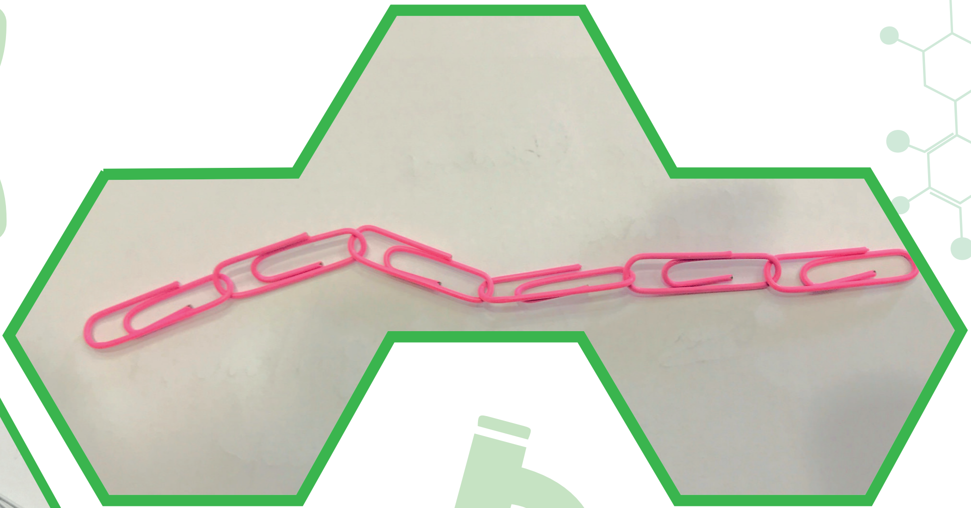
You can start a new polymer chain which will include two different types of monomers differentiated by using paperclips of different types, sizes or colours. Put your paperclips together in a random order, this would show two monomers that are able to react with both themselves and the other available monomer.

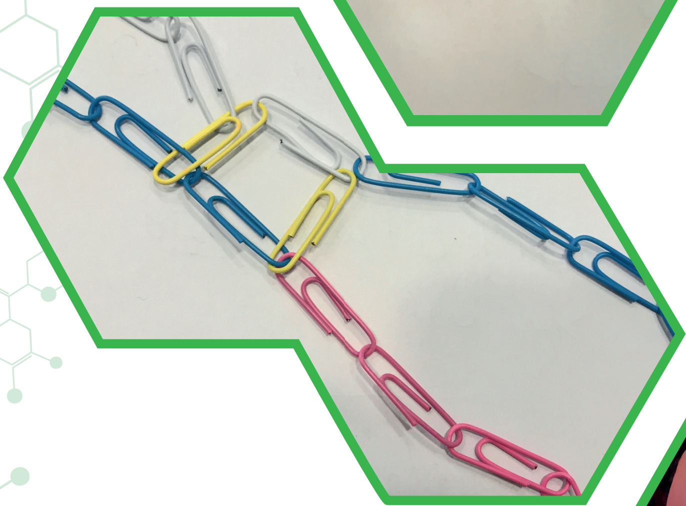
You can create a block co-polymer which consists of a length of a single type of monomer followed by another length of the other monomer. As each monomer might have different properties these are carried into the properties of the polymer. Most commonly one monomer will by hydrophilic and the other monomer will be hydrophobic. Polymers with discrete hydrophilic and hydrophobic sections can aggregate into micelles when placed in water. They will have a hydrophilic exterior and hydrophobic interior. The interior can be used to house drugs for targeted delivery or to “capture” oil and dirt when used in soaps and washing-up liquids.

You can also investigate the effects of cross-linking between chains. Connect separate polymer chains together through the regular placement of cross-linking bond paperclips and you should get a sheet of paperclip chains. Is the sheet strong enough to hold the weight of a tennis ball? Can you join the chains close enough to hold a marble?

Practical notes: Use a digital camera to photograph all the different polymer chains and have laminated examples on the table. Use of molymods could also enhance the learning.

Equipment needed: paperclip, oil, water, cotton wool, nylon, digital camera, cling film, bottle, silk cotton, wood, credit card, bubble wrap, toys, bottle caps, containers,





Further information:

polyethylene terephthalate	PET	clear bottles and containers, fleece, carpet
high-density polyethylene	HDPE	opaque bottles and containers, buckets, crates
polyvinyl chloride	PVC	rigid from: pipes & credit cards; soft form: tubing
low-density polyethylene	LDPE	bags, films, sheets, bubble wrap, toys
polypropylene	PP	bottle caps, yogurt containers, furniture
polystyrene	PS	expandable form: styrofoam; crystal form: CD cases

8. Pot luck

Question: Can you name the 5 senses? What are our 2 chemical senses? Smell and taste are our two chemical senses. They both allow us to be aware of what substances in the world around us and they and rely on our ability to detect these substances by the chemical nature of their molecules.
What do other senses allow us to be aware of? - physical characteristics of the world around us - its temperature, whether there is light present and the texture of materials which we touch.

Demonstration: Use six bottles with white caps and six bottles with black caps. Fill one white bottle and one black bottle with the following six scents and then place matching coloured stickers on the bottom to provide a way for participants to check if they had matched the bottles correctly. The list below can be used or adapt depending on availability.

- cinnamon
- tea tree oil
- peppermint oil
- lemon
- vanilla extract
- cumin

Put all the bottles in a container. The participant should be able to separate the white and black bottles, putting both into lines. Encourage them to sniff the bottles and match each white bottle with a black bottle. Ask which scents the participants prefer and ones they don't like.

Explanation: Our sense of smell is stimulated gas molecules. These may come directly from the air we breathe or from volatile substances released in our mouth, from the food we are eating. The molecules that we interpret as smells are called odorants.
Odorant molecules stimulate sensory nerve cells (neurons) at the top of the nasal cavity and these respond by sending impulses to the brain. The sensory nerve cells are called receptor cells, and their surfaces have places on them called receptor sites. These detect the odorant molecules and the process triggers a sequence of changes in the cell that eventually generate an electrical signal to the brain.

Practical notes: Extracts and oils are ideal scents to put in the bottles, for example: vanilla extract, almond extract, lemon oil, peppermint oil but you can also use spices, soaps or shampoos. If you are using liquid scents, them dab them on to cotton ball and place it into your bottle. Do not allow participants to drink any liquids or apply to skin.

Equipment needed: 12 small bottles with 6 white and 6 black caps, stickers, different extracts and oil, cotton wool

9. Walking with water

Question: How can we make water move without touching it?

Demonstration: Put two plastic beakers at a distance of about the width of your hand apart and fill one cup until it is half full of water. Add some food colouring and stir into the water. Cut a strip of paper towel about 4cm wide or fold a piece of kitchen towel until it is 4am wide. Put one end of the paper towel into the cup with the water. Then place the other end into the glass that is empty and attach with a little blue tack or sellotape. Then leave the cups and watch what happens. Try this with different colours – do they all move at the same rate? Does the thickness of the paper towel make a difference? The longer you wait the greater the amount of water in the other cup. When does the water stop moving? The water will stop moving over until the cups are both filled with the same amount of water.

Explanation: The water appears to defy gravity, but it moves because of a process called capillary action. The adhesive forces between the water and the paper towel are stronger than the cohesive forces inside the water. As a result, the water travels up and across the paper towel out of one glass and into another.

Demonstration: If you find that the participants enjoy this activity then try three beakers. This time place three different beakers next to each other and Pour some water into the two outside beakers until they are halfway full. Leave the middle one empty. Add food colouring into the water and stir the food colouring until the water is all one colour. Try to use blue food colouring in one cup and yellow in the other. Place one end of the paper towel into the glass with the blue water. Then place the other end into the glass that is empty. Then lace one end of the paper towel into the cup with the yellow water. Then place the other end into the glass that is empty. Ask the participants to try and explain what has happened. The longer you wait, the more water will have moved to the middle cup. The water will stop moving over when all of the cups are filled with the same amount of water

Explanation: When you mix two primary colours together they make a secondary colour. Blue & yellow (two primary colours) mixed together in the middle beaker turned into green (the secondary colour made by mixing blue & yellow together). You can also try Red + Yellow = Orange; Red + Blue = Purple

Practical notes: Beware of spillages and make sure that you have enough kitchen towel etc to dry. Do not allow participant to drink the coloured water.

Equipment: water, food colouring, plastic cups, paper towel

10. Going pop

Question: Can we make the bag go pop using chemicals?

Demonstration: Put some vinegar and some bicarbonate of soda in a small resealable zipped plastic bag and close the bag. Watch what happens next. The vinegar and the bicarbonate of soda will react with each other and produce so much foam that they will make the bag go pop.

Explanation: The vinegar is an acid and the bicarbonate of soda is an alkali. We use a pH scale to measure acids and alkali. Anything below 7 is an acid wheras anything over 7 is an alkali. Anything that is exactly 7 is neutral. Vinegar is quite a weak acid and bicarbonate of soda is a weak alkali. When we mix them together we get an endothermic reaction (one that needs heat). The reaction produces carbon dioxide (which is why the bag expands) and water. You could try a similar experiment with a water balloon.

Demonstration: Prepare 6 bottles of different solutions and ask the participant to test whether the solutions are acid, alkali or neutral. Can they differentiate which is the strongest acid or the strongest alkali.

Practical notes: Beware of spillages and make sure that you have enough kitchen towel etc to dry. Do not allow participant to drink any of the solutions.

Equipment needed: plastic bag, bicarbonate of soda, vinegar, washing powder, lemon juice, alka seltzer, tray, beakers, pH paper,

	Activity	In the box	Consumables	Also required
1	Boiling balloon	Wooden dowel, candle holder, matches/lighter	Balloons,candle	raincoat (optional)
2	Freezing and boiling	match/lighter, hand boiler pen, game cards, 5 different metal cubes,	candle, olive oil, ketchup, glycerol. coke,	Kettle, Water,
3	Mallow Man	Clear Vacu Vin coffee canister or similar, cocktail sticks, black and red pen,	marshmallows,	wine sealer and pump and bottle Decorations for marshmallowman
4	Stacking tower	Large tall container, weighing scales, clear containers	cups, salt, stirrers food colouring, common supermarket items,	water
5	So it's soap	small water bottle, large flat dish, elastic band, thin material	examples of bars of soap, liquid soap and foam soap,	
6	Does the bag leak	pencils, cloth, water bottle, plug socket, cling film, expanded polystyrene	plastic bags,	water
7	Paperclip chemistry	nylon,cling film, bottle, silk cotton, wood, credit card, bubble wrap, toys, bottle caps, containers,	paperclip, oil, cotton wool,	water, digital camera
8	Pot luck	12 small bottles with 6 white and 6 black caps, stickers , different extracts and beakers	oil, cotton wool,nylon	
9	Walking with Water	beakers	food colouring, plastic cups, paper towel	water
10	Going pop	tray, beakers,	plastic bag, bicarbonate of soda, vinegar, washing powder, lemon juice, alka seltzer,pH paper,	water

	Activity	In the box	Consumables	Also required
1	Boiling balloon	Wooden dowel, candle holder, matches/lighter	Balloons,candle	
2	Freezing and boiling	match/lighter, hand boiler pen, game cards, 5 different metal cubes,	candle, olive oil, ketchup, glycerol. coke,	
3	Mallow Man	Clear Vacu Vin coffee canister or similar, cocktail sticks, black and red pen,	marshmallows,	
4	Stacking tower	Large tall container, weighing scales, clear containers	cups, salt, stirrers food colouring, common supermarket items,	
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Health and Safety Assessment

A risk assessment is a judgment of how likely it is that someone might come to harm if a planned activity is carried out. The law requires that the likelihood of harm should be reduced to as low as is reasonably possible.

To make a risk assessment you need to know the **hazards** and the **risk** of them causing harm in the planned activity.

A **hazard** is anything which could cause harm. For example some chemicals can cause harm or electricity if it is at a high enough current, glass (if it breaks) can cause harm and even you running in the corridor is a hazard. Although sometimes you can use your common sense to identify a hazard, often you will need some specialist information, eg a CLEAPSS Student Safety Shees or chemical suppliers' Safety Data Sheets.

The **risk** is the likelihood that a hazard would cause significant harm. This is a matter of judgment and depends on:

- how likely it is that something would go wrong with this hazard;
- how serious any resulting injuries may be;
- how many people could be affected.

To reduce the risks to an acceptable level, we should always put in place **control measures.** These are the safety precautions used to reduce the risk of harm.

In a science laboratory it is often advised that we wear safety spectacles, or use a fume cupboards.

Severity	Likelihood	Risk Rating (S x L)
1 No or or very little harm	1 Unlikely	1-5 Low
2 Minor/First Aid	2 Possible	6-10 Medium
3 Needs Medical Attention	3 Probable	10+ high
4 Needs hospital treatment	4 Likely	
5 Death/Irreparable Injury	5 Certain	

	Activity being assessed	Hazard identified	Person at risk	Control measures
1	Boiling balloon	Balloons may burst. Allergies Scald, slip burn eye damage **Severity: 2** **Likelihood: 2** **Risk Rating: 4**	Presenter and volunteer	Advise of latex allergy. Warn potential volunteers that balloon may burst Candles are lit by supervising adult and volunteers advised not to touch them. Ensure candle is in a holder and does not touch the base of the balloon. Ensure that candle is blown out after demonstration. Candles are placed on heat proof mats to protect the table surface from melting/catching fire. Water is kept in a sealed container, and is appropriate for pouring. Ensure that there are no spillages. Caution when using kebab stick to pierce balloon. Kitchen towel kept in the kit for spillages.
2	Freezing and boiling	Boiling water. Scald burn. Eye damage **Severity: 2** **Likelihood: 2** **Risk Rating: 5**	Presenter and volunteer	Very small quantity of water heated (around 3 drops) pupils advised to wear safety goggles in case any boiling water spits into eyes or faces. Ensure candle is in a holder. Ensure that candle is blown out after demonstration. Ensure that there are no spillages. Water is kept in a sealed container, and is appropriate for pouring. Caution if using a glass thermometer. Kitchen towel kept in the kit for spillages.

	Activity being assessed	Hazard identified	Person at risk	Control measures
3	Mallow Man	Glass container may break **Severity: 1** **Likelihood: 1** **Risk Rating: 2**	Volunteer	Do not eat the marshmallows. Caution with cocktail sticks. If using a glass bottle beware of glass breaking
4	Stacking tower	Slipages, spillages **Severity: 1** **Likelihood: 2** **Risk Rating: 3**	Volunteer	Do not consume the liquids. Liquids are kept in a sealed container, and are appropriate for pouring. Dispose carefully. Kitchen towel kept in the kit for spillages.
5	So it's soap	Allergies, scalds, eye damage slipages and spillages **Severity: 2** **Likelihood: 2** **Risk Rating: 4**	Presenter, volunteer	Do not consume the soap. If the soap touches skin advise to wash hands in case of allergy. Pupils advised not to eat soap, and to alert presenter if they have any allergies, and latex gloves are supplied if necessary. Melting point of soap is very low <40ºC so if any is spilt on skin accidentally it shouldn't cause severe burns. pupils advised to wear safety goggles in case any hot soap ends spits up into eyes or faces. Kitchen towel kept in the kit for spillages.
6	Does the bag leak	Spillages, slip **Severity: 1** **Likelihood: 2** **Risk Rating: 3**	Presenter, volunteer	Water is kept in a sealed container, and is appropriate for pouring. Ensure that any spillages are cleaned. Kitchen towel kept in the kit for spillages.

	Activity being assessed	Hazard identified	Person at risk	Control measures
7	Paperclip chemistry	Damage to skin **Severity: 1** **Likelihood: 2** **Risk Rating: 3**	Volunteer	Beware of sharp ends on paperclips – advise volunteers to take care
8	Pot luck	Allergies **Severity: 1** **Likelihood: 1** **Risk Rating: 3**	Volunteer	Advise volunteers of any allergies. Ensure all pots are sealed after demonstration.
9	Walking with Water	Slip and spillages **Severity: 1** **Likelihood: 1** **Risk Rating: 2**		Water is kept in a sealed container, and is appropriate for pouring. Ensure that any spillages are cleaned. Kitchen towel kept in the kit for spillages.
10	Going pop	Slip and spillages **Severity: 2** **Likelihood: 2** **Risk Rating: 4**		Liquids are kept in a sealed container, and are appropriate for pouring. Ensure that any spillages are cleaned. Do not consume Kitchen towel kept in the kit for spillages.

More information

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http://scifun.chem.wisc.edu/homeexpts/fireballoon.html

2. Freezing and Boiling
Changes of state KS4 https://www.bbc.com/bitesize/guides/z2wmxnb/revision/4
https://sciencing.com/calculate-freezing-boiling-point-6160564.html

3. Mallow Man
https://www.bonappetit.com/story/what-are-marshmallows-made-of
https://recipes.howstuffworks.com/question128.htm

4. Stacking Tower
https://www.stevespanglerscience.com/lab/experiments/density-tower-magic-with-science/
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5. So it's soap
https://www.explainthatstuff.com/detergents.html
https://www.reuters.com/article/us-health-handwashing-foam-soap-idUSKBN16U2ZJ

6. Does the bag leak
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7. Paperclip Chemsitry
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https://www.science.org.au/curious/everything-else/polymers
https://www.mrsec.psu.edu/sites/mrsec.psu.edu/files/education-outreach/build_a_polymer_model.pdf

8. Pot luck
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https://health.howstuffworks.com/mental-health/human-nature/perception/question139.htm

9. Walking with Water
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10. Going pop
https://wonderopolis.org/wonder/what-happens-when-you-mix-vinegar-and-baking-soda
http://www.exploratorium.edu/science_explorer/bubblebomb.html