



SECONDARY ACTIVITY PACK

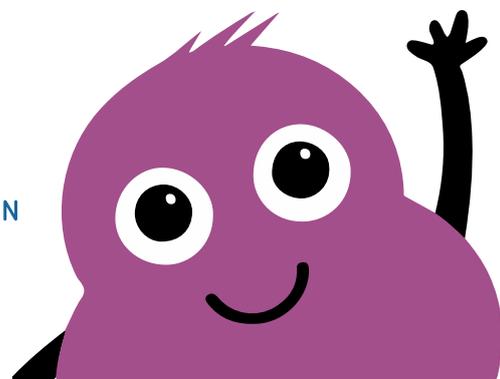
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CATCH A RAINBOW

Toolkit



- 🕒 Milk
- 🕒 Washing up liquid
- 🕒 Shallow bowl
- 🕒 Red, yellow and blue food colouring

About this activity



Some very unusual interactions take place when you mix a little milk, food colouring, and a drop of liquid soap. This artsy activity will help you discover the scientific secrets of soap and create a beautiful explosion of colours at the same time.

Watch out!



This experiment can get rather messy so ensure your workspace and clothes are well protected. Afterwards, make sure you wash the bowl thoroughly and wipe up any spills carefully.

Part 1

Get colourful

Pour a cup of milk into a shallow bowl and carefully put three drops of red colouring into one side. About a third of the way around put three drops of blue food colouring and another third of the way around put three drops of yellow food colouring. Do this very carefully, without moving the bowl, so that the three colours do not mix.

Next squeeze a drop of washing up liquid into the centre of the bowl and record what you see. What happens to the colours?

Part 2

Think about it

Think about the chemical changes occurring:

- What is the dish soap doing to the bonds?
- What molecules are present within the solutions?

Part 3

Mix it up

You could try repeating the experiment using water in place of milk.

Observe whether you get the same eruption of colour or not.

You could also test out different types of milk (but never unpasteurised) and explore which % of fat produces the best swirling of colour? Semi-skimmed or full-fat – which is better?



FLOWERS TO DYE FOR

Toolkit



- White flowers
- Water
- Food colouring
- Vase

About this activity



This colourful activity demonstrates how plants absorb water through their roots and the xylem within their stems. Add a little food colouring to the vase in order to transform white flowers into different colours.

Watch out!



This experiment can get rather messy so ensure your workspace and clothes are well protected.

Part 1

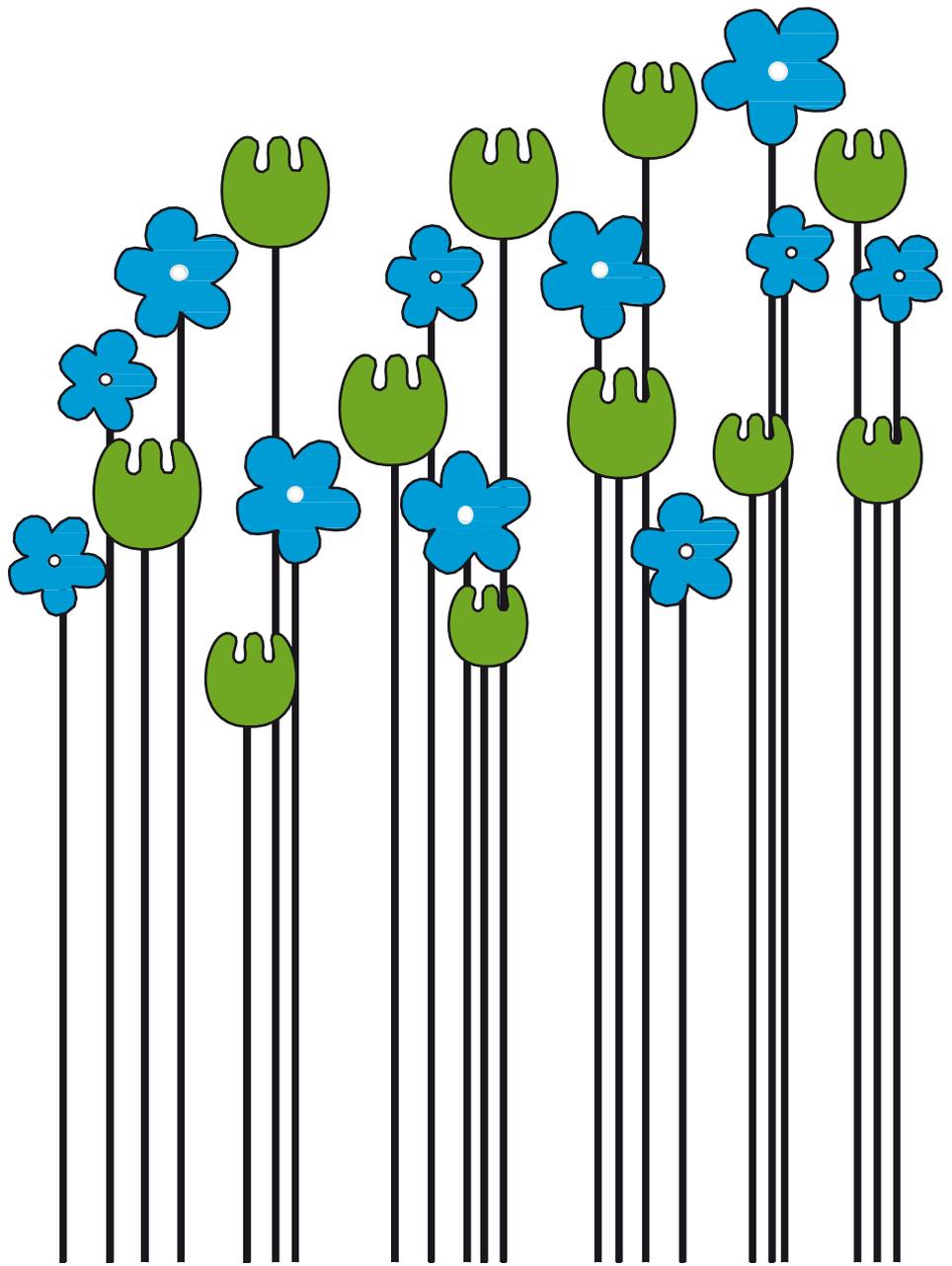
Get colourful

Fill your vase with water and add a few drops of food colouring. Cut the bottom off the stems of your flowers and place them in the vase. Leave your flowers in the coloured water for a few hours and observe what happens.

Try splitting the stem of your flower in half and putting each half in water dyed a different colour. What do you think will happen?

What is the role of the xylem in the plant?

It should take between 6 – 12 hours to get the best results, so perhaps check again at the end of the day.



OUBLECK SLIME

Toolkit



- ⦿ Large mixing bowl
- ⦿ Measuring jug
- ⦿ Cornflour
- ⦿ Water
- ⦿ Spoon
- ⦿ Clear re-sealable storage bag
- ⦿ Eggs (optional)

About this activity



Fancy making a weird slimy concoction that acts like a liquid but behaves like a solid when you hit it? Most liquids behave in a predictable manner, but oobleck slime does not stick to the rules and acts in a very curious way. This is because it is a non-Newtonian fluid.

Watch out!



When you've finished, do not pour the slime down the sink as this could clog the pipes, instead spoon the mixture into a zip-lock bag, fasten it tightly and dispose of it in a bin.

Part 1

Make some slime

Place some cornflour into a large mixing bowl and little by little, add water and use your hands to mix it into the cornflour. Keep mixing until the cornflour and water have blended together and the slime is the consistency of thick honey. Make sure you add the water slowly and carefully.

Part 2

Put the slime to the test

Once you've made your slime, try out a few experiments to see how your slime reacts. Do you think your slime is a liquid or a solid?

Why not try the following? Test out:

- Punching the slime and drawing back your hand quickly
- Scooping some of the slime into your hand and rolling it into a ball between your palms
- Leaving your slime out over a few days/overnight and seeing if you can you make it slimy again once it has dried out
- Spooning some of the slime into a re-sealable storage bag until it is two-thirds full, and then gently pushing an egg or another delicate object (e.g. a biscuit) into the mixture. Then try dropping the bag from a tall height (around 2-3m) and see how high you can you drop it from before the object breaks
- Making your slime 'dance' by placing some on a plastic plate over the top of speaker set to a low frequency sound



Exploring the outdoors

All at sea

About this activity

In this activity, you will explore the waterproof and breathability properties of a range of fabrics used in clothing designed for sailing. In particular, you will find out how breathable waterproofs work and what advantages and disadvantages they have over conventional waterproof fabrics.

Kit list

- ⦿ Different waterproof fabric samples, including breathable and non-breathable fabrics
- ⦿ 250ml beaker
- ⦿ Water
- ⦿ Funnel
- ⦿ Measuring cylinder
- ⦿ Pen
- ⦿ Paper
- ⦿ Ruler
- ⦿ Electronic scales

WATCH OUT!

Mop up any water spillages promptly.

Part one

You will need to research manufacturers of waterproof sailing wear and ask for samples of as many fabrics as possible, including breathable and non-breathable fabrics. **This will need to be done well in advance** so that you have them in time for your investigation. Local outdoor shops may be able to help.

Part two

Half fill a 250ml beaker with water, cover it with one of the sample fabrics and secure with sturdy elastic bands. Invert the beaker over a funnel placed in a measuring cylinder and record the amount of water (if any) that drips into the measuring cylinder every hour for 4 hours. Do this for each of the fabrics - one of the fabrics could be a control e.g. a sheet of polythene or some other material that you are confident is 100% waterproof.

Part three

Use the ideas above to decide how are you going to make your measurements. Think about how you are going to make sure that your tests are fair.

Part four

How will you display your results? As graphs or charts?

Things to consider:

- ⦿ Was there a noticeable difference between the fabrics?
- ⦿ How big was the difference?

- ⦿ Was there any pattern in the results?
- ⦿ Were the breathable fabrics more, equal to, or less, waterproof than non-breathable fabrics?



Run to the Deep

About this activity

Run, walk, push, or even skip to the bottom of the ocean and get active whilst exploring sea-life.

Invite families to take part and make it a whole school event.

Kit list

- ◉ Long tape measure or measuring wheel
- ◉ 7 pieces of cloth or other banner material for waymarks
- ◉ Materials to decorate banner: pens, poster paints, PVA glue, scrap fabrics, string

Part one

Find a large space outdoors to mark out a 1000 metres course. This will give a rough scale of 1:10 compared to the actual depth of the ocean which is 10,000 metres. You might need to have multiple laps. You can scale it down further to suit different ages and abilities. Use the depth guide on the following page (worksheet 1) to plan the course. Ask your students to help calculate where they will need to place the waymarks along the route to mark the start of each of the five zones.

Part two

Tip: Students should divide the depths on the worksheet by 10.

Divide the class up into groups and ask each group to research one of the ocean zones. Give each group materials to create a banner or display which will communicate what they have found out. You could ask them to come up with a simple demo or brief presentation to perform alongside their display. Position the banners around the course at each waymark.

Tip: The deeper you go, the less we know about ocean life, so the abyssal and hadal zones may be more challenging to research.

Part three

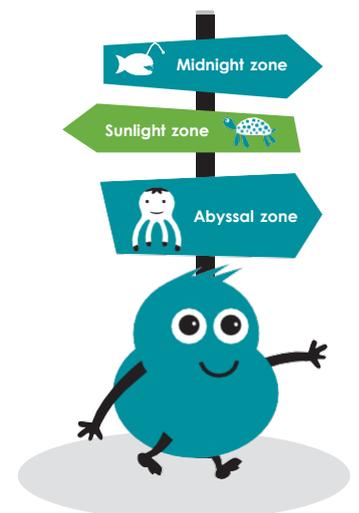
Invite other students, teachers and families to sign up to take part. They could run, walk, push themselves or even skip around the course. Ask them to stop at each banner to find out about the ocean zone and watch the demo or presentation.

Next steps

Present your findings in a creative way - perhaps a presentation or poster

WATCH OUT!

Make sure that the course is safe and remove any trip or slip hazards.



Get involved

Run to the Deep

Worksheet 1

Exploring the world

Ocean Zones



0m The ocean surface

0 - 200m

The epipelagic
or sunlight zone

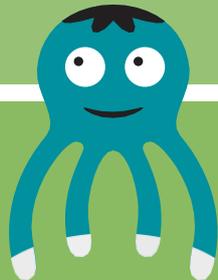


200 - 1000m

The mesopelagic
or twilight zone

1000 - 4000m

The bathypelagic
or midnight zone



4000 - 6000m

The abyssopelagic
or abyssal zone

6000 - 11000m

The hadal or
trenches zone



11000m The ocean floor

INVESTIGATING AND EXPLORING JOURNEYS

How do rockets work?

About this activity

In this activity, you will study how rockets are propelled by building and testing your own water rocket.

Time

2+ hours

Kit list

For the water rocket:

- ✓ One 2 litre plastic fizzy drink bottle
- ✓ A wine cork
- ✓ A valve from a bicycle inner tube, the longer the valve the better
- ✓ A pump that fits the valve, e.g. hand pump
- ✓ Something that can hold the bottle, neck down, at an angle to the ground - the handle of a garden fork works well but branches, bits of wood or plant pots will all work as a launch pad

✓ Tapwater

General equipment:

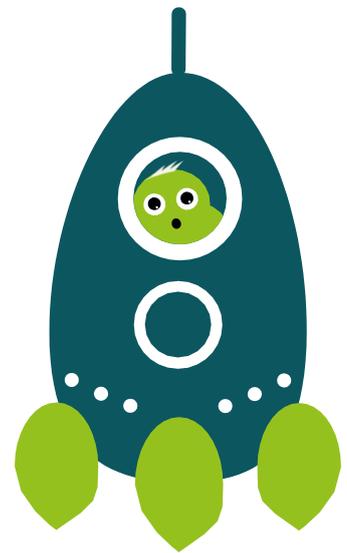
- ✓ Stopwatch
- ✓ Tape measure

Instructions:

- 1 See the *Watch out!* section to make sure you are launching your rocket safely
- 2 To build the rocket, start by checking the cork fits suitably into the neck of the bottle.
- 3 Check that the valve can fit through the cork and come out the other side enough to attach the pump.
- 4 An adult should make a hole through the cork to let the valve through, using a drill or other equipment.
- 5 Make a launchpad that holds the bottle with the neck downwards, lets you attach the pump and stand behind the bottle.
- 6 Fill the bottle up a quarter of the way and seal with the cork and valve.
- 7 Launch the rocket by pumping air into the bottle until it flies away.

Next steps:

- ✓ Try changing the power of the rocket by increasing or decreasing the amount of water in the rocket.
- ✓ Try different launchpads to see if this makes a difference.
- ✓ You could measure the flight time and distance the rocket travels - a calm day is essential for this.



Watch out!

- ✓ Only an adult should use a drill
- ✓ Make sure the launch pad is clear before launching your rocket
- ✓ Choose your launch site carefully. Launching where the rocket might land on a road is very dangerous
- ✓ The bottle must be made entirely of plastic, it must have no sharp points and it must be for a fizzy drink, so that the plastic is designed to hold pressure inside it



Diverse people

Revealing fingerprints



About this activity

Every person's body is different, and this includes our fingerprints. This means they are very useful in identifying people, in particular those who have left fingerprints at a crime scene. In this activity you will investigate the best way to identify fingerprints on different surfaces.

Kit list

- ✓ Different surfaces to retrieve fingerprints from. e.g. crockery, glass, paper, gloss paint
- ✓ Ink pad
- ✓ Different types of adhesive tape, to test their effectiveness at lifting prints
- ✓ 'Dust' to use for lifting prints. e.g. cocoa powder
- ✓ Iodine vapour can also be used to reveal latent fingerprints. You could try this, but be careful what you expose to iodine - it may permanently stain some surfaces.

Time: 2+ hour

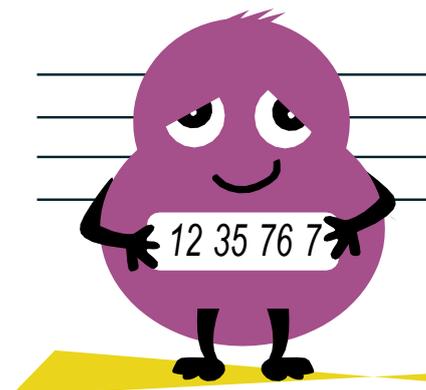
Watch out!

Iodine is **HARMFUL** - avoid skin contact.

Some powders and chemicals used to reveal fingerprints may be hazardous. Make sure you complete a risk assessment before you start your investigation and check it with your teacher.

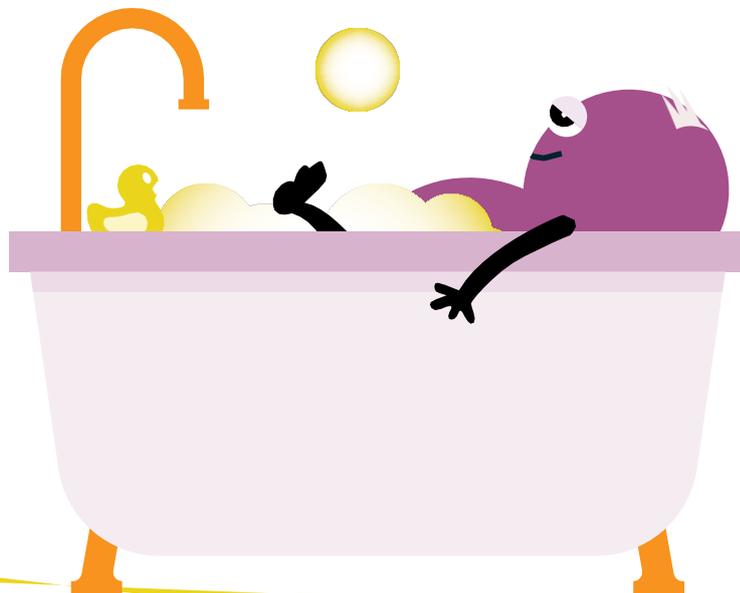
Instructions

- 1 Start by testing how well you can see your own or others' fingerprints on the different surfaces listed in the kit list.
 - ✓ You could investigate various types of adhesive tape to see which picks up the best impression of the fingerprint from different types of surface. You may need to find a way to 'develop' the print on the sticky surface to make it more visible.
 - ✓ Why do you think police take fingerprints from paper, not glass?
 - ✓ Do fingerprints show up better on light or dark surfaces?
 - ✓ Argue your case:
 - ✓ Why not use your discoveries about identifying fingerprints to argue a case, identifying some fingerprints at a fictional crime scene?
 - ✓ You will need some sample latent prints, and a record of prints from a suspected 'criminal'. Use your identification skills to argue that the 'suspect' was in fact at the scene of the crime.
- 2 If revealing fingerprints involves using chemicals, you may need to remove the print from the surface first, to avoid the chemicals damaging the surface. This is called 'lifting'.
 - ✓ Are prints more difficult to see clearly on a patterned surface?
 - ✓ Does the answer depend on whether the fingers are clean or dirty? For example, with mud, oil / grease or printing ink after reading a newspaper.
 - ✓ You can 'lift' fingerprints using adhesive tape such as sellotape. Why not try different adhesive tapes to see which one is best for 'lifting' fingerprints.
 - ✓ If revealing fingerprints involves using chemicals, you may need to remove the print from the surface first, to avoid the chemicals damaging the surface. This is called 'lifting'.



Try it at home

Make your own bath bomb



About this activity

In this activity you will investigate how to make your own bath bomb. We can all support the diversity of our planet by using less packaging including single-use materials. By designing your own bath bomb you could also find a way to cut down on the packaging required and encourage others to make their own bath bombs.

The following recipe makes four small bath bombs.

Dry ingredients

- ✓ 100 grams baking soda
- ✓ 50 grams citric acid
- ✓ 25 grams cornflour

Wet ingredients

- ✓ 2 tbsp sunflower oil or olive oil
- ✓ 2 tsp water
- ✓ 1 tsp food colouring (optional)
- ✓ 12-15 drops essential oils of choice (be sure to check for allergies)

Kit list

- ✓ Two mixing bowls
- ✓ Whisk
- ✓ Flexible plastic moulds (clean empty yogurt pots, silicone ice cube tray or silicone cupcake cases)

Time: 2+ hours

Watch out!

Always complete a risk assessment and have it checked by your teacher before you start your experiment.

Never use anything on your skin that has been made in the laboratory or using laboratory chemicals.

Instructions

- 1 Mix the dry ingredients together in one bowl and the wet ingredients together in the other bowl.
- 2 Add the wet ingredients to the dry ingredients a few drops at a time while whisking, until the mixture just sticks together when pressed.
- 3 Press the mixture into the mould and leave to dry for at least 2 hours.
- 4 Make a few bath bombs with variations and record the differences in them, such as:
 - ✓ More or less baking soda
 - ✓ More or less citric acid
 - ✓ Different oils (citric or other)
 - ✓ Different colours
- 5 Remember to keep some elements the same, to make it a fair test.
- 6 Now it's time to test your bath bomb! Put the bath bomb in some water and record:
 - ✓ How long it takes to disperse.
 - ✓ How high the 'fizz' is.
 - ✓ What happens to the water.
 - ✓ Anything else you think might be important in deciding if a bath bomb is effective or not.
- 7 Compare your different bath bombs, deciding which one makes it more effective as a bath bomb.
- 8 Re-write your favourite recipe as a step-by-step guide