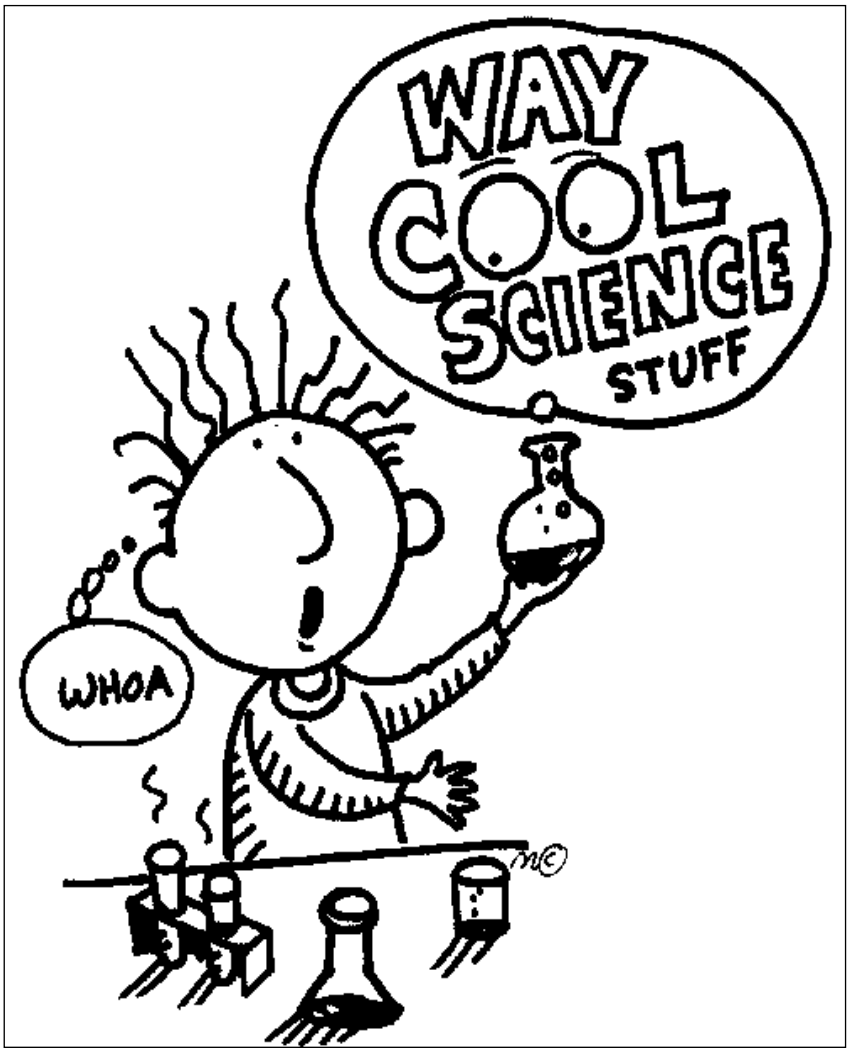
A student's guide to the NIWA Bay of Plenty Science and Technology Fair 2014



Regional NIWA Bay of Plenty Science and Technology Fair

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Proud Sponsors of Regional Science and Technology Fairs

IMPORTANT STEPS

- The NIWA Bay of Plenty Regional Science and Technology Fair is held each year in August and is open to all Year 7 to 13 students.

- Get excited about an idea and decide what you will investigate for your science fair project.

- Talk with your science teacher. They will help you to decide which class of entry your project belongs in and fill in the necessary entry forms with you.

- Start work on your project straight away! It is important to keep a diary (log book) of everything you do.

- Prepare your project for completion which must then by selected by your school as one of the school entries to go on to the Bay of Plenty Fair.

- Various information on the Science Fair is available from the Bay of Plenty Science Fair website www.bopscifair.org.nz.

- Leading up to the Science fair you may like to practice talking about your project to the judges. GOOD LUCK ☺

ENTRY INFORMATION

Exhibits are classified as either: Science, Technology or Art in Science

Exhibitors enter under age group only

- Forms 1 and 2 – Years 7 and 8 (Intermediate)
- Forms 3 and 4 – Years 9 and 10 (Junior Secondary)
- Forms 5, 6 and 7 – Years 11, 12 and 13 (Senior Secondary)

Entries from each school will be limited and related to roll size. Schools will receive allocations on numbers, but may apply for extra places.

PRIZES

Prizes awarded at previous NIWA Bay of Plenty Science and Technology Fairs include:

- NIWA Premier Award
- Kiwanis Reserve Award
- All expenses paid for Summer School at Otago University
- 1st, 2nd and 3rd place getters in all category sections (Intermediate, Junior Secondary and Senior Secondary) for both science and technology will receive a cash prize.
- Some of the Special Awards include:
  - Hayes International for Technology
  - Bay of Plenty Regional Council for Environmental Award
  - Scion for Wood Processing
  - IPENZ for Engineering
  - NIWA for Maori Science
  - Rotorua Energy Charitable Trust for Physical Science
  - Plus many others

REALISE THE DREAM

A five-day national celebratory and educational forum, hosted by Victoria University, for 35 high achievers selected from Regional Science and Technology Fairs. The programme includes a presentation of current NZ research and technological practices by our leading scientists, mathematicians and technologists; workshops for students in innovation, entrepreneurial skills and the development of an idea to commercial reality. The finale is a formal celebration dinner with high profile leaders of New Zealand.

Top awards at this event include:

- Scholarships for tertiary study up to $2,000 in value.
- 1 week at Hands on Science in Otago.
- Entry to other competitions.

More information can be found from the following website www.realisethedream.org.nz.

REMEMBER

Your entry should be a scientific investigation or technical process - not just a display. **You can further develop last year's entry, but you must include the logbook from last year as well as the current one.**

Bring along a quiet indoor game to play while waiting for judging to be completed. You must stay with your exhibit until released by the judges.

SAFETY RULES

The following safety rules regarding the construction and care of displays are necessary to prevent electrical fires, injury to visitors and stress to animals and plants that are part of the display.

RULES FOR EXHIBITS:

1. **Construction**
   Exhibits must be durable, safe, self-contained, stable, and not exceed the maximum size (see condition 3). Moveable parts must be firmly attached. Exhibits must also be designed to be safe from any interference from members of the public. It is the Exhibitor's responsibility to ensure that all valuable parts are securely attached or able to be removed by the Exhibitor for safekeeping when the exhibit is left unattended.

2. **Use of Mains Electricity**
   Any exhibit requiring mains electricity must have a suitable cord 3 metres long with a durable 3 pin plug correctly attached. All parts involving mains electricity must comply with the relevant electrical regulations. The wiring should be carried out by a registered electrician. Exhibitors using mains electricity for high voltage equipment must use an RCD or a suitable isolating transformer to supply electricity to their exhibit to give a greater margin of safety.

3. **Electrical Safety**
   Voltages over 100 volts must have all conductors (wires and switches) completely and securely enclosed by non-conducting materials to prevent any possibility of an observer receiving an electrical shock. Such projects must be safe at all times, which means it must be able to be disconnected or locked when unattended. Nails, tacks, etc must not be used to secure wires because of the possibility of shorting and fire. Correct procedures for securing wires must be observed.

4. **Fire Safety**
   Heating elements must be mounted on a suitable non-combustible support so that there is no possibility of fire. Lamps must be well ventilated to avoid heat build-up and only non-combustible materials used near the lamp. No gas supply is available. An Exhibitor wishing to use gas must seek written permission from the Organising Committee to use any supply of gas. Gas is to be supplied by the exhibitor if approval is given. Please supply full details of the proposed supply: type of gas, size and age of cylinder, use of the gas.

5. **Radiation**

Any radio transmitter in working order must comply with the relevant radio transmitting regulations and be licensed. Microwave and high frequency radiation must be safe and have a warning sign. Any damaging radiation (e.g. UV light) must be shielded so viewers could not be harmed. Radioactive materials are permitted only when written permission has been gained from the Organising Committee and they must comply with the relevant regulations.

6. General Safety

Explosives, including explosive gases, must not be exhibited. Dangerous chemicals (including strong alkalis and acids) are not to be used in any exhibit (if in doubt contact the Organising Committee). All exhibits using liquids of any kind must stand in a leak proof tray. Exhibitors must have sponges, cloths etc to wipe up and remove any spills. No direct water supply is available. Should your exhibit require water you will need to design it so it has its own reservoir. No large pools. It is the responsibility of the Exhibitor to ensure that the area immediately surrounding their exhibit is kept clean, dry and tidy at all times.

7. Caring for Living Organisms

Micro-organisms (Bacteria and Fungi)

If you intend to bring micro-organisms to the venue, you must follow the guidelines in "Safety and Science" Published by the Ministry of Education and available to all schools. Failure to do so will result in disqualification of your exhibit.

Plants

Most often carrying out scientific investigations with plants will cause no regulatory problems. However, if you are working with noxious plants please dispose of them in a responsible manner. Remember that some plants/plant parts may be poisonous. If working with registered endangered New Zealand plants you need to get permission from the Department of Conservation before starting your experiments.

Animals

For Science and Technology Fairs all vertebrates and some invertebrates are to be considered. You may need to apply for permission prior to starting your research. Go through the chart below and then if necessary download the application details from the Education page of the Royal Society website www.rsnz.org.nz. This permission process is easy for you to do so please do not "forget" to attend to it or be put off. It is part of good scientific practice. If you are working with protected indigenous animals, e.g. koura, you will need to also contact Department of Conservation for permission.

NOTE 1: Examples of interfering with an animal are:

- Exposing it to any drug, chemical or biological product, parasite, radiation, electricity or abnormal environment; OR
- Subjecting it to enforced activity, unusual restraint, abnormal nutrition, or surgery; OR
- Depriving it of usual care.

NOTE 2: Live animals will not be accepted as part of your exhibit, but you may study animal behaviour and record your findings.

8. **General Rules**

The Organising Committee reserves the right to not display any exhibit and to withhold any prizes for which the judges consider an adequate standard has not been reached. The Organising Committee also reserves the right to group Entry Forms where numbers are insufficient in particular classes. The judges and the Organising Committee reserve the right to withdraw prizes and promote others in the class if rules are discovered to have been broken. The Organising Committee's decision in all matters is final. **THE ORGANISING COMMITTEE SHALL NOT BE HELD RESPONSIBLE FOR ANY LOSS OR DAMAGES TO EXHIBITS, ALTHOUGH ALL CARE WILL BE TAKEN.** The Science Fair will be open to the public (after Judging has been completed) during which time exhibitors need not be present.

ENTRY FORMS

Your school has been sent 'Exhibitors Entry' forms, or they may be downloaded from the Bay of Plenty Science Fair website www.bopscifair.org.nz.

These forms MUST be completed and returned to your Teacher several days before the date on the website timeline.

N.B.
1. Full names are required.
2. No more than 2 students may be listed for each exhibit.
3. The Convention Centre will be open from 7.30 am and exhibits must be ready for the Judges by 9 am. The Organising Committee reserves the right to refuse entry to late arrivals.

KEEP A LOG

This will be a diary of everything you do, from the day you choose the question to the day you present your investigation for marking.

Science Exhibits

Include methods, all raw data, calculations you made, problems you encountered, ideas, help you received, as well as your conclusion and evaluation.

Technology Exhibits

For technology exhibits, the process (steps taken in designing and constructing possible solutions to the final product) needs to be recorded.

Art in Science Exhibits

Art in Science may take the following forms:

- Drawings or illustrations e.g. physiological processes or anatomical illustrations.
- 3-D models made with a variety of materials e.g. plasticine, wood, paper mâché and should be made to be dismantled.
- 2-D moving images e.g. stop motion, animation. Use of colour, sound and a story board should be considered, (wmv; avi; jpg files) for display on a laptop computer. There is no set length, but the presentation should maintain the viewers' attention throughout.

Exhibits should fit in the same space that a standard science fair board would occupy. In all cases a standard Science Fair title board will be required, along with the relevant information such as a log book, story board, static image, descriptive text or any relevant references.

Judging criteria will be based on the educational merit of the exhibit, the research involved with its creation and the technologies used to produce it.

SOME IMPORTANT DESIGN INFORMATION:

- Avoid repetition – Your design needs to be innovative, to look for needs or for opportunities what will make jobs, etc easier.
- K.I.S.S. (Keep it Simple S…..)
- Set a plan (long or short) and map it out.
- A Log Book is essential, include all problems encountered and solutions found.
- Test the product – yourself and in the market place at least 3 times. Record the results.
- Cost and analysis is important.
- Include a bibliography and acknowledgements.
- Presentation (cards) is the final step – all other work needs to be completed first.
- It is a 2 –3 month project – not 2 weeks.

WRITING AN EXPERIMENT

A well written experiment should show the reader how you:

- Came up with a question from something you were interested in.
- Thought about an answer and a way of finding this out.
- Carried out your investigation and interpreted your results.
- Reflected upon the experimental process and what you learnt.

All of the main parts of an experiment should be separated with a sub-heading and recorded in order.

INTRODUCTION (What you already know about your topic)

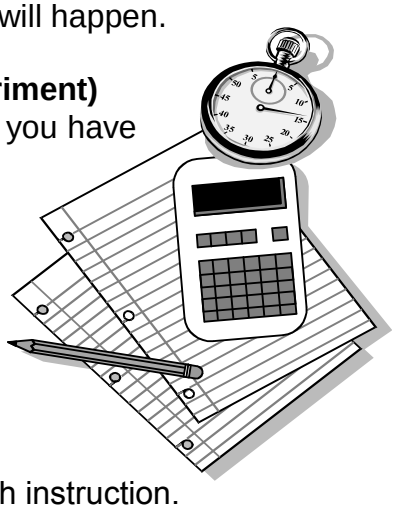
This gives the reader some background information to your topic and the reasons why you may have chosen your question. It is set out in paragraphs and is brief but specific.

AIM (What you want to find out)

This tells the reader what you want to find out through your experiment.
It is your question.

HYPOTHESIS (What you predict will happen)

This tells the reader what you think will happen. It is usually only two sentences long.
e.g. If I …… then …….. will happen.



EQUIPMENT (What you have used to carry out your experiment)

This is the list that gives the reader an idea of all the resources you have used. Remember to include people.

METHOD (What have you done)

This is a form or procedural writing that tells the reader the steps you have undertaken to carry out the investigation, what you have measured and how.

It should:

- Give the instructions to your experiment in order.
- Have a verb – such as mix, place, cut … at the start of each instruction.
- Have a line between each step.
- Have precise and clear instructions.
- Only contain factual and necessary words.
- Have each instruction numbered.

RECORDS AND RESULTS (The raw data from your investigation)

Usually shown as a table of raw data, samples, photos, a video, a brief description, or a diagram or sketch

DISCUSSION OF YOUR RESULTS (An analysis of your results)

This is usually shown as graphs and brief explanations. It explains the raw data presented in your results.

Graphs must have:

- An even scale
- A title
- Precise, clear explanations
- A key

CONCLUSION (Was your hypothesis right? If so, why? If not, why? Could you have done anything better? How could your improve it for next time?)

This tells the reader if your hypothesis was right, whether your experiment was carried out fairly and if you have any new queries.

It should:

- Have a summary and introduction.
- Be set out in clear paragraphs, each one expanding on an idea.
- Be written in precise clear language.
- State clearly your opinion on how you carried out the experimental process and what you have learnt.

SCIENCE AND TECHNOLOGY FAIR SPECIAL PRIZES

To help you decide on your project, the following is a list of typical Science Fair Special Prizes:

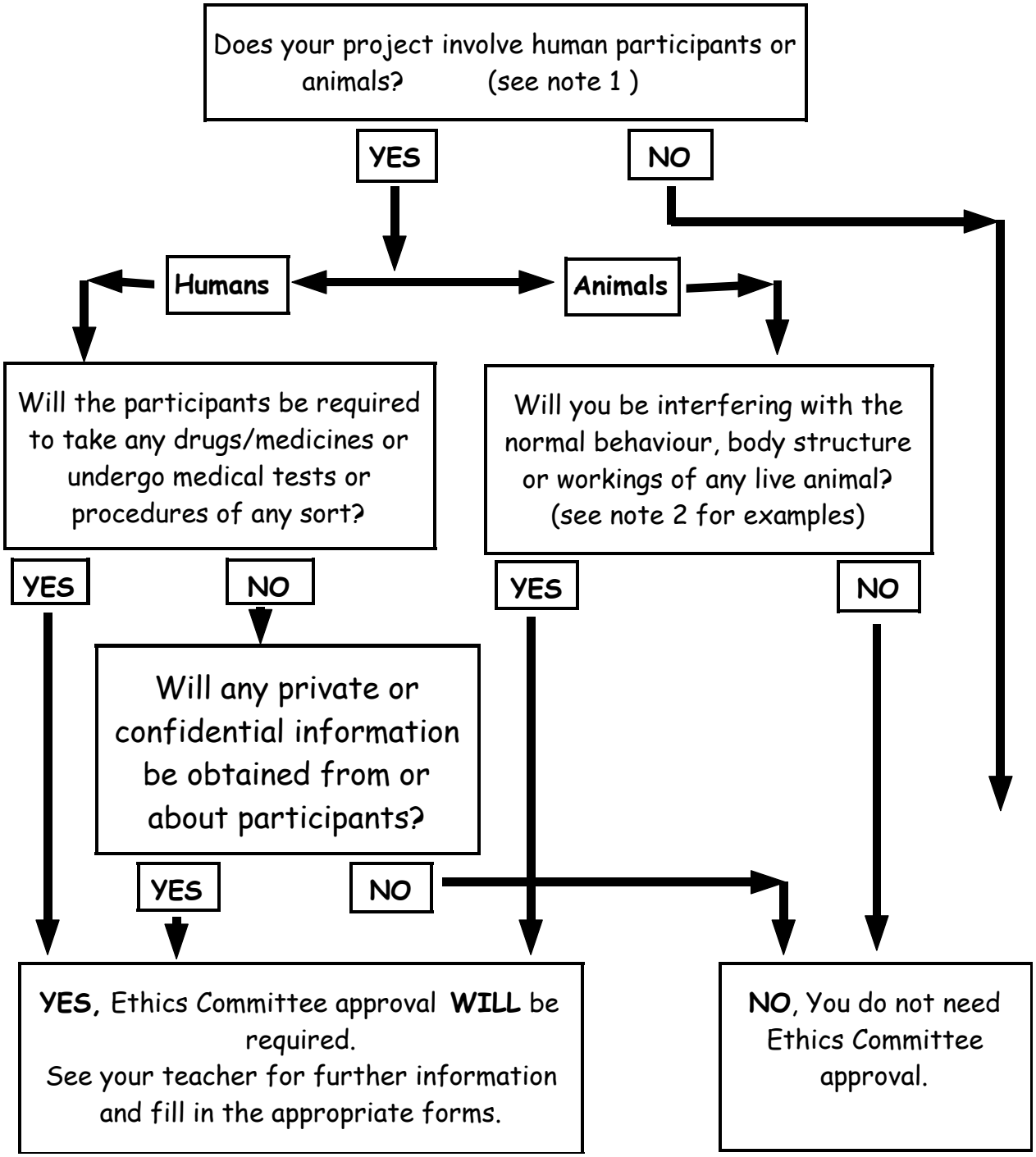
- Sport Science and Technology related to a sporting activity
  - Exercise Physiology
  - Sports Nutrition
  - Sports Biomechanics
  - Sports Psychology
  - Computers and Technology in Sport Science
  - Sports Medicine
- Wood / Tree Related
- Flour Related
- Statistical Data
- Radioscience and Associated Electronics
- Conservation
- Water and Atmosphere Related
- Farming and Forest / Wood Related
- Environmental Related
- Soil Related
- Energy Related
- Maori Science (as a topic)
- Consumer Product Testing
- Electronics
- Art in Science

DO I REQUIRE ETHICS APPROVAL FOR MY EXPERIMENT?

Animal Ethics

If you are entering a project involving an animal, ask your teacher for the information about Animal Ethics. You **MUST** have Animal Ethic Committee approval **BEFORE** the Science Fair. There is a link on the Bay of Plenty Science Fair website for this.

Follow the chart below



IDENTIFYING EXHIBITS AS SCIENCE OR TECHNOLOGY

✓ The 'Yes' box or the 'diamond' box in between Science and Technology. (See the note below).	Science	either	Technology
Rather than meeting a human need or opportunity, is the exhibit primarily driven by curiosity about something?	Yes ☐	◇	No
Is the exhibit a response to a hypothesis?	Yes ☐	◇	No
Is the exhibit a response to an identified human need or opportunity for a product, process or environment?	No	◇	Yes ☐
Was some of the research aimed at confirming the validity of the original need or opportunity, and/or finding out the precise nature of the problem to which they are developing a solution?	No	◇	Yes ☐
Was most of the research aimed at gathering new data in response to an observation and/or hypothesis?	Yes ☐	◇	No
Did the gathering and processing of data ensure its validity and aim to determine its significance to causes of an effect?	Yes ☐	◇	No
Was much of the research aimed at guiding the development and/or improving the performance of the product, process, or environment?	No	◇	Yes ☐
Is the scientific method the core process?	Yes ☐	◇	No
Is the design process the core process?	No	◇	Yes ☐
Does the exhibit identify as important such attributes as: efficiency, optimisation, reliability, cost-effectiveness, appropriateness of materials, ergonomics, aesthetics etc?	No	◇	Yes ☐
Does the exhibit show that the satisfaction of the end-users of a product, process, or environment was a key factor in guiding the development?	No	◇	Yes ☐
Is it concerned with something that could be massed produced?	No	◇	Yes ☐
Has a theory been formulated to explain the observations?	Yes ☐	◇	No
Is the **development** of the identified product, process, or environment, the key element of the exhibit, including documentation with sufficient plans, models, etc, to verify the development process?	No	◇	Yes ☐
The centre column ◇ indicates exhibits that could be regarded as either technology or science exhibits. **TOTALS**			

Total the ticks

The Art in Science category should be quite clear by the means that the exhibit is presented.

THE DESIGN TECHNOLOGY PROCESS
(Solving Problems)

What need or opportunity are you responding to? What are you interested in?

STARTING WITH A NEED OR OPPORTUNITY

How can you improve: use; accessibility; lifestyle, or; enjoyment for . . .

Develop your 'Solution' through a series of prototypes.

Design it

DEVELOPING YOUR 'SOLUTION'

Perhaps start with a drawing or model (if appropriate) before making working versions. Keep a log book of everything you do, especially any new 'fair test' and performance measurements; and how the results affected development

The real test is whether your project does what you had planned

HOW WELL YOUR 'SOLUTION' WORKED

Try your 'solution' with people in the Market Place (with those who would use it) Keep a record of your testing

If your 'solution' is successful don't keep it to yourself ….

MARKETING YOUR PRODUCT

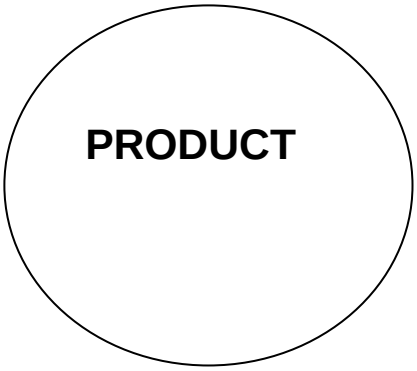
Is it really something other people will want? Include ideas for production, packaging and marketing

SOME IMPORTANT DESIGN INFORMATION:

- Avoid repetition – Your design needs to be innovative, to look for needs or for opportunities what will make jobs, etc easier.
- K.I.S.S. (Keep it Simple S…..).
- Set a plan (long or short) and map it out.
- A Log Book is essential, include all problems encountered and solutions found.
- Test the product – yourself and in the market place at least 3 times. Record the results.
- Cost and analysis is important.
- Include a bibliography and acknowledgements.
- Presentation (cards) is the final step – all other work needs to be completed first.
- It is a 2 –3 month project – not 2 weeks.

PLANNING YOUR TECHNOLOGY DESIGN

Market



Need

Existing Products

Product	Plus	Minus	Interesting

Product Criteria

Resources

THE SCIENTIFIC INVESTIGATIONS PROCESS

Questions need to be **specific**
What is meant by **best?**
Longest, strongest, tastiest, driest……

QUESTION

Which?
What?

What do you think may happen?

HYPOTHESIS

Predict the answer to your question

Plan how you will find your answer.
Have you controlled all the variables?
What is your time scale?
What equipment will you need?

TEST

Record everything.
How, when, what?
Have you run at least 3 tests?
Is your sample size more than 6?

Decide on an organiser that will present your results clearly and effectively

RECORDS & RESULTS

Observations, research, measurements, surveys, experiments

Analysis of graphs
Interpretations
What does it all mean?

DISCUSSION OF RESULTS

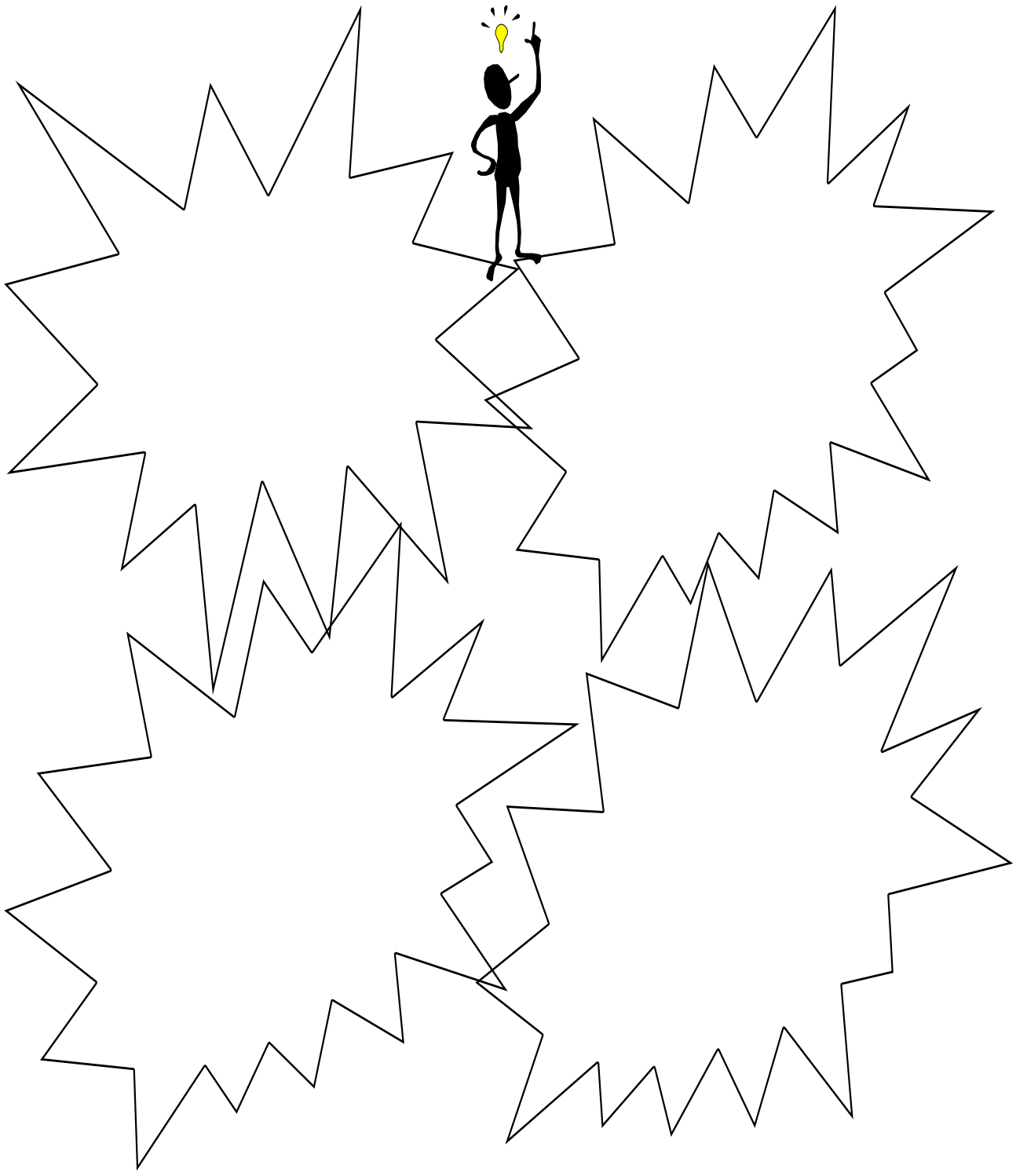
What next?
Have you found the answer?
Do you need to add some other controls?

Positive
Minus
Interesting
Improvements
Questions

CONCLUSION

In what ways do your results support/refute your hypothesis

BRAINSTORM PAGE



Put a question in each space. Choose one that will make a good investigation.
Re-write into a question using key words like what or which. (NOT why!)

_____

_____

_____

_____

_____

PLANNING YOUR SCIENTIFIC INVESTIGATION

Question: This is what I am trying to find out

Existing Ideas: This is what I already know which may help

Hypothesis: This is what I predict will happen?

Method: Here are the steps I will follow?

Constants: These are the things I need to keep the same.

Variable: This is the one thing I will change.

Measurements: This is what I am going to observe and measure?

Organiser: This is how I will organise my results?

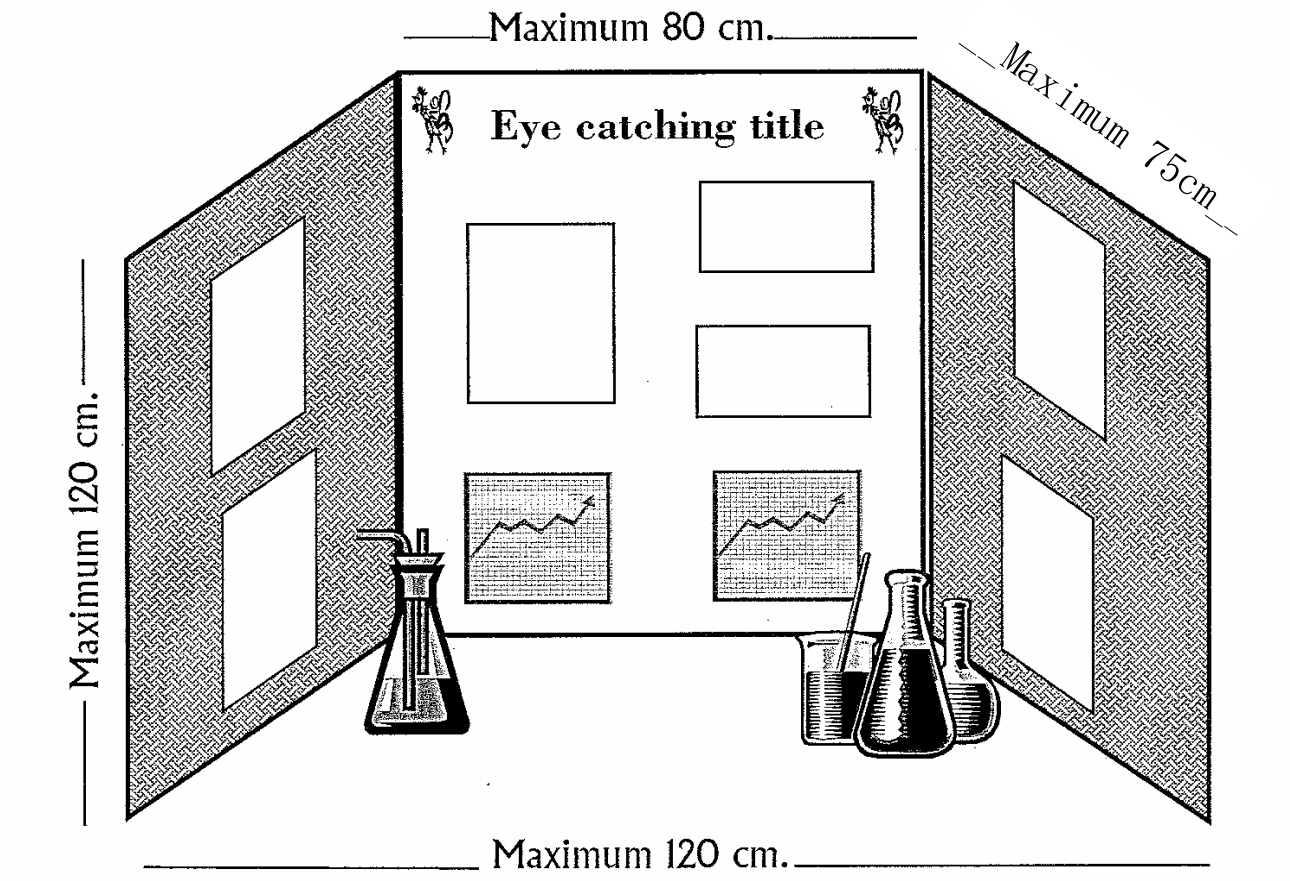
Equipment: This is the equipment I will need to carry out my investigation?

PRESENTATION GUIDELINES:

This is a **major** step. Your entry can only be judged on the information you can communicate – so the way you set out the display board can determine your results.

MAKE SURE: Your display is free standing

- You have no valuable items on your display.
- Your display shows the steps you took in your investigation – in order.
- There are no spelling mistakes or errors.
- Nobody will be offended by any of the content.
- Any graphics or 3-D props are relevant.
- The information is clear and easy to read from a distance i.e. 14 pt or bigger and a clear font e.g. Times, Arial, Garamond.
- All extra material/models/support information fits inside your display area.
- If you have a large prototype as part of your technology project, please bring it to the Fair where it may be displayed, at the judge's discretion, in a separate area.



Technology – Judging Criteria	Value
Oral Communication: Ability to discuss findings; ability to explain design principles	**10%**
Technological Process: **Prototype:** Need or opportunity clearly identified/defined; researched existing solutions; reworking/adaptations/testing of successive prototypes/models; construction skills; quality of finish; working parts of exhibit; own skills; consistent, logical discussion and interpretation of results; **Final Product**: Appropriate technological aspects; efficiency, reliability, cost effectiveness, ease of use, suitable materials, safety, environmental soundness – considered; final product meets needs of end-users; potential marketing and packaging strategies recorded/shown.	**60%**
Originality/Innovation: Users' needs met in original/innovative ways with supportive evidence.	**10%**
Presentation of Display: Colour/Form; clarity; graphics; innovative appeal.	**10%**
Log Book: Authentic ongoing record showing raw data; supporting documentation, bibliography and acknowledgements included.	**10%**

Science – Judging Criteria	Value
Oral Communication: Ability to discuss findings and the significance of these; ability to explain scientific principles involved.	**10%**
Scientific Process and Background: Clear aim/hypothesis carried through; method, accurate experimentation and includes appropriate data; results clear, accurate and include appropriate data; discussion and analysis of results; conclusions in line with aim/hypothesis; results are interpreted and discussed.	**50%**
Technical Skills: Design of the experiment and the use of apparatus and materials.	**10%**
Originality: Imaginative/Creative ideas; New/Unusual application in science.	**10%**
Presentation of Display: Colour/Form; Clarity; Graphics; Innovative appeal.	**10%**
Log Book: Authentic ongoing record showing raw data/field data; supporting documentation, bibliography, and acknowledgements included.	**10%**