Te Kura
Te Aho o Te Kura Pounamu
The Correspondence School

Being a scientist

Starter activities

INT209A
CURRICULUM LEVEL 2-3

INT209A

Note:

Begin with INT209.

This is the ‘starter activities’ resource.

ATOMISER

Science Strands: Planet Earth & beyond/Physical World
Curriculum levels 2/3

I AM LEARNING TO:

- make careful observations
- ask questions
- talk about what I think is happening
- gather evidence to support an explanation.

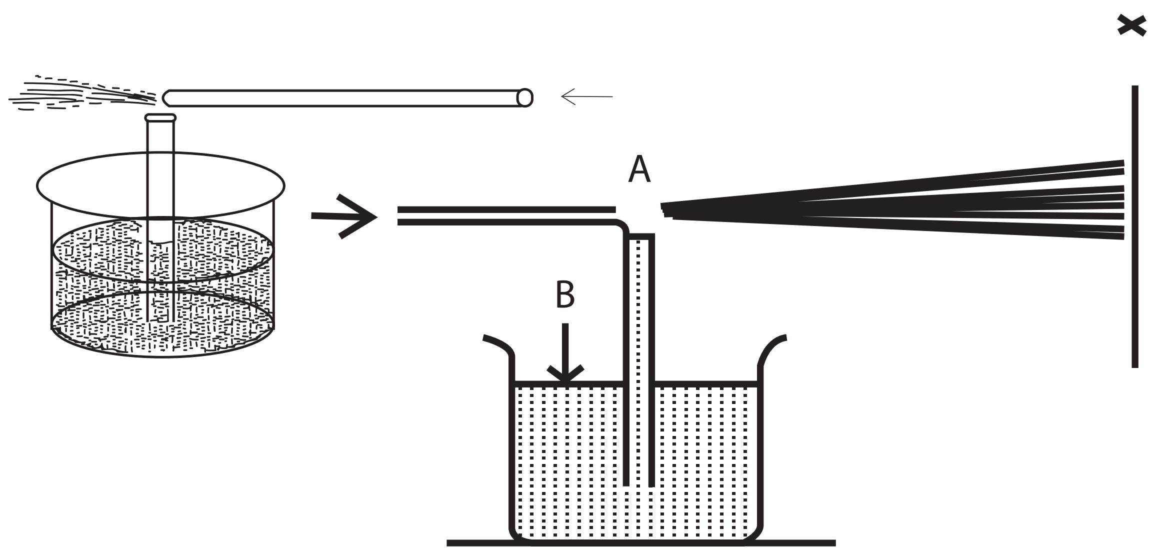
You might think that water blasts out of a water gun (or hose) as a light spray because that is just what it does! But how do we find out about the science behind the blasting spray? There's only one way to find out – by careful observation, questioning and scientific reasoning.

YOU WILL NEED:

- a glass or cup partly filled with water
- a thick drinking straw.

EXPERIMENT

Cut the straw about 3/4 down from one end but only 2/3 of the way through the straw. Bend the straw towards the uncut edge of the straw at 90°. Immerse the long end of the straw into the water in the glass or cup. Blow through the short straw towards the cut bend. Observe and record what happens.



OBSERVATIONS

Look closely as the water rises up the straw and is sprayed out the end. What do you see?

1. ____
2. ____
3. ____
4. ____
5. ____

Repeat the experiment as many times as you want and take it further by blowing softly or hard, changing the angle of the straw, immersing the straw in the water at different lengths etc.

View a similar atomising experiment here:
www.youtube.com/watch?v=-Q5KjBlgiHU

Use a table similar to the one below to keep track of your observations as you adapt the experiment.

Experiment adaptations	Results (what you observed?)
Blowing hard	
Blowing soft	
Changing the straw angle	

Immersing the straw shallow	
Immersing the straw deep	

QUESTIONS – BRINGING IT ALL TOGETHER

Thinking about the experiments you have conducted, the results from the different adaptations you made to the experiment and the careful observations you have made, record what you believe the answers are to these questions are:

1. During your observations, did anything surprise you?

2. What is the science involved here?

3. Can you think of examples of this sort of thing happening in real life?

EXPLANATION – HOW DOES AN ATOMISER WORK?

Air pressure is all around us. It is the weight of the atmosphere’s air pushing down on you and everything around you.

In the case of your experiment, water entered the straw from the cup or glass and come out through the slit in the straw as a spray.

As you blew through the long section of the straw, a stream of air flowed over the top of the short section, reducing the air pressure at that point. As normal air pressure underneath forced water up into the straw, the moving air blew it off in drops.

Atomisers such as perfume bottles and spray bottles frequently use a balloon, thumb or trigger pump to blow the in air.

BALLOON ROCKET

Science strands: Planet Earth & beyond/Physical World
Curriculum levels 2/3

I AM LEARNING TO:

» be a scientist
» make careful observations
» make predictions
» ask questions
» talk about what is happening
» record what I observe.

MAKE A BALLOON ROCKET

YOU WILL NEED:

» a balloon
» a straw
» sellotape
» string or fishing line (about 2 metres)
» two chairs.

EXPERIMENT:

1. Tie one end of the string to the back of a chair.
2. Thread the straw through the other end of the string.
3. Tie the loose string to the back of another chair and pull tight.
4. Blow up a balloon and hold the end closed.
5. Ask someone to help you attach the balloon to the straw with two pieces of sellotape.
6. Talk about what you think will happen if you let the balloon go (prediction).
7. Move the balloon and straw to the end of the string.
8. Let the balloon go.
9. Talk about what happened.
10. Blow up the balloon and try again. Experiment with making the rocket go faster or slower.

Write some facts about what you observed in your experiment.

1.
2.
3.
4.
5.
6.

CONCLUSION:

As the air is released out of the balloon in one direction, the force propels the balloon in the opposite direction, much like a rocket. The stored elastic energy in the full balloon forces the air out, which creates thrust forward.

See: www.sciencebob.com/experiments/balloonrocket.php

BURNING CANDLE

Science strand: Material World
Curriculum Levels 2/3

I AM LEARNING TO:

- be a scientist
- make careful observations
- make predictions
- ask questions
- talk about what is happening
- measure time with a stopwatch
- record what I observe.

SCIENCE EXPERIMENT WITH A CANDLE

Ask an adult to supervise this experiment.

YOU WILL NEED:

- tea light candles
- three glass jars of different sizes
- matches
- permanent marker
- pen or pencil
- stopwatch or watch with a second hand.

EXPERIMENT:

1. Read instructions and discuss them with your supervisor.
2. Talk about what you think will happen? (prediction)
3. Light a candle and put one of the jars over it.
4. Observe what happens to the flame and wax.
5. Measure the time it takes for the flame to die down.
6. Talk about what happened. How long will the candle burn in a larger jar? or a smaller jar? (prediction)
7. Put the three jars in a row from smallest to largest. Mark the jars with numbers 1, 2, 3.
8. Use this chart to record the time the candle burns in each jar.

	Time estimate	Actual time
1		
2		
3		

9. Light the candle and place the largest jar over it. Estimate how long it will take for the candle to burn out. Record your answer. Measure the actual time with the stopwatch.
10. Wait until the jar cools down then do the same experiment with the other two jars.
11. What did you notice about the size of the jars and the length of burning?

1.
2.
3.
4.
5.
6.

CONCLUSION:

Fire and burning is a chemical reaction that creates light and heat from oxygen and fuel. A lit candle needs to draw oxygen from the air to burn.
If you limit the amount of air available the candle's flame will go out when it has used up all the oxygen. We can summarise the chemical reaction as an equation:
air (oxygen) + fuel $\longrightarrow$ carbon dioxide + water

HEAT & FREEZING

Science strand: Material World
Curriculum Levels 2/3

I AM LEARNING TO:

» make careful observations
» ask questions
» talk about what I think is happening
» use scientific words to describe a process.

Water freezes at 0°c (degrees Celsius).

You might think that squeezing ice cubes together in your hand just makes your hand cold because that's what ice cubes do! But how do we find out about the science behind what really happens to those squeezed ice cubes? There's only one way to find out – by careful observation, questioning and scientific reasoning.

YOU WILL NEED:

» two ice cubes.

EXPERIMENT:

1. Hold an ice cube in your hand and squeeze hard.
2. Observe what happens.
3. Push two ice cubes together in your hand (very hard) and then release the pressure.
4. Observe what happens.
5. Try to separate the ice cubes.

OBSERVATIONS:

Look closely as you squeeze one ice cube in your hand. What do you see?

1. ______________________________

____

2. ______________________________

____

Look closely as you squeeze two ice cubes together in your hand.
What do you see?

1. ______________________________

____

2. ______________________________

____

What happens when you try to separate the ice cubes?
Repeat the experiment as many times as you want and take it further by using different size ice cubes, pressing with more or less pressure, warming or cooling your hands first etc.

Use a table similar to the one below to keep track of your observations as you adapt the experiment.

EXPERIMENT ADAPTATIONS	RESULTS (WHAT YOU OBSERVED?)
Different size ice cubes	
Pressing more	
Pressing less	
Warm hands	
Cold hands	

QUESTIONS – BRINGING IT ALL TOGETHER

Thinking about the experiment you have conducted, the results from the different adaptations you made to the experiment and the careful observations you have made, record what you believe the answers are to these questions are:

1. During your observations, did anything surprise you?

2. What is the science involved here?

3. Can you think of examples of this sort of thing happening in real life?

EXPLANATION – WHY DO THE ICE CUBES STICK TOGETHER?

When you squeeze an ice cube hard, water drips from between your fingers. When you squeeze two ice cubes together, the ice cubes fuse together and cannot be separated.

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The ice cubes stick together because of latent heat transfer.

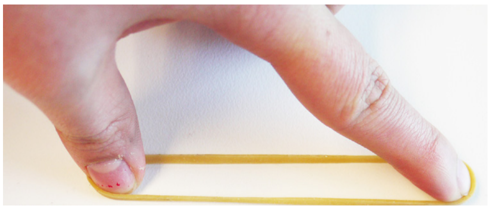
Water freezes at 0°c. The ice cubes in the freezer are around -15°c, which is much colder. When you take the ice cubes out of the freezer, the outer layer of the cubes melt, when they are pressed together they are cold enough for the melted water to refreeze (from heat transfer).

The key ideas here are that water freezes at 0°c and that heat travels from one place to another.

HOW FAR CAN WE STRETCH RUBBER BANDS?

Science strand: Physical World
Curriculum Levels 2/3

I AM LEARNING TO:



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- » make careful observations
- » ask questions
- » talk about what I think is happening
- » gather evidence to support an explanation.

You might think that rubber bands stretch because that's just what they do! But how do we find out about the science behind the stretch? There's only one way to find out – by careful observation, questioning and scientific reasoning.

YOU WILL NEED:

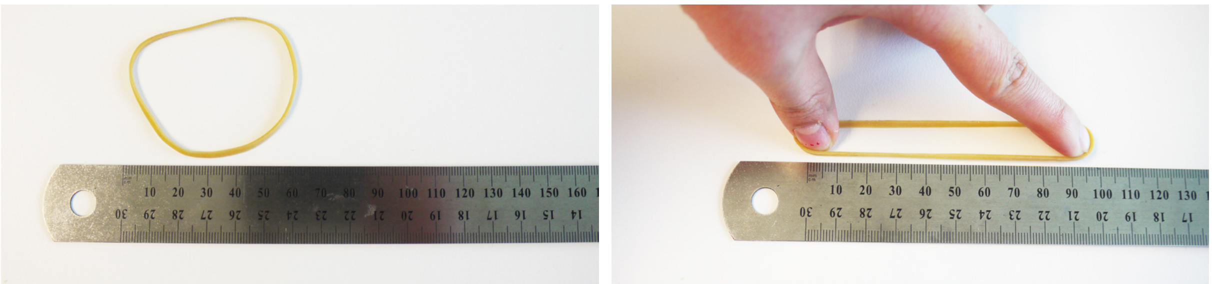
- » a range of different sized rubber bands
- » sets of hanging weights, about 250g each, totaling about 3kg per set. If you don't have weights, pull on the rubber band with your fingers instead
- » two small double ended hooks
- » one 30cm ruler.

EXPERIMENT:

Attach the top of a double ended hook to an object that has clear space below it, select a rubber band and attach this to the hook on the bottom. Now attach the second double ended hook to the bottom of the hanging rubber band and use this to attach weights to. Use the ruler to measure how far the rubber band stretches as weights are added.

Repeat the experiment as many times as you want and take it further by using rubber bands of different lengths and widths.

View stretching a rubber band here
www.youtube.com/watch?v=fFtM9JznLh8



TE KURA

Measure the length of a rubber band like this.

Use a table similar to the one below to keep track of your results.

Rubber band length	Rubber band width	Maximum length of stretched rubber band	Maximum weight added to rubber band

Complete the recording sheet below – *Experimenting with rubber band stretching*

OBSERVATIONS:

Look closely as the rubber band stretches. What do you see?

Record your observations in sequence (order) starting from when the rubber band is hanging with no weight added to the point where the rubber band is at maximum stretch (or breaks!).

1.

2.

3.

4.

5.

You may have more than five observations…keep going if you have more!

QUESTIONS – LOOKING AT AND INTERPRETING RESULTS

Thinking about the experiments you have conducted, the results from the different size rubber bands you used and the careful observations you have made, record what you believe the answers are to these questions are:

1. What factors influence how much rubber bands can be stretched?

2. Why do you think that rubber bands stretch?

EXPLANATION – WHY DOES A RUBBER BAND STRETCH?

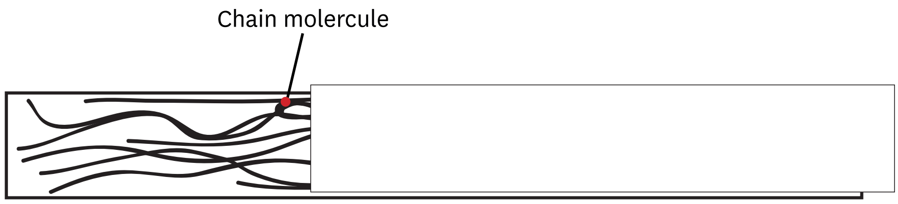
Friction is what happens when any two things rub against each other.

For example;

1. *Solid things such as your two hands rubbing together or a hammer hitting a nail*
2. *Gases such as the air slowing down your car.*
3. *Liquids such as water slowing down a boat.*

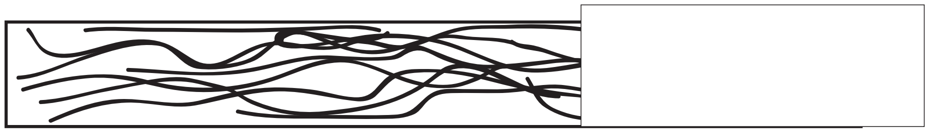
Rubber is a polymer – that means that the rubber molecules are made of long chains of atoms. When a rubber band is un-stretched (relaxed) the molecule chains are all twisted up (Figure 1(a)). As the rubber is stretched they begin to untangle themselves as shown in Figure 1(b).

Figure 1(a)



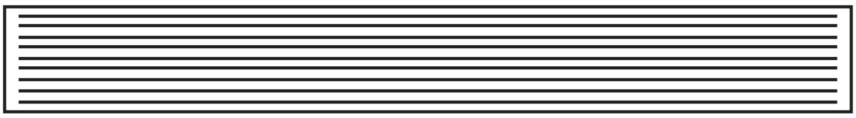
Chain molecules tangled up

Figure 1(b)



Chain molecules untangling

Figure 1(c)



Chain molecules completely untangled

When fully stretched, they are all lined up (Figure 1(c)). At this point the rubber changes its appearance – the surface looks rougher and whiter.
You may notice that when a rubber band is stretched it gets slightly warmer. You can test this by taking a rubber band, holding a short length of it, stretching it quickly and then holding it against your lips – it feels warmer. This is because there is friction between the untangling molecules.

RECORDING SHEET – EXPERIMENTING WITH RUBBER BAND STRETCHING

How far can a rubber band stretch?	
What happened when you stretched rubber bands of different lengths? Why do you think this happened?	
What happened when you stretched rubber bands of different widths? Why do you think this happened?	
Did anything surprise you?	
What is the science involved here?	
Can you think of examples of this sort of thing happening in real life?	

LIGHT FOR PLANTS

Science strand: Physical World
Curriculum Levels 2/3

ISTOCK

I AM LEARNING TO:

» be a scientist
» make careful observations
» make predictions
» ask questions
» talk about what I think is happening
» record what I observe.

SCIENCE EXPERIMENT WITH SEEDS

YOU WILL NEED:

» four small paper plates
» four sheets of paper towel
» cress or radish seeds
» water
» pen or pencil.

WHAT YOU DO:

1. Place a layer of paper towel on each plate.
2. Sprinkle some cress or radish seeds on top.
3. Spray some water over the seeds on one of the plates and put it in a sunny place indoors.
4. Spray some water on the second plate and put it in a dark place like a cupboard.
5. Don't add water to the other two plates and put one in the sun and one in the cupboard.
6. Talk about what you think will happen? (Prediction)
7. After a few days look at the plates again. The plants should be at different stages.
8. Talk about what has happened? Is this what you predicted? What do plants need to grow well?

9. Use the chart to record what happened to the seeds?

PLATE		WHAT HAPPENED?
1.	sun and water	
2.	no sun and water	
3.	sun and no water	
4.	no sun and no water	

Write some facts about what you observed in your experiment.

1.	
2.	
3.	

4.
5.
6.

CONCLUSION:

Plants can do something that no other living thing can do. They can convert energy from the sun into food energy to help the plants live and grow. Plants need light from the sun and water and nutrients from the soil to grow.

Without plants there would be no food for animal life on Earth. Animals that eat plants become food for animals that eat meat.

METAL AND MAGNETS

Science Strand: Physical World
Curriculum Levels: 2/3

ISTOCK

I AM LEARNING TO:

- » be a scientist
- » make careful observations
- » make predictions
- » ask questions
- » talk about what is happening
- » record what I observe.

SCIENCE EXPERIMENT WITH METALS AND MAGNETS

There are many different metals, but they all have some things in common.
All metals look shiny. They all allow electricity to pass through them.
They can be flattened into thin sheets like aluminium foil. They feel cold when touched and warm when heated. Some metals are attracted to magnets.

Some metals are attracted to magnets.

FIND METAL OBJECTS

YOU WILL NEED:

- » a few drink and food cans
- » spoon, pot, jug, toy or some other objects maybe made of steel
- » magnet.

WHAT YOU DO:

1. Find out if your objects are steel, aluminium or another metal by holding your magnet to them. If it is attracted, they are steel.
2. What did you observe? How many objects were attracted to the magnet?

3. Record your results on the chart.

Experiment Name	Object 1 can of spaghetti	Object 2	Object 3	Object 4	Object 5	Object 6
Does it feel cold? **yes or no**						
Does it look shiny? **yes or no**						
Is it attracted to a magnet? yes or no						

Write any other observations here.

1.
2.

3.
4.
5.
6.

WHICH ONES ARE SPIDERS?

Science strand: Physical World
Curriculum Levels 2/3

I AM LEARNING TO:

- make careful observations
- ask questions
- identify similarities and differences between species
- use scientific words to describe a species
- classify species based on their features.

You might think that spiders are insects or just scary creepy crawlies! But how do we find out about the science that describes these creatures? There's only one way to find out – by careful observation, questioning and scientific reasoning.

YOU WILL NEED:

- a range of pictures of insects and spiders.
- to explore and observe spider in the garden, but don't catch!
- a magnifying glass.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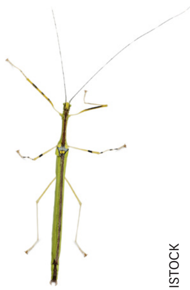

ISTOCK

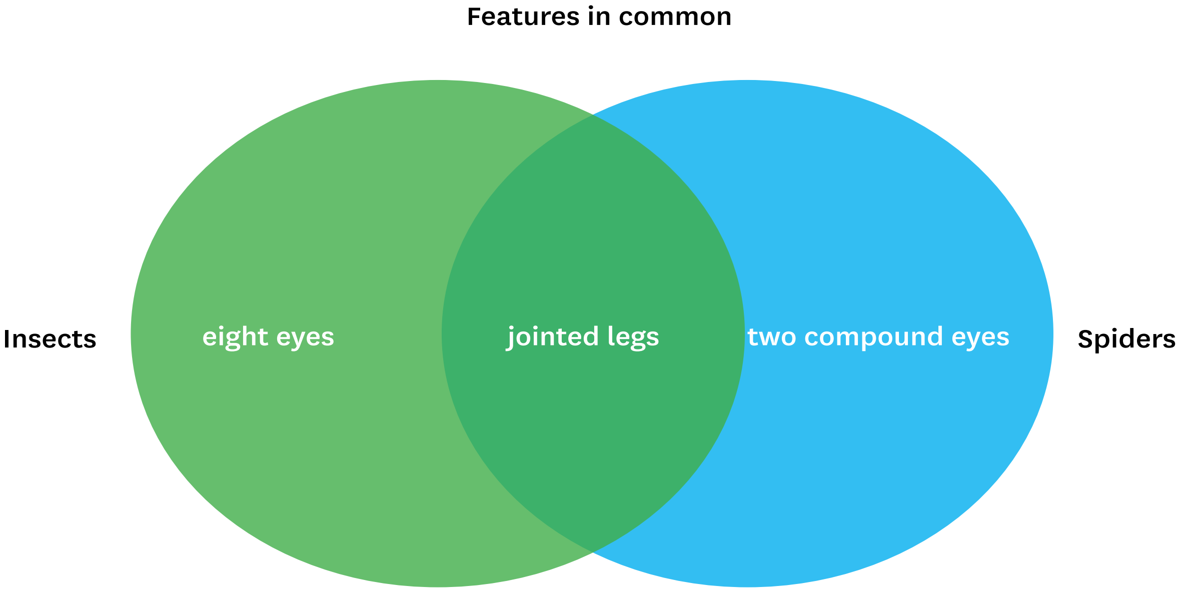

ISTOCK

EXPERIMENT (OBSERVATIONS):

Place the pictures of spiders in one group and the insect pictures in another group. Use a magnifying glass to look closely at the specimens in each group and record the similarities and differences that you observe between the two groups.

View the more information on spiders and insects at:
Insects: www.youtube.com/watch?v=H8bzy7a8Oow
Spiders: www.youtube.com/watch?v=ALsnmm-ghlA

Use a diagram similar to the one below to keep track of your observations. Record features that both insects and spiders have in common in the middle part of the Venn diagram. Some features have been done to help you.



EXPERIMENT (OBSERVATIONS):

Think about the detailed observations you have made, the footage that you have viewed in the video links, and the similarities and differences that you have recorded on your diagram. Record your answers the following questions:

1. Did anything surprise you as you investigated spiders and insects?

2. What do you think might happen if you were bitten by a whitetail or katipō spider?

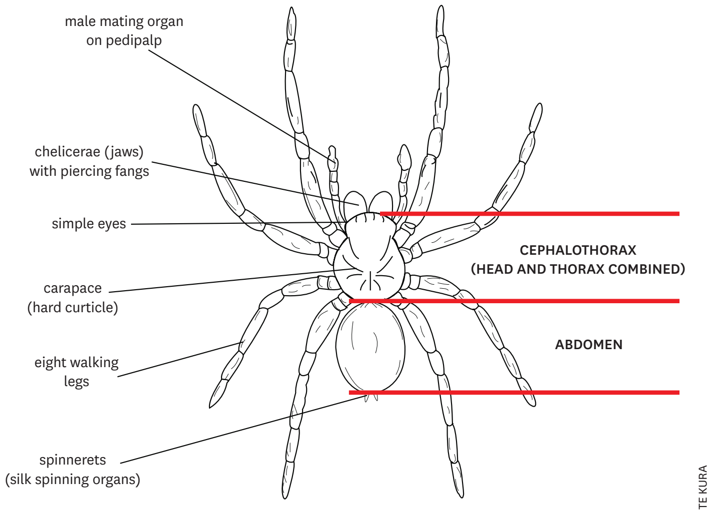
3. Why do you think that spiders do not have antennae?

4. If spider venom is so lethal to insects, why do you think human deaths from spider bites are so rare?

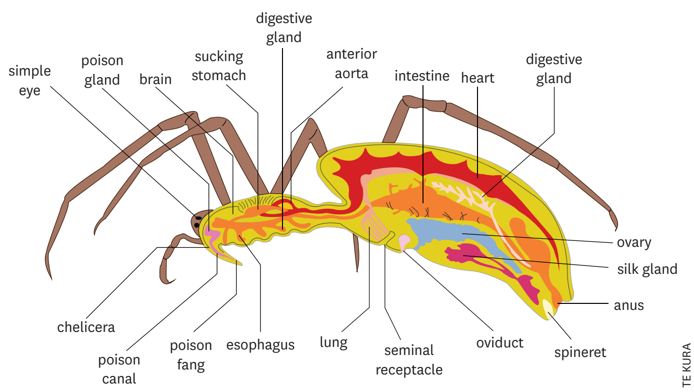
5. Do you think that spiders are helpful to humans or a pest? Why do you think that?

EXPLANATION – WHAT IS A SPIDER?

- Spiders are arachnids, not insects.
- Spiders have eight legs while insects have six.
- Spiders don't have antennae, while insects do.



INTERNAL ANATOMY OF A SPIDER



- A fear of spiders is called 'arachnophobia'.
- Spiders are found on every continent of the world except Antarctica.
- There are approximately 34,000 different species of spider.
- Most spiders make silk which they use to create spider webs to capture prey. Abandoned spider webs are called cobwebs.
- Most spiders are harmless to humans but a few spider species, such as the redback, can bite humans and inject venom. Deaths from spider bites are rare however.

The redback spider can be found in NZ. They prefer warm, dry conditions. They are most commonly found in the north and east of the North Island

View the more information on the katipō spider at www.tepapa.govt.nz/researchattepapa/enquiries/spidersweb/what/pages/katipo.aspx

WHY DOES POPCORN POP?

Science strand: Physical World
Curriculum Levels 2/3


ISTOCK

I AM LEARNING TO:

» make careful observations
» ask questions and talk about what I think is happening
» gather evidence to support an explanation
» use scientific words to describe a processes.

You might think that popcorn pops because that's just what it does! But how do we find out about the science behind the pop? There's only one way to find out – by careful observation, questioning and scientific reasoning.

YOU WILL NEED:

» unpopped popcorn
» butter or vegetable oil (one teaspoon per three tablespoons of unpopped popcorn)
» apparatus for containing and heating the popcorn e.g. heavy based saucepan with lid (preferably clear lid to see through), stove or hotplate.

EXPERIMENT:

Heat the butter or oil in a pan, add unpopped popcorn in a single layer, put the lid on the pan (not like the guys in the slow motion video!), keep the pan on heat and shake the pan from time to time. Keep the lid on until the popping noises stop. Then remove from the heat.

View slow motion popcorn popping at
www.youtube.com/watch?v=p_7Qi3mprKQ

View interesting popcorn facts at
www.youtube.com/watch?v=LAh8OICXDmE

Repeat the experiment using different oils and fats. If you want to take it further, try heating the corn in water to see if the unpopped popcorn will pop in that. Make sure you take the pan off the heat, before the corn burns, if the corn does not pop!

OBSERVATIONS:

Look closely at the popcorn as it pops, or use the slow motion footage from the video. What do you see?

Record your observations in sequence (order) starting from when the unpopped popcorn is put into the hot pan through until the popcorn has finished popping?

1. ______________________________

____

2. ______________________________

____

3. ______________________________

____

4. ______________________________

____

5. ______________________________

____

You may have more than five observations…keep going if you have more!

QUESTIONS – BRINGING IT ALL TOGETHER

Thinking about the experiments you have conducted, the results from the different substances you used and the careful observations you have made, record what you believe the answers to these questions are:

1. What conditions are needed for popcorn to pop?

2. Why do you think that popcorn pops?

3. How could you test to find out what causes the popping?

4. What are the boiling points of water and oil? Does this provide a clue about why oil is better than water for popping corn?

EXPLANATION – HOW DOES POPCORN POP?

Each kernel of popcorn contains a small drop of water stored inside a circle of soft starch. Popcorn needs between 13.5–14% moisture content to pop. The soft starch is surrounded by the kernel's hard outer surface.

As the kernel heats up, the water begins to expand. The water turns into steam and changes the starch inside each kernel into a superhot gelatinous goop. As the kernel continues to heat the pressure inside the grain will reach 135 pounds per square inch before finally bursting the hull open.

As it explodes, steam inside the kernel is released. The soft starch inside the popcorn becomes inflated and spills out, cooling immediately and forming into the odd shape we know and love. A kernel will swell 40–50 times its original size!

KEY IDEA

Apply heat, increase in pressure, energy stored is released…pop!

ACKNOWLEDGEMENTS

Every effort has been made to acknowledge and contact copyright holders. Te Aho o Te Kura Pounamu apologises for any omissions and welcomes more accurate information.

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