Student Teacher Guide
2025

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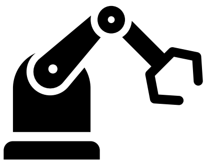
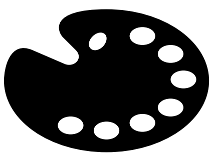
How to enter

1. Decide whether you are entering as an individual, pair, group or class
2. Choose a project type (see list below)
3. Choose a topic (see page 4)
4. Carry out your project, keep a logbook
5. Complete the online entry form via https://www.cawthron.org.nz/scitec/
6. Write up your project
7. Prepare your display
8. Film your video if also entering the Science communications award

Choosing a project type

Decide a category to enter. These are your four options;

	**Science Experiment** You will need to ask a question that will become a hypothesis or prediction. You will gather data in experiments, in order to prove or disprove a hypothesis or confirm or not confirm a prediction or aim. Follow the scientific method and write the practical up using set guidelines. See pages 5-8
	**Research** When an experiment or a product is not possible, you can choose a topic or question and investigate it in-depth by researching information from which conclusions are drawn. You must show good understanding of your research. See pages 9-10.
	**Technology** You will need to develop a product, device or process to serve a purpose, a human need, or a problem that needs solving. These projects involve following a set technology process and write up. See pages 11-12.
	**Art** Create art inspired by science or technology and display it using any type of media. These projects should be accompanied by a paragraph explaining the inspiration. They will be judged by artists and scientists. See page 13

If you are entering a Science, Research or Technology project, you also have the option of entering the **communication** award, where you produce a short video summary of your project. See page 14.

Project topics and prizes

Choose a topic that you really care about or are interested in. Think of questions related to that topic that you would like to explore and find answers to. If you get stuck, there are lots of resources available on the internet about how to choose a science fair topic.

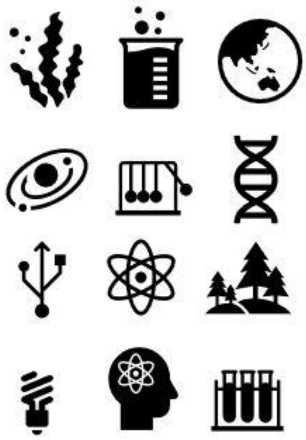
Secondary students have sometimes adapted projects undertaken as part of their NCEA studies into a winning Scitec entries. Prizes will be awarded according to the following table;

Year band	Science	Research	Technology	Art	Highly Commended
1-4	$50	$50	$50	$50	$20 each
5-8	$100	$100	$100	$100	$50 each
9-10	$150	$150	$150	$150	$75 each
11-13	$150	$150	$150	$150	$75 each
1-13	Supreme Award $500 and trophy	Supreme Award $500 and trophy	Supreme Award $500 and trophy	Supreme Award $500 and trophy	

There is also a prize ($250 worth of equipment) for the best class effort. This could be for one class project, or for a series of projects all submitted by the one class.

Special prizes are for projects that best feature any of the following aspects of science:

- Climate change
- Te Ao Māori
- Marine and/or freshwater science*
- Engineering*
- Sustainability
- Astronomy
- Health science*
- Data science / coding
- Agriculture / forestry / horticulture
- Business idea or concept
- Food innovation or research*
- Bird, plant or animal protection*



When registering your entry online, tick any of the above topics that could apply to your project. Your project doesn't have to include any of these. You can select as many as apply but each project will only be eligible to win one special award. <u>Your project will not likely be considered for these special awards if you fail to register for them.</u>Think outside the square for this. You have to be in to win!

There is also a Communications Award ($250) you can enter if you are submitting a science, research or technology project. See page 14 for further details.

* IMPORTANT - Please refer to the Health & Safety appendix on page 22.

Science experiment project

Think of a question you would like to answer

↓

Do some research, ask for advice

↓

Create a hypothesis or prediction

↓

Develop a method; make sure you consider ethics if relevant (see page 20 - 21)

↓

Carry out experiment and collect raw data in your log book

↓

Analyse results

↓

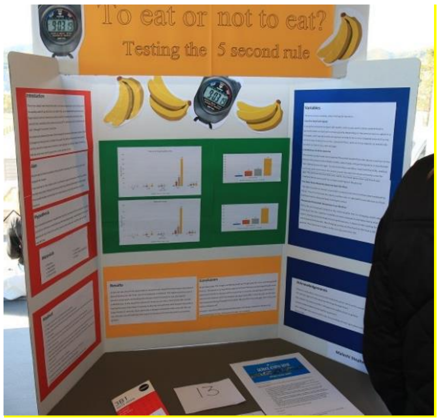
Draw conclusions and discuss your findings

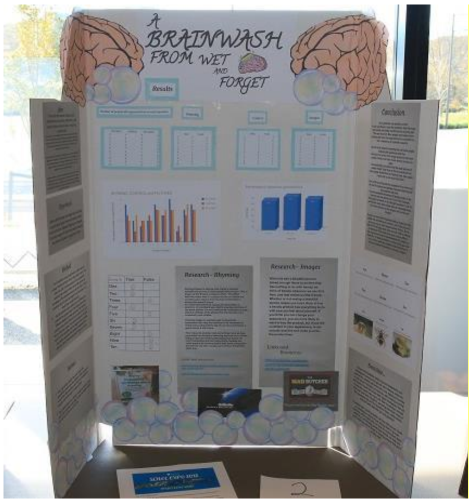
↓

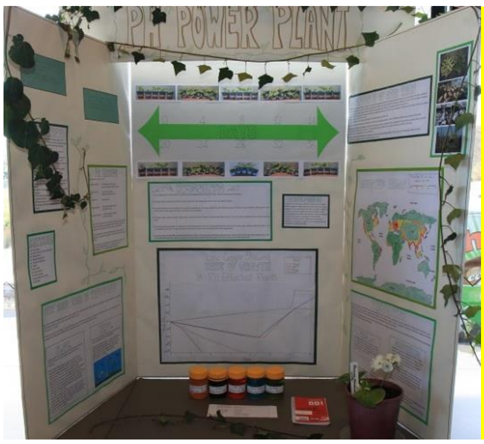
Evaluate your experiment or test, what would you change next time?

↓

Write up project and create display







Types of science experiment projects

Fair test:
Fair testing finds relationships between factors (variables). A single variable is changed while keeping other variables the same. Any differences are said to be the result of the changed variable.

Pattern seeking:
The pattern seeking method involves observing and recording natural events or carrying out experiments where the variables cannot easily be controlled.

EXAMPLE: Chloe's *Fair Test* Science Experiment Project

Chloe is interested in the outdoors and the garden. She is aware of climate change and global warming. She wonders how rising temperatures will affect plants growing.

Topics: Botany, Biology, Environmental, Earth Sciences

Chloe's question: 'How well do seeds germinate at different temperatures?'

Hypothesis: 'More seeds will germinate the higher the temperature gets'.

Independent Variable (the thing you change): Changing temperature between 5, 10, 15, 20, 25, 30 degrees Celsius.

Dependent variable (the thing you measure): Measuring how many seeds germinate.

Conditions staying the same: same type of seeds, number of seeds, growing conditions such as water, light, spacing of seeds, same set amount of time before counting the number of germinated seeds.

Method: Chloe makes mini green houses and heats them to set temperatures, she plants seeds in trays, with identical growing conditions. After a set time she counts how many seedlings have germinated. She repeats this with method at different temperatures, being careful to keep all other conditions the same. Chloe records all stages of her work in her logbook.

Analysis: When the experiments are complete Chloe puts all her data into a table and then draws a graph to display the results. She sees the most seeds germinate at the highest temperature and the least seeds germinate at the lowest temperature. Her graph shows the higher the temperature, the more seeds germinate / does not show a clear relationship between temperature and germination.

Discussion: Chloe researches the effect of increasing temperature on seed germination and uses this to explain her results.

Evaluation: Chloe thinks that she controlled her growing conditions well, but next time she could use another type of seed to see if that would react differently to temperature.

EXAMPLE Simon's *<u>Pattern Seeking</u>* science experiment project

Simon lives by a river and notices the colour of the water changes to a muddy brown when it rains. After researching he wonders if the amount of muddy-brown sediment in the water is related to rainfall.

Topics: Environmental, Other

Question: Is the amount of sediment in a stream affected by rainfall?

Prediction: The amount of sediment in a stream will increase with rainfall.

Two key variables:

- The amount of sediment: measured by taking 100mL samples of stream water over time, and at the same place on the river, and then determining the amount of sediment in each sample.
- The volume of rainfall: measured by a rain gauge and checked at predetermined intervals.

Conditions staying the same: Same volume of water sampled and collected in the same size shape and bottle, same way of determining amount of sediment (either by allowing the sediment of each sample to settle and then measuring depth of sediment, or by filtering the sediment, drying and weighting each amount of sediment) , same rain gauge.

Method: Simon measures the rainfall at his house and records his results in a table. He also takes water samples relative to the rising and dropping of the river. He measures the volume of sediment, for each sample, at his school where he can use accurate equipment. Exactly how much sediment was measure to ensure rigour must be mentioned here. He records these results in the same table.

Analysis: Simon now plots the volume of rainwaters against the amount of sediment, using a line graph. He analyses his results to see if there are any clear relationships between the volume of rain and the amount of sediment. He notices the amount of sediment increases about two days after rainfall increases, and vice versa.

Discussion: Simon uses the knowledge he has gained from research to suggest explanations for his results

Evaluation: In future Simon would like to take more samples during the rainy part of the experiment.

Writing up: science experiment project

Your write-up needs to make sense to anyone reading it who has no background knowledge of your project. Your logbook will be looked at by the judges. These are the main stages of a science investigation write-up:

Background/observation:
What did you observe or find out about your topic that made you think of your question? What science does your observations or research relate to? Hypothesis/prediction/aim: This 'sets the scene'.

Method:
Write your step-by-step method accurately describing what you did to collect data and what equipment you used. Make sure somebody else could redo your experiment by using your method.

Processing results:
Process your results and display them. Tables, graphs, photos, diagrams, statistics and videos can be used to show results.

Interpreting results and writing a conclusion:
What is the data telling you? Write a conclusion by relating what you found out back to your hypothesis/prediction/aim and the relevant science that you identified.

Discuss your results:
Have your results and conclusion made you think of more questions? If so, what experiment would you like to do to learn even more? Are you pleased with your results?

Evaluate:
Did your experiment work well? What would you do differently another time?

Bibliography/Acknowledgements:
What books and websites did you use to find out information? Who gave you valuable assistance?

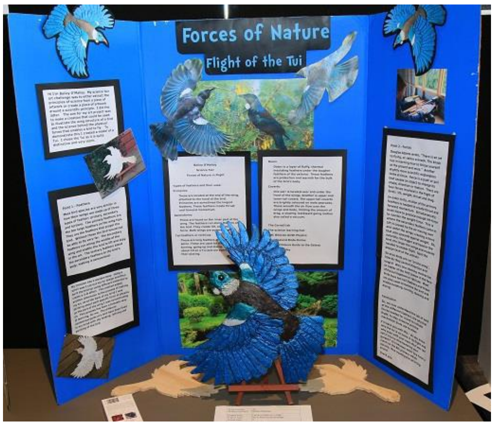
Research project

Many fields of science and technology can't easily be experimented on. Researching is a major part of scientific and technological work.

Information is to be gathered, discussed and presented on your display board.

You must show your independent thought and understanding of your topic.

Use a logbook to show the development of your ideas and research and include this with your write-up.



Think of a research question.

↓

Research to find information relevant to your initial question.

↓

Ask more questions to show your curiosity.

↓

Research information to answer these questions.

↓

Write up your answers to show your curiosity and understanding.

↓

Draw conclusions from your research.

↓

Evaluate your research, thinking about what else you could have asked.

↓

Write up your project.

Research project steps

1. Develop a question or idea for your topics and search for information from books, the internet and asking experts (text, data, images and diagrams). Make sure that you record where you have gained your information from.

2. Select the information that answers your question. Develop more resulting questions and find answers to those questions. This should show a logical progression, curiosity and understanding of your original question.

3. Process your information by:
   - Putting information into your own words in a way that shows your understanding
   - Stating where you found any information that you do understand but can't put into your own words
   - Relating any diagrams, data or images to the relevant text
   - Annotating (labelling) relevant diagrams, data or images to explain what they are showing. Sometimes a well-labelled diagram can save you having to write a lot of text.

4. Show that you understand your research, discuss and link information, evaluate your research and draw conclusions. Conclusions may include your opinion. Indicate possible future investigations that could be done.

Writing-up research

- Your research may be presented digitally or on a board. See page 15.
- Make sure that your display includes your logbook so that the judges can see a logical development in your thinking.
- Use a larger font and increase the gap size between lines. This makes the text easier to read on a board.
- Don't present your information in big blocks of text. Break up blocks with relevant sub-titles, annotated diagrams, data or photos. A good annotated diagram can easily replace a big block of writing.
- Showing understanding is crucial for this research project. You must show how all ideas relate to each other.

Technology project

Technology describes how we can make or adapt something to solve a problem or to allow us to do something new. It requires you to use critical and creative thinking and follow a development process.

You must show independent thinking and good understanding of your topic. Use a logbook to show the development of your ideas and research. Include this with your write-up.

Decide on a problem that needs a solution. Product? Process? Software?

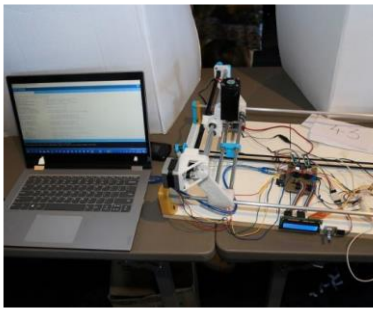
Background research. Consult stakeholders. Who will use it? Where? Research existing solutions to similar problems - check that a solution does not yet exist. Ask for advice.

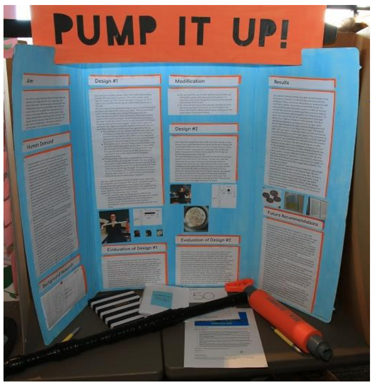
Write a brief to describe your solution - a conceptual statement (who, what, where, when, why) and list specifications to assess whether it is fit for purpose

Generate a range of design ideas. Select one that best meets your brief while being realistic and achievable.

Produce a prototype. Test it and seek feedback from stakeholders

Evaluate the results of your test against the brief - justify why your solution is fit for purpose





Writing up: technology

When undertaking your project, you use a logbook to record everything. Your logbook will be looked at by the judges. These are the main stages of writing up a technology project:

Background:
Explain why your project solves an opportunity or need that does not yet have a solution.

Aim:
Describe the problem. What will you aim to do to solve it and what is your criteria for your design? What inspired you to find a solution? Include your brief (conceptual statement and specifications)

Design:
Draw concept sketches or plans showing alternative design options. Show the option you've selected with clear justification of why it will meet the brief and will be a feasible option.

Evaluation:
Discuss how your design performed against your criteria and justify how it is fit for purpose.

Modification:
Show what you changed and why. You can "Design>Evaluate>Modify" several times as technology has a cyclic nature. Explain the role of stakeholder feedback in this process.

Future recommendations:
Show what you would do next. Where do you see this going in the future? If you have done any marketing research included it here.

Bibliography:
What books and websites did you use to find out information?

Log Book:
All projects must be accompanied by a log book, which will show your thought process, every modification and result/observation recorded

Art in science

In visual art we communicate important ideas through art media (such as paint, printmaking, sculpture, design, assemblage). For the Scitec Expo, we ask you to create an artwork which communicates a scientific concept that you think is important. You can use any art media you wish.

You will be judged on how well you communicate your ideas through your artwork, how well you have used the media you have chosen, how well you have developed your idea, and how well your idea relates to the wider world.

Art projects must be accompanied by a sentence/paragraph explaining the scientific concept which underlies the project.

Please refer to the exhibit size restrictions. See page 15.

The judging criteria for art projects is on page 18.





Communications Award

If you have entered a Science Experiment, Research or Technology Project, you may also enter the Science Communication Award by preparing a short video summary of your project. This is entirely optional and will be judged separately to your project using different marking criteria that's weighted more towards communication whilst still requiring a solid degree of science. (see page 19)

The Presentation

Aim for 2-3 minutes of video, no longer.

Your target audience is the wider public – the content should be easily understood by other students. This may mean simplifying some technical terms that you've learnt or using a metaphor so people can visualise what you're describing; e.g., wetlands act like a sponge, soaking up water when we have lots of rain.

Think about how you can capture the audience's attention. You can have video footage of you talking about your project and of your project itself. You can also include other content too like photos, graphics, music, animations. Whilst you're working on your project, think about what 'content' you would like to include in the video so that you can capture it along the way.

Make your point. Make it quickly. Don't sweat the small stuff – the idea of these videos is to enable the audience to learn two or three exciting things about your project in a short space of time. You don't need to provide all the detail of your research; you should aim to give people bite size pieces of information they can remember easily. So, try to take **two or three** of the most important points from your project and focus on communicating these. Ask yourself what you want people to remember when they've finished watching your video.

Once complete, you need to save your video to a cloud-based storage service (eg Google drive, Dropbox etc) and email the link to foundation@cawthron.org.nz by the required deadline.

You'll find good examples of science videos here;

- Nanogirl science super hero
- The physics girl

And here's a really good resource on how to avoid the standard boring presentation!

Please refer to page 19 for the communications presentation marking criteria.

The winning Science Communications entry will receive $250.

Making an exhibit

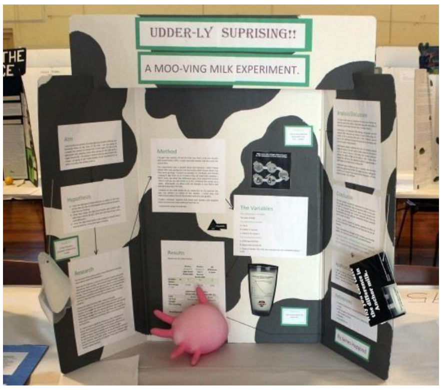
The classical way of displaying Science Experiment, Research and Technology projects is shown below. However, you may choose to have a flat poster or present it in a powerpoint presentation.

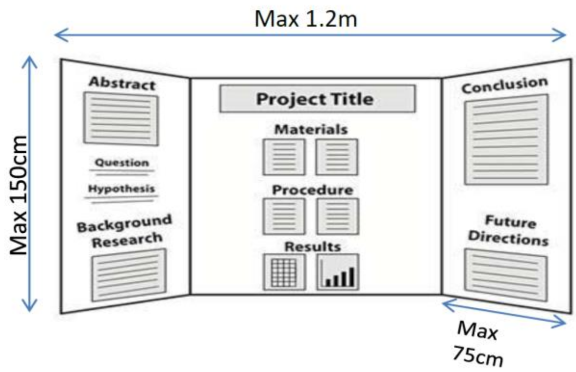
Size restrictions

Every project, regardless of the type, is allocated an equal amount of space (1.2m wide, 1.5m tall and 0.75m deep). Please do not exceed these dimensions or it may be difficult to display your project at the venue.

Recommendations

- Free standing and robust
- Use colour and photos, make it attractive
- Writing no smaller than 1 cm anywhere on your project
- Font larger than you would normally use. Also, increase the gap size between lines. This makes the text easier to read on a board.
- Clearly set out and with a logical flow
- Space in front of board can be used for equipment, product or logbook





Digital presentation requirements

If you choose to display your project digitally, you will need to do the following;

- Use Powerpoint to display your project with no more than 12 slides
- Email a PDF of your slideshow to foundation@cawthron.org.nz by the required deadline.
- Bring your digital presentation to the Expo loaded on a fully-charged laptop (wifi is not available). In the event you are not able to bring a laptop, bring your presentation loaded on a USB stick.
- Also bring a print out copy of your presentation to leave at the expo.

Keeping a log book

All good Scitec projects – whether they be Science Experiment, Research, Technology or Art - are accompanied by a log book. This could be a notebook or a digital record of notes compiled while undertaking your project.

What should be in your Log Book?

1. Your research prior to choosing your project. Include all books, websites and other sources that you researched.
2. Your proposal. Include things like the problem, your hypothesis, variables, materials you plan to use, the steps/procedures involved and drawings of your experiment/designs.
3. Data. You need to record everything that happens during your experiment or project. Date all entries when they occur.
    - If you run into problems, record the problem and how you plan to solve the problem. Research possible solutions. If it doesn't solve the problem come up with a new plan and try that.
    - Include question and ideas for further experiments or questions

Our judges can tell when a log book has been compiled at the end of your project rather than while it's being undertaken!

Preparing for an interview

Every student will be asked questions by the judges so be prepared and give feedback on everything. Be confident - you are the expert on your own project.

Things you may get asked:

- Why did you do this project?
- Did you enjoy it?
- Do you understand the ideas and concepts of the project?
- What was the process you took to complete the project?
- What were the challenges you overcame?
- What would you do differently if you had the chance?

Judging criteria

It is important to know what you will be judged on, that way you can make sure you score highly. There are separate judging criteria for each different type of project.

Science experiment project

	Outstanding	Good	Average	Poor	Minimal	Absent
Understanding of background research	**5**	**4**	**3**	**2**	**1**	**0**
Scientifically rigorous	**5**	**4**	**3**	**2**	**1**	**0**
Ability to explain project clearly	**5**	**4**	**3**	**2**	**1**	**0**
Understands results	**5**	**4**	**3**	**2**	**1**	**0**
Logical conclusions from results	**5**	**4**	**3**	**2**	**1**	**0**
Can discuss problems/limitations	**5**	**4**	**3**	**2**	**1**	**0**
Exhibit is well designed and set out in a logical order	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Research project

	Outstanding	Good	Average	Poor	Minimal	Absent
Preliminary development of ideas for the topic or questions	**5**	**4**	**3**	**2**	**1**	**0**
Selected and processed a wide range of valid resources	**5**	**4**	**3**	**2**	**1**	**0**
Shows logical progression of thought throughout the presentation	**5**	**4**	**3**	**2**	**1**	**0**
Has drawn relevant conclusions	**5**	**4**	**3**	**2**	**1**	**0**
Shows understanding of the underlying science	**5**	**4**	**3**	**2**	**1**	**0**
Acknowledgement of all sources of information	**5**	**4**	**3**	**2**	**1**	**0**
Exhibit is well designed and set out in a logical order	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Technology project

	Outstanding	Good	Average	Poor	Minimal	Absent
Understanding of background research	**5**	**4**	**3**	**2**	**1**	**0**
Quality of brief and design ideas	**5**	**4**	**3**	**2**	**1**	**0**
Chosen design is innovative and a clear solution to the problem	**5**	**4**	**3**	**2**	**1**	**0**
Stakeholder and end-user considerations are evident in the development	**5**	**4**	**3**	**2**	**1**	**0**
Shows and can discuss skills learned during the development process	**5**	**4**	**3**	**2**	**1**	**0**
Can justify how the prototype or outcome is fit for purpose and meets the brief	**5**	**4**	**3**	**2**	**1**	**0**
Is able to discuss future development of the concept and/or limitations	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Art in science

	Outstanding	Good	Average	Poor	Minimal	Absent
How well have the ideas been communicated through the artwork	**5**	**4**	**3**	**2**	**1**	**0**
How well has the chosen art media been used	**5**	**4**	**3**	**2**	**1**	**0**
How well the thinking behind the artwork has been developed (includes log book content)	**5**	**4**	**3**	**2**	**1**	**0**
How well the concept behind the artwork relates to the current ideas in the wider world of science and beyond	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Communications presentation

	Outstanding	Good	Average	Poor	Minimal	Absent
Effectively explained the relevant science from their project	**5**	**4**	**3**	**2**	**1**	**0**
Clearly described observations and justified conclusions	**5**	**4**	**3**	**2**	**1**	**0**
Used interesting methods and tools to deliver their science story	**5**	**4**	**3**	**2**	**1**	**0**
Considered the target audience	**5**	**4**	**3**	**2**	**1**	**0**
Overall message was clear, concise, engaging and had impact	**5**	**4**	**3**	**2**	**1**	**0**
COLUMN SCORE						
TOTAL SCORE						

Special awards

You have to select which special award categories that you wish to enter when registering your entry. Special awards will be judged separately by at least two judges with specialist knowledge of the special award topic.

Appendix: human ethics approval

If your project involves humans, you must incorporate the human ethics guidelines to ensure protection of physical, mental and emotional welfare. People should only be asked to contribute to research that gives meaningful results, and they must complete a consent form. Experiments should be well designed so results are collected and analysed accurately.

When are ethical considerations necessary?
Safety must be considered if your experiment involves yourself or other people

- tasting, touching or smelling different foods or other substances
- taking any medicines, drugs or other substances
- applying any substance to their bodies
- undergoing any physical or medical test
- giving you any information of a personal, private of confidential nature
- giving information that could identify them

What are all the risks involved in your study?

↓

How likely are those risk to occur?

↓

Is this any different to the risks possible in daily life?

↓

What have you done to minimise those risks?

↓

What strategies have you got in place if things do go wrong?

↓

Do you believe informed consent is appropriate?

What should informed consent look like?
When you ask people to participate in your research, you need to tell them

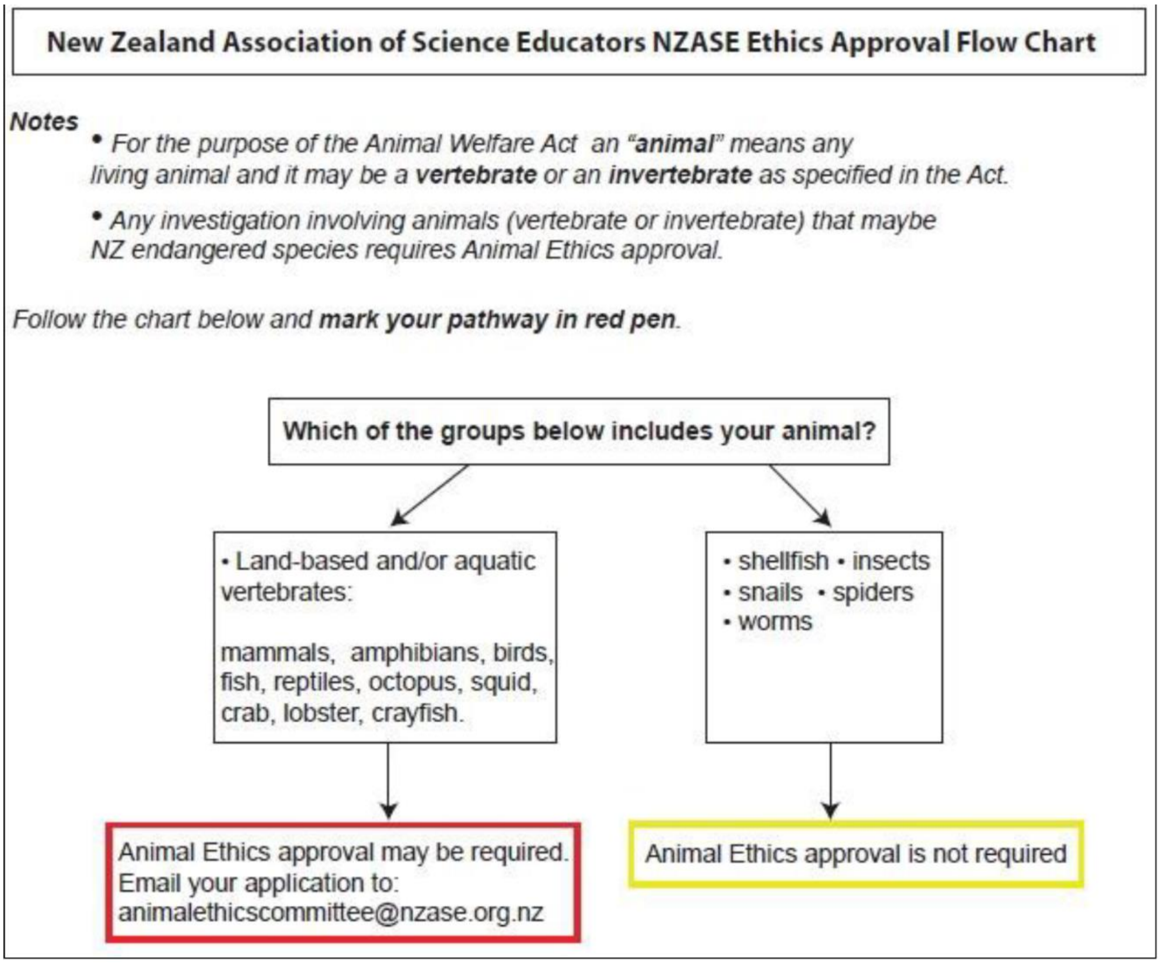
- the purpose of your research
- what will be required of them
- what risks or benefits there will be to them if they agree to work with you
- that they can withdraw from your research at any time
- Whether or not the information you collect can be linked to them, what you will do with that information, who else will see it, and how you will dispose of your records when the project is over

An informed consent template can be found here.

Please email Gaye Bloomfield to check if your project design is ethical; she will assess your research design using Te Tikanga Matatiki.

Appendix: animal ethics

If your investigation involves animals, including humans you may need animal/human ethics approval **prior** to beginning your project. Refer to the flowchart below to determine whether or not you require ethics approval. Online application forms, information and ethics approval be obtained from www.nzase.org.nz.



Appendix: health and safety

The following safety rules for construction of projects are necessary to prevent electrical fires and prevent injury or illness to exhibitors and visitors.

NOTE: No power supply is available at the venue, nor can wifi be guaranteed.

1. No food samples/sampling is allowed at the expo. Use photos instead to show any food experimentation. Examples of food innovation or research projects can be found here.
2. Construction must be durable and stable when on display
3. Dangerous chemicals and explosives must not be exhibited.
4. Naked flames cannot be used in any type of display – they are a fire risk.
5. Animals must be fed and their containers kept clean. A certificate of approval from the NZASE Animal Ethics Committee is needed for projects that involve manipulation of animals. See page 21.
6. Human participants in projects must be fully informed and have filled out a consent form – see your teacher for information and before carrying out your investigation, get approval. See page 20

ALL PROJECTS WILL BE INSPECTED BY THE SCIENCE FAIR COMMITTEE AND THOSE THAT DO NOT COMPLY WITH THESE RULES WILL BE DISQUALIFIED.

Responsibilities: The Science Fair Committee will take due care of equipment and exhibits on display, but it does not take responsibility for loss or damage. Exhibitors are to remove any valuables after judging.

Checklist

Read the Student/Teacher guide to understand entry requirements ☐

Decide where you are entering as an individual or group, what type of project you wish to enter, and whether you wish to enter the science communication award ☐

Complete your online entry registration ☐

Consider whether ethics approval is needed for your project and make sure the relevant consent forms are completed ☐

Do background research and get help from an expert ☐

Carry out your project (remember to keep a logbook) ☐

Design and create your exhibit ☐

Check your exhibit follows all the safety rules ☐

Arrange to get your exhibit to the Scitec Expo on time ☐

Be present for judging interviews as advised ☐

Tell your family and friends to come and see your entry displayed ☐

Arrange for your exhibit to be removed from the Scitec Expo as advised once judging is complete ☐