

SCIENCE FAIR PROJECTS

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Includes original source material by Dr. Gabbott



PROJECT CHECKLIST

Do I have everything?

Is my problem in the form of a **question**?

Have I answered the question with a clearly written **hypothesis** including a **prediction**?

Does my **experiment** test my hypothesis (prediction)?

Does my experiment include appropriate **controls** to eliminate other factors that may explain the observations?

Have I designed my experiment with enough **repeated tests** to reduce chance as a factor?

Do I have a **logbook** to record all my data, my ideas and any other notes?

Have my teacher and parents/guardians **approved** my project?

Is my **display** complete and visually appealing? Have I included all the **supporting materials** I need?

Have I handed in my **Abstract**?

THE LOGBOOK

This is simply a book with a complete record of your project. It contains the “**raw**” data as you collected it, along with the dates of each record. It should also include your ideas, original plans for the procedure and any changes you made as the project progressed. One important page should be the original (and subsequent) Project Proposal. Make sure these have been signed by your teacher.

The logbook should be “**bound**”, and not loose leaf, such as a three-ring binder. It doesn't have to be particularly neat but it should be clear and well annotated, with dates for all entries. It might contain the sources of the apparatus and materials you used (what shop did you buy equipment from, how much did it cost? Who did you borrow equipment from?). Pictures can also be included.

THE DISPLAY

-like a formal Lab Report, but in **POSTER FORM**. *You must include the following:*

PROJECT TITLE

Student name and grade

PROBLEM A clear statement of the problem. Provide background information or a context for the problem – explain why this is an important question.

HYPOTHESIS Your “answer” to the problem and a Prediction (written in “If ... then ...” format.) You must give the reason for your hypothesis. Identify the dependent and independent variables and those you controlled.

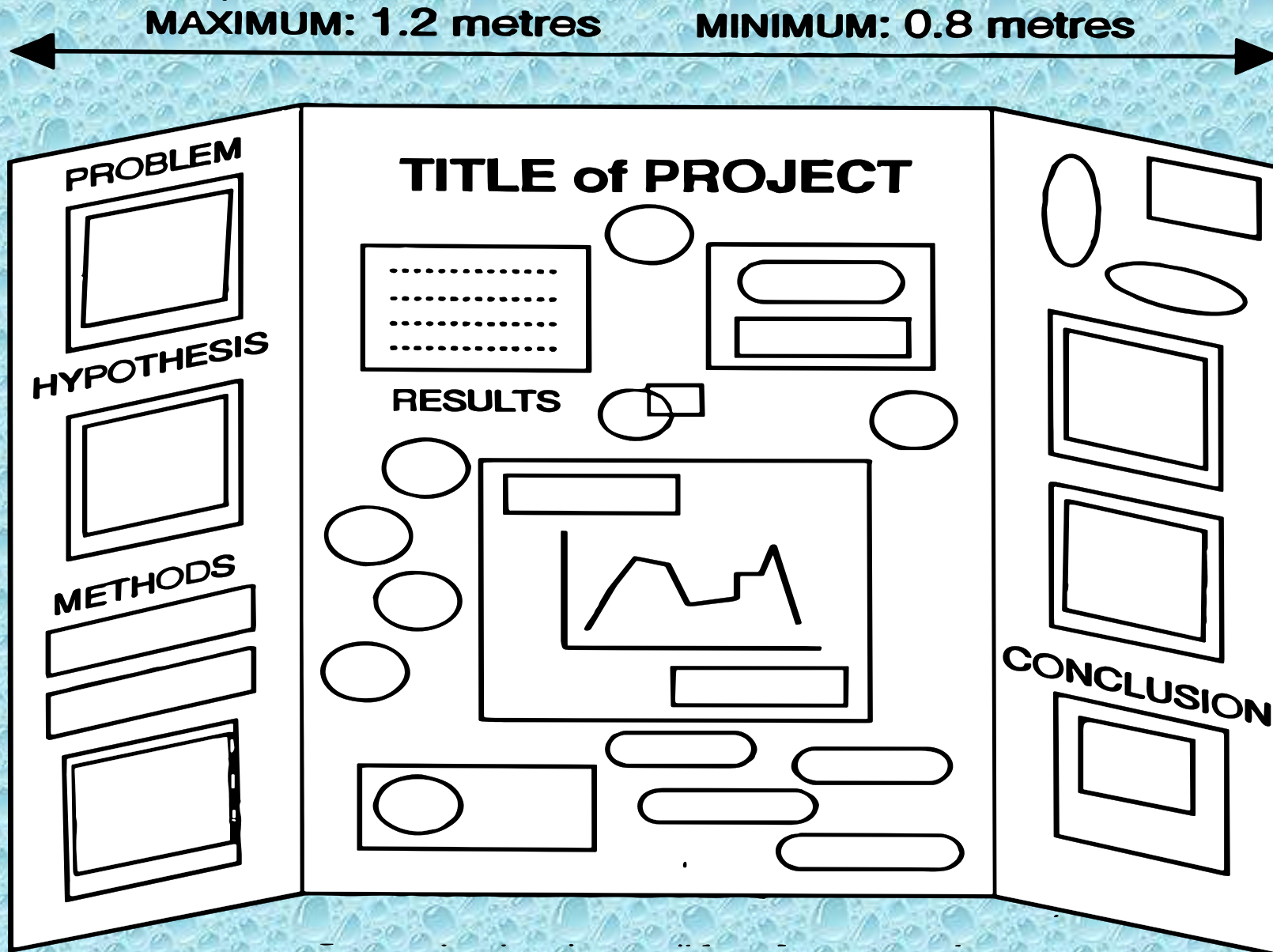
METHODS An explanation of the procedures used in the experiment which *must* be written in the past tense. List any unusual or important equipment.

RESULTS Present data as clearly as possible, preferably graphically, so that it is easily understood. Graphs must have labelled axes (including units) and title.

DISCUSSION Interpret your results, what do they show? How convincing is your data? Was the prediction correct? Consider any **SOURCES OF UNCERTAINTY OR ERROR**.

CONCLUSION What are the conclusions you can draw from the experiments? Have you answered your original problem? What else could be done next?

Above all, the display should capture the interest of the viewer. Remember that an appropriate photo or drawing can be more effective than many words. Careful use of colour can make a real difference. Make the title large, clear and neat, and be sure that all your lettering is large enough to be read without difficulty from about 1-2 metres.



NOTE: Your name and grade must be printed clearly in a small (approx. 6cm x 12cm) box in the top right hand corner of the poster.

Here are a few examples of displays from 2009....

Problem

Scientist do not always know the very exact idea and can make big mistake the world. There are many reasons for this in the future planning and construction. These people always are able to work the way it makes the world which kind of salt will be the best. The purpose was to see which of the substances will be the best for this. In doing various chemical ideas at home, practical chemical and I'll discuss, ammonium chloride, zinc chloride and other chemical to see the importance of pure salt synthesis.

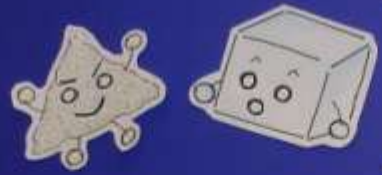
Hypothesis

When the salt will be added to the ice, it will lower the melting point of the ice which is called for freezing. When ammonium chloride will be added to the ice, it will melt the ice faster than the other salts. The other salts will be slower to melt the ice. Calcium chloride will melt the ice faster than the other salts. A salt which melts the ice faster.

Materials



SALTY ICE



Types of Salt	Time
Calcium Chloride	17 m 50s
Iron (III) Chloride	27 m 20s
Zinc Chloride	20 m 40s
Potassium Chloride	21 m 50s
Ammonium Chloride	21 m 30s
Silver Chloride	25 m 13s
Cobalt Chloride	21 m 19s
Pure Ice (no salt)	28 m 13s



Results

When the salt will be added to the ice, it will lower the melting point of the ice which is called for freezing. When ammonium chloride will be added to the ice, it will melt the ice faster than the other salts. The other salts will be slower to melt the ice. Calcium chloride will melt the ice faster than the other salts. A salt which melts the ice faster.

Methods

The purpose of this experiment is to see which salt will melt the ice the fastest. The salts used were calcium chloride, iron (III) chloride, zinc chloride, potassium chloride, ammonium chloride, silver chloride, and cobalt chloride. The method was to add a certain amount of salt to a piece of ice and measure the time it took to melt. The results showed that calcium chloride melted the ice the fastest, followed by zinc chloride, ammonium chloride, potassium chloride, cobalt chloride, iron (III) chloride, and silver chloride. Pure ice without any salt took the longest to melt.

Conclusion

The results of the experiment showed that calcium chloride was the most effective salt for melting ice. It melted the ice in the shortest amount of time. Zinc chloride and ammonium chloride were also effective, but took longer than calcium chloride. Iron (III) chloride, potassium chloride, cobalt chloride, and silver chloride were less effective. Pure ice without any salt took the longest to melt. This experiment shows that different salts have different effects on the melting point of ice.

Some comments:

In this project the student was looking at the ability of different salts to melt ice.

Visually - very eye catching

- bright colours, diagrams, charts, pictures, etc.

Content - well displayed

- amount of material is appropriate to deal with the topic but overall a bit basic.

Skin Cancer Prevention With SUN SCREENS

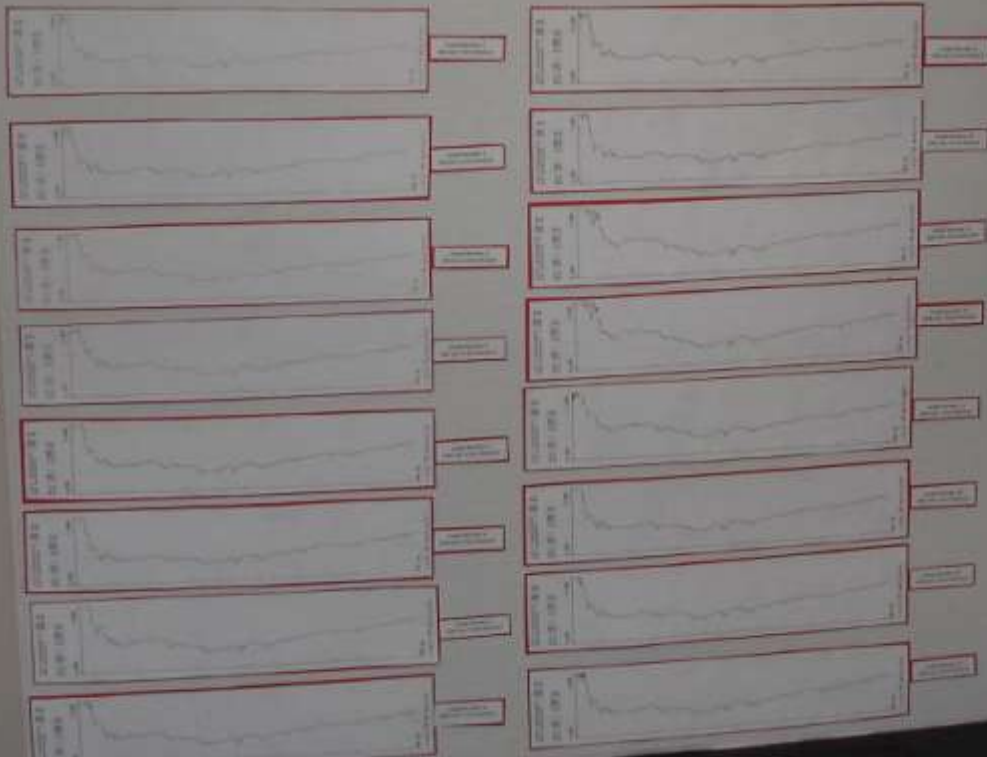
HYPOTHESIS

VARIABLES

MATERIALS

METHODS

PROCEDURE



DISCUSSION

SOURCES OF ERROR

RESULTS

CONCLUSION

BIBLIOGRAPHY

Some comments:

This was a very good project in which the student investigated the effectiveness of various types of sunscreen.

- The experiment was well thought out and executed.
- The display is neat and well organized, although the title is a bit large – some of that room could have been used for a larger font for the rest of the display.

Note the use of photos and the logbook in the lower right corner.

Problem

Does cigarette smoke directly affect the skin (and are being absorbed into blood)? If yes, what are the effects of cigarette smoke on the proliferation and morphology of skin cells?

It has been widely known that cigarette smoking leads to severe diseases and cancers, but not many people know that it also affects our skin. In an experiment in 1982, Dr. Douglas Miller of U.S. Army was able to harvest half of the human epidermis in the 100 patients by their face before skin. The effects of cigarette smoke on skin were certainly noticeable. The term "Smoker's Face" was then invented and defined as a face that has a rugged appearance, with less skin hairy wrinkles and a slightly grey appearance of the skin. The effects on skin cells caused by the 4,000 toxins absorbed into the blood are incalculable, but all I know that smokers also have cigarette smoke directly entering their skin. I wonder if the smoke may have direct effects on the skin cells.

Hypothesis

I hypothesize that cigarette smoke will directly affect the skin by enhancing the growth, proliferation and morphology of skin cells. If it is true, then I think that cigarette smoke will inhibit growth and proliferation of human dermal fibroblasts and damage morphology of dermal fibroblasts.

Equipment and Apparatus

- Pipette and Mechanical Pipette
- Inverted Microscope
- Cell Counter
- Hemacytometer Cell Counter

- "Walter Latham" Cigarette, made in Canada
- Human Dermal Fibroblasts
- Dulbecco's Modified Eagle's Medium (DMEM)
- Fetal Bovine Serum (FBS)
- Penicillin G Sodium
- Streptomycin
- Fungus EC2A
- Trypan Blue
- 24 well plate
- Petri Dish
- Vacuum Pump



Methods

Control: ratio and concentration of CO₂ and temperature is cell number, morphology of medium for cell culture, standard assay of counting viable cells (MTT) number of adherent in 24 well plate.

Dependent variables: Cigarette Smoke Extract concentration and time between medium.

Independent variables: Proliferation rate and morphology of human dermal fibroblasts.

Prepare Cigarette Smoke Extract (CSE):
The smoke from 10 cigarettes was collected through 100 µm of 250ml using vacuum pump in trip at a constant speed of 1 cigarette/10 minutes. CSE with DMEM was extracted by filtration through a 0.22 µm sterile filter. The resulting solution, concentrated for 100% CSE, was stored at 4°C.

Culture Dermal Fibroblasts

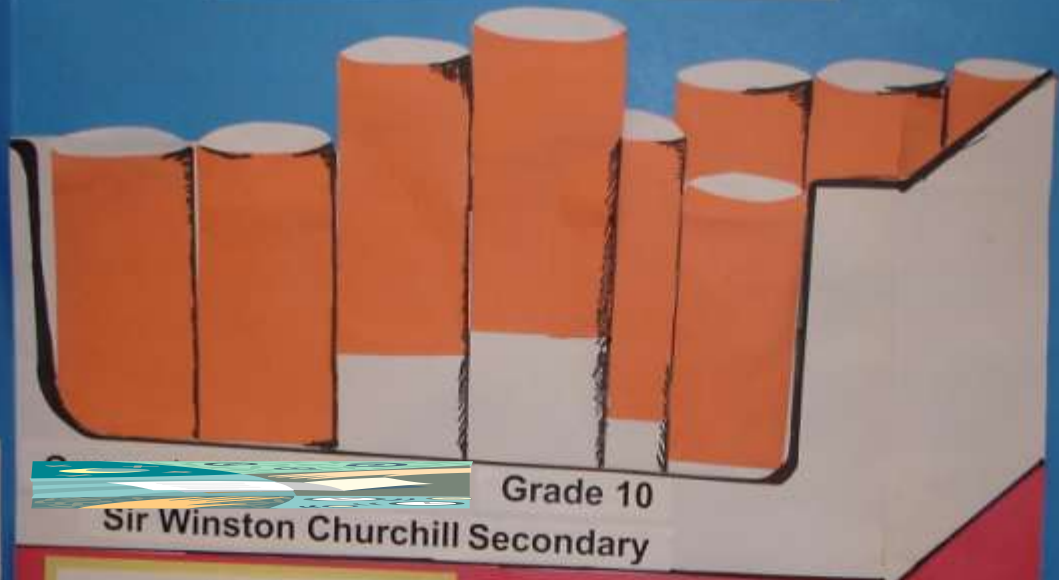
Human dermal fibroblasts (HDF) were cultured from dermal fibroblasts collected in DMEM supplemented with 10% FBS, 100 U/ml penicillin and 100 U/ml streptomycin at 37 °C in a humidified incubator with a 5% CO₂ atmosphere. To quantify cell proliferation, MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) was used to measure cell viability. Cells were cultured in DMEM medium in 24-well plate using medium changed every three days.

Add CSE to the Medium

After 24 hours, different concentrations of CSE containing medium were prepared: 0.625%, 1.25%, 2.5%, and 5% of total cells concentration of the medium.

The Skin Killer:

The Effects of Cigarette Smoke Extract on Human Dermal Fibroblast



Results

1. Analysis of Data

1. Observation of morphology of human dermal fibroblasts

Observation was made using inverted microscope. The control dermal fibroblasts were a regular, spindle form, with prominent nuclei and well-defined adherent cell clusters. They had non-circular shapes and were densely populated and frequently seen to merge with neighbouring cells (Figure 1a). The changes in morphology of fibroblasts treated with CSE could clearly be observed after 24 hrs with a concentration-dependent manner. The observations of untreated fibroblasts showed the development of processes, which shrinkage, nuclei compression, a number shape, and uneven, further apart cell distribution, (Figure 1b,c,d).



Figure 1. Morphological changes of HDFs showed a consistent ultra-structural response to various CSE. Healthy growth of fibroblasts of the cells at 0.625% CSE, some changes in morphology of cells. Control (a) significant changes in morphology of cells, loss of processes in singly

2. Inhibition of human dermal fibroblasts proliferation by CSE

CSE inhibited human dermal fibroblasts proliferation in a concentration-dependent manner (Figure 2). On Day 7, ~80% of added cells were attached under normal culture conditions. During the 7 d of culture, cells without CSE exposure possessed about 8 fold. Inhibition of cell proliferation was calculated using the following: 3.02% CSE inhibited cell proliferation over 50%, and 5% CSE completely inhibited the cell proliferation.

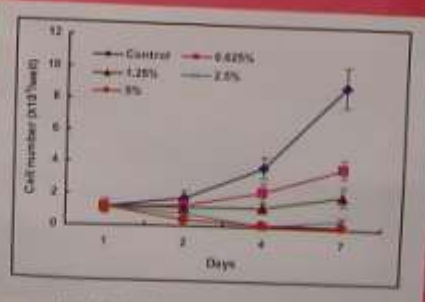


Figure 2. Effect of CSE on dermal fibroblast proliferation

Reliability of Data

There were several factors needed to consider for the experiment to ensure the reliability of data.

1. The concentration of CSE

The vacuum pump was set to a certain negative pressure to keep the constant speed of collecting CSE about 1 cigarette/10min, ensuring the smoke was evenly collected into DMEM. The 10 concentrations of CSE making solution had to be prepared accurately to provide comparable results.

2. Accuracy of cell counting and preparing of cell suspension

The number of cells for each experiment needed to be as precise as possible to provide comparable results. The number of cells in each well of the 24 well plate, in replica, needed to be the same for each experiment. This was ensured by manual counting using the hemacytometer Cell Counter, and then calculating, with the following equation:
Total number of cells = (cell count) x (dilution factor) x (total volume).
Through gentle mixing of the cell samples were done to ensure the homogeneity of cell suspension, which would result in more accurate cell counting.

3. Manipulations of factors

Factors needed to be strictly manipulated to ensure the accuracy of the experiments. Systems that was used at all times during all experiments to prevent contamination of experimental samples by bacteria.

Conclusion

One of the most important signs to harmful substances, such as in the case of cigarette smoke, cigarette smoke, such as in the case of 4,000 and 40%.

Cigarette smoking led one of the major contributors of our metabolic energy and is doing so without having the gross effect of air pollution. The absorption of tar and carcinogens of cigarette smoke is known to be the main cause of cancer and other respiratory diseases.

In present experiment, I found that CSE had a direct effect on the morphology of human dermal fibroblasts. The fibroblasts with CSE were observed to proliferate less in 24 hours, spindle-shaped form. The effects of tar growth and inhibition of cell proliferation were observed on the first course of fibroblasts with medium concentration CSE had lower growth rates, which limited the proliferation of fibroblasts.

The experiment results supported my hypothesis, which was that cigarette smoke had a direct effect on human dermal fibroblasts by increasing growth and proliferation, and changing the morphology of the fibroblasts. The results may also be the consequence of cigarette smoke being toxic to cells. Study of skin cell morphology of cigarette smoke and air pollution.

Post-Project Discussion

The results and data of the effects of CSE on human dermal fibroblasts were analyzed and used to determine the amount and distribution of cells. The results were used to determine the amount and distribution of cells. The results were used to determine the amount and distribution of cells. The results were used to determine the amount and distribution of cells.

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Comments:

This was an excellent project! Here the student was investigating the effect of cigarette smoke on actual skin cells.

The presentation board is very neat, well organized and the use of the cigarette package is very creative and eye catching.

Font size could have been a bit larger. A large portion of the board is used for the title and visuals.

The experiment was well designed and executed and the analysis of the results was excellent.

Note again the use of photos and graphs.

Some reminders:

Make sure you check the criteria for displays before any fair you attend!

Usually there is some allowance for things like display size, etc.

If you have other items you would like to display with your poster **MAKE SURE THEY ARE ALLOWED.**

Things like chemicals, live specimens (including plants and bacteria), etc. are usually not permitted.

You can modify your display between fairs. If you plan to continue with your project or participate in other fairs, use any feedback you receive **CONSTRUCTIVELY.**

THE PROJECT SUMMARY

In addition to the Project Display, you must submit a Project Summary (or Abstract). The Summary is part of the evaluation of your project.

The Summary is a brief account of the essential parts of your project. It is NOT a Lab Report. The Summary should point out the key features of the project, including the problem, your hypothesis, the experiment you did and your overall conclusions.

The Summary is limited to a maximum of ONE page (8.5" x 11") and must be printed on white paper, one side only. Summaries longer than one page will not be marked. The minimum font size is 10 pts. Don't include any graphs or illustrations.

The Summary must have the following:

- Project title
- Student's name
- Grade
- School name
- A clear statement of the problem and your hypothesis
- A brief description of the experiments carried out
- A brief account of the results. Do NOT include graphs, tables or illustrations
- Your overall conclusions



CRITERIA for EVALUATING
PROJECTS

SCIENTIFIC THOUGHT

Is there a clear problem or question?

How well does the hypothesis “answer” the question?

Has an effective experiment been designed to test the hypothesis?

Have the dependent and independent variables been identified?

Are there adequate and appropriate controls for other variables?

Are there sufficient replicates or trial numbers?

Has the data been suitably and effectively analysed?

Is the data displayed neatly and in a way that is easy to understand?

Are the results (graphs, charts, tables) neat, clear and understandable?

Is there adequate consideration of the reliability of the data?

Is there a suitable conclusion that answers the question?

CREATIVE ABILITY

Does some part of the project strike you as being creative or original?

DRAMATIC VALUE: PRESENTATION

Does the overall presentation provoke interest?

Ask your teacher for a copy of the marking rubric.

You will also likely be asked to complete a peer evaluation of other student's projects and receive peer evaluations of your project.

***HAVE FUN AND
GOOD LUCK!!***

