Year 6 KS2 – KS3 Science Transition Pack

We're so excited that you'll be joining us at Isca Academy!

In this pack you will find a number of science experiments that you might choose to do at home over the summer holidays. These experiments will help prepare you for Science in Year 7.

Some of these experiments will require adult supervision. These experiments are clearly labelled. Make sure you do not attempt these experiments without an adult present.

You will also find tasks and questions that go alongside the experiments. Complete these and bring this pack back in with you during your first week in Year 7. Any students who complete a transition pack will be added into a raffle to receive a prize!

If you don't have the equipment at home to do the science experiments, go to the last page of this pack and you will find QR codes that link to the videos of the experiments. You can use these videos to help you answer the questions in the back. Don't forget to hand your pack to your science teacher to be entered into the raffle.

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Experiment 1: Investigating Osmosis

Have you ever placed a raisin in a glass of water? If so, what happened? What you may have found is that the raisin expanded! This is due to a scientific process called **osmosis**. Osmosis is a process where water moves from a **high concentration** (an area where there are a lot of water particles), to a **low concentration** (an area where there are fewer water particles). In our example of the raisin, because there were more water particles outside the raisin than inside, water moved into the raisin by osmosis. This makes the raisin expand.

Your investigation is to see how osmosis affects gummy bears.

Apparatus (what you will need)

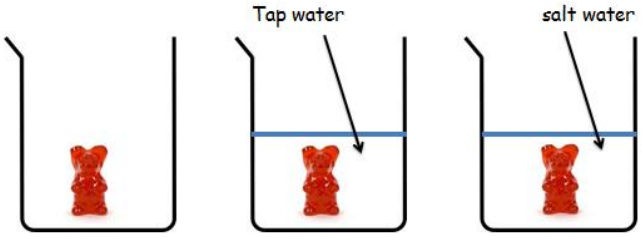
- 2 gummy bears from a packet of Haribo (supermarket own brand will not work)
- 2 glasses
- Kitchen scales
- Ruler
- Measuring jug
- Salt
- Teaspoon
- Pen and paper
- Paper towel

Health and safety

Do not drink the salty water or eat the gummy bears once you placed them into the different solutions

Instructions

1. Use your measuring jug to measure 100 ml of water and pour this into a glass
2. Repeat with the other glass so you have two glasses, each with 100 ml of water
3. Add three teaspoons of salt to one glass and stir the salt until it dissolves
4. Label this glass as 'salt solution'. Label the other glass as 'water'
5. Weigh one gummy bear on your kitchen scales and record this value in your results table on the next page
6. Measure the length of the same gummy bear with a ruler. Record this in your results table
7. Put this gummy bear into the glass with salty water
8. Weigh the second gummy bear on your kitchen scales and record this value in your results table
9. Measure the length of the same gummy bear with a ruler. Record this in your results table
10. Put this gummy bear into the glass with only water
11. Leave your gummy bears for a minimum of three hours, overnight preferably
12. After three hours or the next day, remove your gummy bears from their glasses and observe how they have changed!
13. Carefully dry your gummy bears with paper towel
14. Place your 'salt solution' gummy bear on the kitchen scales and record its new mass in your results table
15. Measure the length of your 'salt solution' gummy bear and record this in your results table
16. Place your 'water' gummy bear on the kitchen scales and record its new mass. Add this into your results table
17. Measure the length of your 'water' gummy bear and record this in your results table
18. Work through the questions on the next page



Results table:

	Mass before experiment (g)	**Mass after experiment (g)**	**Change in mass (g)** (mass after experiment – mass before experiment)	**Length before experiment (cm)**	**Length after experiment (cm)**	**Change in length (cm)** (length after experiment – length before experiment)
Salt solution gummy bear						
Water gummy bear						

Questions:

1. Which gummy bear increased in mass the most?

   .....

2. Which gummy bear increased in length the most?

   .....

3. Did any gummy bear decrease in length/mass? If so, which gummy bear?

   .....

4. What is it called when water moves from a high concentration to a low concentration?

   .....

What's the Science?

The gummy bear that was placed into the water gains mass because water moves into the gummy bear by **osmosis**. This is because there is a higher water concentration outside the gummy bear compared to inside the gummy bear.

The gummy bear that was placed into the salt solution lost mass because there was a lower concentration of water outside the gummy bear compared to inside the gummy bear. This meant that water left the gummy bear by **osmosis.**

What's next?

Why don't you repeat the experiment but change the solution? You could try sugary water, vinegar or baking soda and water. Be sure to record your results to see how osmosis affects your gummy bears in these different solutions.

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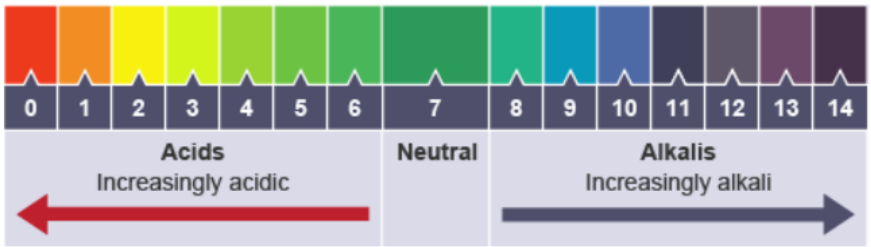
Experiment 2: Red Cabbage Indicator

Adult supervision required

Red cabbage is a pretty boring vegetable, right? Wrong! We can use red cabbage in science to investigate the **pH** of different substances.

pH is a measure of how acidic or alkaline something is. Substances that have a pH lower than 7 are acids, substances that have a pH higher than 7 are alkalis. You've probably come across many acids and alkalis without even knowing. Vinegar is an acid and toothpaste is an alkali. Substances with a pH of 7 are neutral, they are neither acid nor alkali.



Your investigation is use red cabbage indicator to investigate how acid or alkaline different substances are.

Apparatus (what you will need)

- Red cabbage
- Lemon juice
- Baking soda mixed with water
- Washing powder mixed with water
- Vinegar
- Lime juice
- Sieve
- Cooking pot or a blender
- Jug
- Glasses
- Pen and paper
- Spoon

Health and safety

- Make sure a responsible adult is present at all times
- Take care when using knives and boiling water
- Do not drink the red cabbage indicator
- Remember than some household substances can be harmful – make sure you read any warnings on the bottle before you use it

Instructions

1. Chop half a red cabbage into small pieces
2. Place the red cabbage in a pan and add enough water so the cabbage is just covered. Boil for 10 minutes. Another way to make red cabbage indicator is to put the red cabbage in a blender with some water and blend until smooth
3. Sieve the water from the cooked cabbage into a jug
4. Leave it to cool for 30 minutes
5. Add a small amount of each test substance (vinegar, lime juice etc) into separate glasses.
6. Label each glass with what it contains
7. Pour a small amount of your red cabbage indicator into the different glasses
8. Stir the indicator and test substance with a spoon and watch how the colour changes

9. Record your results in the table on the next page and use the red cabbage indicator guide to work out if the substance is an acid or alkali

Results table:

Substance to test	Colour substance changes when mixed with red cabbage indicator	pH	Acid or alkali?
Lemon juice			
Baking soda			
Washing powder			
Vinegar			
Lime juice			

Red cabbage indicator colour guide:

Questions:

1. Which of your substance were acidic?

.....

2. How did you know that the above substances were acidic?

.....

3. Which your substances were alkaline? How did you know they were alkaline?

.....

4. Which of your substances was the strongest acid? Which was the strongest alkali?

.....

What's next?

Why don't you use the acid in white vinegar to dissolve an eggshell? Add a hardboiled egg to a glass jar and cover it with white vinegar. Put the lid on the jar and you'll see bubbles on the eggshell – this means a chemical reaction is taking place! Leave the egg for a few days (replace the vinegar after day 1) and it will become larger and paler. After a few days, remove the egg from the vinegar and gently wash and rub off any remaining eggshell. You now have an egg without a shell!

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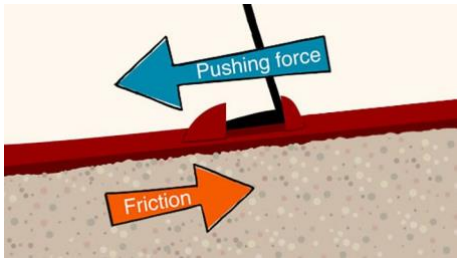
Experiment 3: Investigating Friction

Have you ever wondered why you need to be more careful when you walk on ice? This is because ice reduces a force called **friction**. Friction is a force between two surfaces that are moving against one another. Friction makes it more difficult for things to move. The less friction there is, the more likely you are to fall over! Try pushing a book across a carpet and then across a smooth table. Was it easier to push the book on the table than on the carpet? That's because there is more friction between the book and the carpet than the book and the table, which makes it harder to push the book across the carpet.



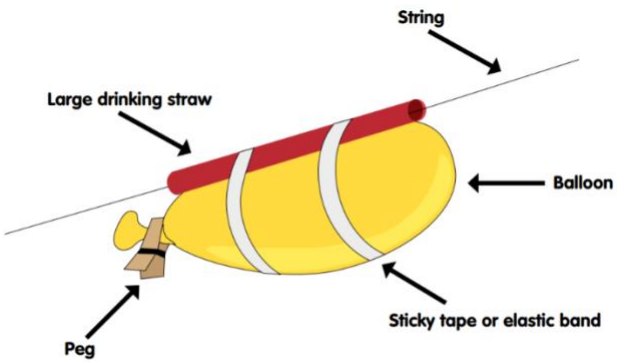
Your investigation is to investigate how washing up liquid affects friction. You'll do this by creating a rocket balloon.

Apparatus (what you will need)

- Different shapes and sizes of balloons
- A drinking straw
- A peg
- Sticky tape
- String
- Washing up liquid
- Two chairs
- Tape measure
- Newspaper
- Washing up liquid

Method

1. Place your two chairs at least 3 meters apart
2. Thread the straw through the end of the piece of string
3. Securely tie the string between the two chairs, making sure the straw stays on the string and that the string is tight (it cannot droop in between the two chairs)
4. Attach two pieces of tape to the straw (like in the diagram)
5. Blow up the balloon and use the peg to keep the air in
6. Attach the balloon to the straw using the tape
7. Pull the balloon to one of the chairs
8. Remove the peg and watch the balloon fly across the string!
9. Measure how far the balloon moved with your tape measure and record this in the results table on the next page
10. Repeat the experiment but use balloons with different shapes. Make sure you blow them up to the same size. Record your results in the results table
11. Cover your string with washing up liquid to reduce the friction between the straw and the string. You may want to put newspaper under the string to protect your floor from any falling washing up liquid!
12. Repeat the experiment with different shaped balloons on the string with washing up liquid and record your results in the table



Results table for string without the washing up liquid:

Shape of balloon	Distance balloon moved (m)

Results table for string with the washing up liquid:

Shape of balloon	Distance balloon moved (m)

Questions:

1. Which shaped balloon travelled the furthest?

   .....

2. How did adding washing up liquid affect the distance that the balloons moved?

   .....

3. What force did the washing up liquid reduce?

   .....

What's the science?:

As the air rushes out of the balloon, a force called thrust is generated and pushes the balloon forward. When you add washing up liquid to the string, this reduces another force called friction between the straw and the string. As friction is lower, the balloon will now travel further and faster.

What's next?:

Try changing the length of the straw or the type of string to see how this affects the distance the balloon moves. You could also experiment by adding objects to the balloon to make it heavier and increase its mass.

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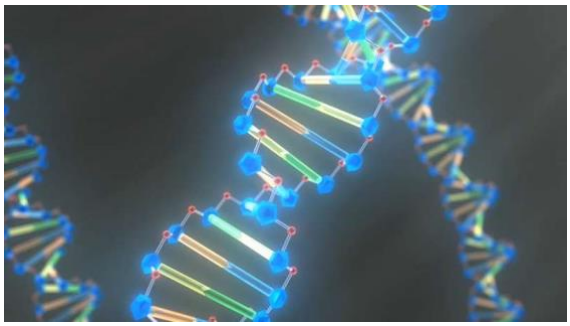
Experiment 4: Extracting DNA from a Strawberry

Adult supervision advised



Have you ever wondered what makes you, YOU? Why do you have your hair colour? Or your eye colour? What makes you so unique? A lot of this is down to your **DNA**. **DNA** is molecule found in nearly every cell of your body. Imagine your cells as the building blocks that make up you – in fact you are made up of around 100 trillion cells – that's 1,000,000,000,000,000 cells!

DNA is very special because it holds all the instructions that a living thing needs to grow, reproduce and function. Your DNA gave the instructions for you to have your particular hair colour or eye colour.

Your DNA is twisted into a shape called a double helix (see the picture above). If you stretched out the DNA in just one cell it would be 3 meters long. If you stretched out all the DNA in your body, it would be 67 billion miles long – the same as around 150,000 round trips to the Moon!

Your task is to extract the DNA from a strawberry.

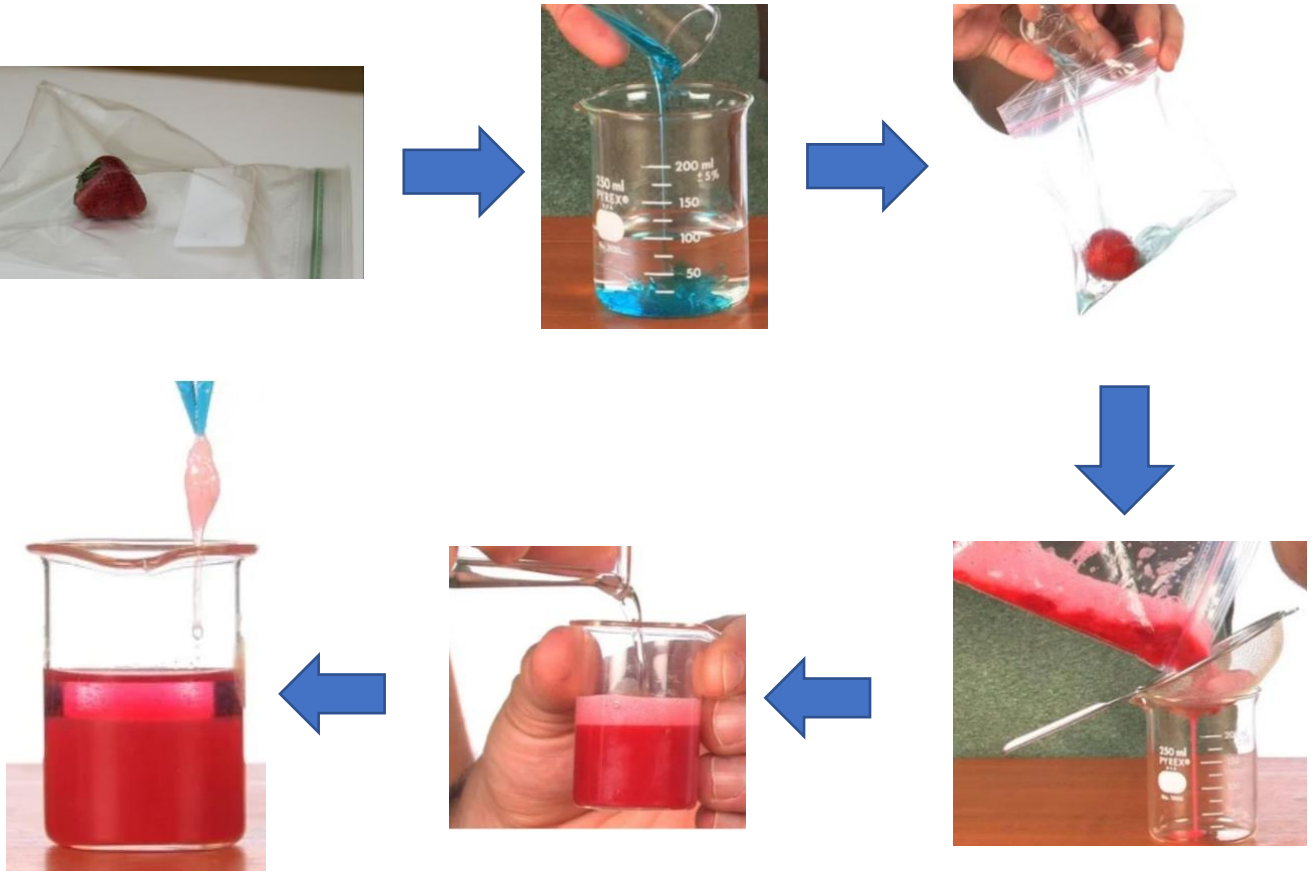
Apparatus (you will need)

- 2 strawberries
- Re-sealable plastic bag (zip lock or sandwich bag)
- Salt
- Washing up liquid
- Sieve
- 2 glasses
- A toothpick or cocktail stick
- Rubbing alcohol or hand sanitiser
- Measuring jug
- Teaspoon

Method (see next page for visual instructions)

1. Put the rubbing alcohol or hand sanitiser in the freezer. You'll need this later
2. Remove the green leaves from your strawberries
3. Place the strawberries in the re-sealable plastic bag and crush them with your hand for 1-2 minutes. This will open the cells and release the DNA
4. Use the measuring jug to measure 100 ml of water and pour this into the glass
5. Add two teaspoons of washing up liquid and ½ teaspoon of salt to the water. Stir the salt until it dissolves. This is called your extraction fluid
6. Measure 10 ml of your extraction fluid with your measuring jug and add this to the bag with the strawberry
7. Ensure the bag is sealed and mix the strawberry and the extraction fluid for another minute
8. Use your sieve to filter the strawberry and extraction fluid mixture into a clean glass. Use your spoon to help you filter the mixture
9. Remove the rubbing alcohol or hand sanitizer from the freezer
10. Pour 10 ml of rubbing alcohol down the side of the glass into the strawberry mixture. If using hand sanitizer, squeeze a few squirts of this down the size of the glass. Do not stir or mix it in

11. Wait a few seconds and you'll see a white cloudy substance appear in the top layer of your mixture – this is DNA!
12. Remove the DNA with a toothpick or cocktail stick and observe!



Questions:

1. What is the name of the molecule that makes you unique?

.....

2. Why did you crush the strawberries in this practical?

.....

3. What did you use to help you separate the solid bits of fruit from the fruit juice?

.....

4. DNA is coiled into a special shape, what is the name given to this shape?

.....

<u>What's next?</u>

Why don't you try extracting DNA from other fruit and vegetables? Bananas and kiwis work well as they are easy to crush. If you want a challenge you could ty extracting the DNA from an onion!

Experiment 5: Skittles Chromatography

What colour ink do you think is in a black felt pen? Black only? You may be surprised to find that black felt pens are made up of many different colours – from pinks to greens! Scientists can use **chromatography** to find out exactly what colours are in things like pens and food.

Your task today is to separate the colours in skittles to see what food colours are in different coloured skittles.

Apparatus (what you will need)

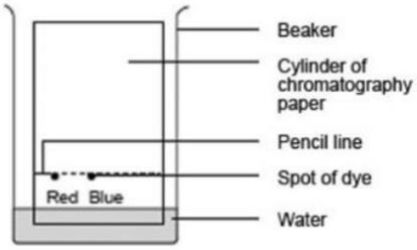
- A cup or glass
- Small paintbrush
- Paper clip (optional)
- Large coffee filter paper
- Pencil
- Ruler
- Hairdryer (optional)
- Skittles
- Scissors

Health and safety:

- Do not eat the skittles once you have experimented on them

Method

1. Cut the coffee filter into a rectangle, it needs to be longer than the cup or glass you are using
2. Place the filter paper onto a flat surface. Draw a straight line with a pencil and ruler about 2 cm from the bottom of one of the short edges of your coffee filter
3. Dampen the paintbrush with some water
4. Brush one of your Skittles with the dampened paintbrush to remove some colour
5. Paint this colour onto the pencil line on your coffee filter. Small spots are best
6. Put some water into your cup or glass
7. Put your coffee filter paper into the cup or glass, with the pencil line and coloured spot at the bottom. **Make sure your pencil line is above the water!** (see picture on the right →)



8. If you can, secure the filter paper to the side of the cup/glass with a paper clip to hold it in place. If not, you can hold your paper in place. You don't want your pencil line or your spot of colour to slip into the water
9. Watch as the water and colour move up through the paper!
10. When the water gets close to the top of the paper, remove the paper
11. Optional – dry the paper with a hairdryer
12. Repeat with different coloured Skittles

Questions:

1. Sketch a picture of your experiment set up:

2. How many colours were in each of your Skittles?

.....

3. Did any of your Skittles contain more than one colour?

.....

4. Which colour travelled furthest up your paper?

.....

<u>What's the science?</u>

The food colouring in Skittles is soluble (can dissolve) in water. When you placed the filter paper in water, the water moved up the paper and the food colouring dissolved into this water. As the water moved up the filter paper, the food colouring went with it!

<u>What's next?</u>

Try carrying out the experiment again, but this time using M&Ms or Smarties. You could also place Skittles or Smarties in a circle on a plate and add some water to the middle of the plate. The food colouring from the sweets will dissolve in this water and move away from the sweets and into the middle of the plate.

If you have felt pens, you can try this experiment to see which felt pens have more than 1 colour pigment in them.

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QR codes for links to videos

Some of the videos may have different methods to what is described in the pack – that's ok. Both methods will work.

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Experiment 1: Gummy bear osmosis

Experiment 2: Red cabbage indicator

Experiment 3: Investigation friction

Experiment 4: Extracting DNA from a strawberry

Experiment 5: Skittles chromatography