# Table of Contents

- SCIENCE FAIR OUTLINE & INFORMATION ................................................................. 3
- GETTING STARTED - HELPFUL HINTS & GUIDELINES ............................................. 3
- WEIGHTING .............................................................................................................. 5
- SCIENCE FAIR PROJECT IDEAS ................................................................................ 6
- SCIENCE FAIR PROPOSAL ....................................................................................... 7
- SCIENCE FAIR PROJECT PLAN ............................................................................... 8
- HOW TO WRITE A LAB REPORT .............................................................................. 11
- THINGS TO REMEMBER ABOUT DOING EXPERIMENTS ...................................... 14
- SCIENCE FAIR DISPLAY GUIDELINES .................................................................. 15
- SASKATOON REGIONAL SCIENCE FAIRE EVALUATION RUBRIC ......................... 16
Science Fair Outline & Information

Purpose: The purpose of this project is to develop some REAL science skills with a topic that interests you.

Timeline: The 2016 Saskatoon Regional Science Fair will be held on Friday, April 8, 2016 at the University of Saskatchewan, Education Building. Students can register at www.usask.ca/srsf beginning January 1. Registration closes on March 20. This does not give you an excuse to procrastinate!!! Do not leave this until the day before the hand-in date.

Groups: It is ideal if students work alone or in a group of 2.

Getting Started - Helpful Hints & Guidelines

1. Pick a partner that you will work well with. This is a major project that requires lots of time and energy. Don’t just pick someone because they are cool, funny or your BFF – make sure you can trust them to handle half of the workload. You will definitely need to get together to work outside of class time, so pick someone that you don’t mind getting together with outside of school. If you don’t think you can trust your partner to do a good job, be prepared to do the majority of the work by yourself while they slack off and take credit. If that doesn’t sound fair to you, maybe working by yourself would be a better option.

2. Choose a topic that interests you. Since this is a major project that takes up time and energy, you might as well do it on something that you like!

3. Choose a topic that is safe and legal – making bombs, fireworks, firecrackers, drugs etc. would not be considered safe or legal. More information on safety requirements can be found on the Canada-Wide Science Fair website https://cwsf.youthscience.ca/

4. Choose a topic that YOU CAN TEST by designing an experiment using the scientific method. This may sound obvious, but it is actually trickier to do than you think. Take the time to think about your topic and make sure there is something in it that you can test.
5. Choose a topic that requires materials and equipment that are cheap, easy to get, and usable at your home. If you need materials and equipment from school (i.e. scales, beakers, etc.), you may do so with your teacher’s permission, but remember that you cannot take them home. Also, few teachers will provide you with chemicals for obvious safety reasons. Some class time may be given for this project, but remember it is designed so that you do some science on your own, outside of the classroom.

6. You should do all work. Your teacher, parents, or others may provide appropriate assistance.

7. Food samples (liquid or solid) should not be a part of your display (but may be part of your project). Please use photographs or drawings, plastic food or the labeled containers.

8. Valuable equipment should not be a part of your Display (but may be part of your project). Please use photographs or drawings to document their use during your experiments.

9. Do not use live animals if your project will involve using live animals of any type you will be disqualified for ethical reasons. There are some exceptions where proper measures are put in place. Please refer to the Youth Science Canada website for more information. http://youthscience.ca/node/835

10. Get yourself a binder for keeping all of your Science Fair work organized. This will make the process of writing your presentation and designing your display so much easier. Good science involves meticulous notes and careful descriptions of every step taken.

11. Be aware of the various deadlines. This project is VERY difficult (if not impossible) if you leave it to the last minute. By setting up a regular schedule and working on it in chunks, you will make your life easier!

12. Develop a question you want to answer. This is project where you design an experiment. That means that you should first start by developing a quality, answerable, testable question. Avoid things such as “What is sound?” and think more about things that are testable, such as, “Does sound move faster through a solid, liquid, or gas?”
Weighting

Even if your project is not going to be marked, think about how much time and effort you should put into a project based on how much it would be worth as an assignment.

1. **Proposal** 5% - A one-page sheet that outlines what your topic is, what your hypothesis is, how you are going to test your hypothesis, and includes some of your research resources. **Completed by:** ________________________________

2. **Project Plan** 15% - A two-page package that goes into more detail. You need to fully explain your experiment, identify your variables, control and constants. This is a good time to find a few more references and polish your idea. **Completed by:** __________

3. **Lab Book** 30% - This is a collection of ALL of the work you have done on your Science Fair project and includes everything from rough drafts, data, research, notes, photos etc. This should be very detailed and would allow anyone to use the information that is in your book to interpret what has happened during your experiment. Be sure to include what is measured and who did what, when. **Completed by:** __________

4. **Display** 20% - This is the final display that you will show to the world. Remember, this is what the audience gets to see, so make sure you put forth your best effort! You will need an actual 3-sided display poster. These can be obtained from most stationary stores. If you are unable to find one talk to your teacher as they may be able to find some extras. **Completed by:** ________________________________

5. **Presentation** 30% - You should think of this as the whipped cream on a dessert. Make it look good and be sweet! This is where you share your work with experts and members of the scientific community. At Canada-Wide you will have a maximum of 10 minutes for speaking and 10 minutes for questions. **Completed by:** ________________

Please note that Canada-Wide Science Fair has its own judging criteria for the presentation and project. [http://cwsf.youthscience.ca/judging-criteria](http://cwsf.youthscience.ca/judging-criteria)
Science Fair Project Ideas

1. Will vitamins affect the growth of a plant?
2. Do weed killers affect house plants?
3. Does the amount of light on plants affect their growth?
4. Does the amount of water given plants affect their growth?
5. What is the effect of detergent on bean seeds?
6. Under what color light do plants grow best?
7. In what kind of material (sand, clay, etc.) do seeds grow best?
8. Will plants grow better in soil or water?
9. What is the effect of heat when dissolving sugar? Salt?
10. How fast do fabrics burn?
11. How is the strength of a magnet affected by glass, cardboard and plastic?
12. What is the best shape for a kite?
13. Which holds two materials together better, a screw or a nail?
14. Which detergent breaks up oil best?
15. How does the absorption rate of various paper towels differ?
16. Which detergent makes the most bubbles?
17. How does the wattage of a light bulb affect energy use?
18. Which properties of different glue holds two boards together best?
19. Which properties of different popcorn pop fastest?
20. Which type of battery makes toys run longest?
21. Which type of diaper holds the most water?
22. What properties of different hand sanitizer disinfect hands better?
23. Are more expensive golf balls worth it?
24. Does using a cell phone (calls or texting) affect reaction time?
25. Do white candles burn at a different rate than colored candles?
26. Does the presence of detergent in water affect plant growth?
27. Do the same types of mold grow on all types of bread?
28. Does light effect the rate at which foods spoil?
29. How permanent are permanent markers? What solvents (e.g., water, alcohol, vinegar, detergent solution) will remove the ink? Do different properties of different types of markers produce the same results?
30. Is laundry detergent as effective if you use less than the recommended amount? More?
31. Do all types of hairsprays hold equally well? Equally long? Does type of hair affect the results?
Science Fair Proposal

Working project title:

1. Purpose of your experiment. What problem are you going to solve?
   Your Investigative Question(s):

2. Your Hypothesis or Hypotheses based on your Investigative Question(s):
   *A hypothesis is an educated guess based on research – not just a random idea.

3. Can you design an experiment to test your hypothesis? Briefly describe how you will do this:

4. Resources (websites, books, magazines, etc. used to get info on your topic). Set yourself up for success and cite your sources in the appropriate format using a tool such as http://www.bibme.org/

   Resource A:

   Resource B:

   Resource C:
Science Fair Project Plan

Working project title:

1. **Investigative Question(s)** (problem to be solved). What is the purpose of your experiment?

2. **Resources** (books, magazines, etc. used in your bibliography). Where you gathered your information to form hypotheses. Try to find two NEW sources.

   Resource A:

   Resource B:

3. **Hypothesis.** Think further on what your research indicates will occur.
4. Procedure:
   
a. **Materials** Needed (listed vertically with quantities if possible). These are similar to the ingredients and equipment needed to cook a certain recipe.

   
b. **Method and Diagram** - numbered step by step instructions should be included. These should be detailed, yet simple instructions that ANYONE could follow. You must include a diagram of your experimental set up. Think of this as the directions of a recipe and with how-to images.
5. Identify the variables of your experiment.

**Independent variable** – What is not affected by change.

**Dependent variable** – What you are observing in your experiment.

**Control variable** – what you are comparing your experimental results to.

6. Identify the constants within your experiment. What are the unchanging parts of your experiment?

7. Create a Sample Data Sheet you will be using to record your data. You should include any data that you think may be necessary in the future to interpret your experiment. **DO NOT RUSH THIS SECTION. THIS MAY BE ONE OF THE MOST IMPORTANT SECTIONS LATER WHEN YOU ARE WORKING ON YOUR EXPERIMENT!** How many trials do you need and what will the results look like?

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How to Write a Lab Report

1. **Title** – write a title in the centre of the page at the top.

2. **Purpose** – This is a statement about your experiment that should include:
   - What experiment are you doing? Don’t just write the name of the experiment (you can figure that out from the title). Write what you are actually investigating and trying to find out and BRIEFLY state what your method is so that people have a quick idea of what you did.
   - Why you are doing the experiment. What is the actual reason that you are performing this experiment? What are you investigating and why is this important?
   - The purpose section should be no longer than 3-4 sentences.

3. **Hypothesis** – This is an educated guess about what the results of your experiment will be.
   - State what you think will happen during the experiment.
   - State why you think that will happen.

4. **Materials** – This is a list (actually write it as a list with bullet points for each item) of all the items and materials used during the lab.
   - BE EXACT!!! State exactly what you are using and how many you are using. For masses, volumes, temperatures, etc. tell the amount used in the experiment.

5. **Procedure** – This is a step-by-step set of instructions that allow others to understand exactly what you did for your experiment.
   - It should be very simple and very easy to follow. However, you cannot leave out any information. Be brief yet descriptive.
   - It should be written as though it were a list of instructions with numbers for each step.

6. **Identify the Variables** – Every experiment has several variables to consider.
   - Independent variable – What you change during the tests of your experiment.
   - Dependent variable – What you are observing in your experiment.
   - Control variable – what you are comparing your experimental results to.
   - Constants – What are the unchanging parts of your experiment?
7. **Observations and Data** – All of the information that is collected during your experiment should be in one lab book.
   - Data should be simplified in a table and include necessary units.
   - Should be clear, easy to read, and easy to understand.
   - Leave space in the margins to make notes and number each page.
   - Include additional observations of anything out of the ordinary. Remember, “that’s funny” often leads to new discoveries!
   - Attach your procedure to the first page and keep track of who does what.

A good experiment collects as much relevant data as possible. There are two types of data that you can collect in an experiment:

- **Qualitative Data** is descriptive data that describes the qualities of an event. Could be things such as colour, smell, texture, etc. Does not include numbers.
- **Quantitative Data** involves numbers and quantities and can be measured. Could be things such as mass, volume, length, temperature, time, speed, age, people, etc.

8. **Sample Calculation(s)** – If you ever do an experiment that requires you to do a calculation after collecting your data, you always need to show one and only one example of how to perform the calculation. There should be one sample calculation for EACH different calculation performed.

9. **Conclusion** – By far the most important part of your lab report is the conclusion. This is a summary of what you discovered from your experiment and what the implications of that are.
   - Restate the purpose and your hypothesis.
   - Sum up the results of your experiment (if you found final numbers such as density, volume, etc. you should state them with units).
   - Say what your results mean in the context of the purpose of your experiment.
   - State whether these results support, verify, or falsify your hypothesis and why.
   - This is also a good place to reflect and compare your results with your research.
   - Discuss the implications of your experiment and what your results mean.
   - This should be a paragraph and should be 7-8 sentences MINIMUM!
10. **Sources of Error** – Every experiment has tiny errors, many of which you cannot control. You need to report all these errors to the best of your ability. This will help future scientists eliminate errors if possible.

<table>
<thead>
<tr>
<th>Human Errors</th>
<th>Systematic Errors</th>
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</thead>
<tbody>
<tr>
<td>are errors that people make during an experiment. Could be things such as using the wrong amounts, not cleaning glassware well enough, accidently spilling, sneezing in your materials, etc. Human errors are always preventable.</td>
<td></td>
</tr>
<tr>
<td>are errors that cannot be avoided. They are built into the experiment and the experimental procedure itself. Systematic errors are always present and always predictable. Examples include the markings on your ruler being incorrect, the temperature of the room changing over time, the air flow in the classroom changing, impurities in chemicals used, etc. Figuring out what these errors are can be challenging but if you think critically about your experiment you can figure them out.</td>
<td></td>
</tr>
</tbody>
</table>

11. **Future Improvements** – List what could be done about the design of the experiment in order to improve it in the future.
   - Improvements should usually focus on reducing the impact of the errors listed
   - This should never be about what you could change (don’t list things like “I could have been more careful when I measured” or “I could have retried it to make sure I did it right.”)

12. **Sources** – be sure to write a bibliography or list of sources which you have used towards your project. You should also include acknowledgments of any mentorship or guidance you’ve received.
Things to Remember about Doing Experiments

1. Try to be as accurate and precise as possible. This ensures that you have a valid experiment.

Accuracy and precision are 2 different things. In an experiment, you should try be both accurate, and precise.

**Accuracy** – How close your data is to the actual (true) answer. All of your data and values are around where they should be. You are close to the actual answer. (This can only be known if someone has done or will do the same experiment).

**Precision** – How well your data and values compare to each other after doing multiple tests. If you test how much mass a beaker of chemicals has 3 times and you get the same number each time, you had a precise measurement. If they were very different, then you had low precision.

**Valid** – An experiment is valid if it is both accurate and precise, it is said to be valid. This means that the data you found is consistent and reliable. This is important because someone else should be able to perform your experiment and get the same results as you if the experiment is valid. If you experiment did not turn out to be valid, you should redo it or change your experiment.

2. Keep things simple, short, and descriptive. Don’t go into too much detail and don’t ramble on. However, your writing should be descriptive enough that anyone could do exactly as you did or understand exactly what you’re saying. A good way to check this is to have your parents, older siblings, or someone who has not done this experiment read through your lab report to see if it makes sense.

3. Good science is rigorous. This means that, not only was your experiment valid, but it was also meticulous and carefully performed. It means that you only use the data collected to make a decision about what your experiment means and you do not say what it should mean. Rigorous science also tries to make sure that the only changing variable in an experiment is the independent variable. All others should be accounted for. Remember, science is not about making stuff up or making things work, it is about drawing conclusions from carefully collected data!
Science Fair Display Guidelines

Your project will be surrounded by many others, so it should be attractive and have eye appeal. Remember the “C’s” for exhibiting:

- Color appeal
- Contrast
- Clear, concise statements
- Completeness

Your exhibit should tell the story of your project. Be sure to include ALL of the following information on your display:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Control</th>
<th>Steps/procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis</td>
<td>Constants</td>
<td>Data</td>
</tr>
<tr>
<td>Variables – Independent</td>
<td>Materials List</td>
<td>Results/Analysis</td>
</tr>
<tr>
<td>Variables – Dependent</td>
<td></td>
<td>Conclusion</td>
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</tbody>
</table>

**Option 1 – Display Poster Board**

Displays must be sturdy enough to stand alone on a table. The materials should be easy to work with and easy to transport.

If you used special equipment, the set-up should be placed in front of your display or in a place to enhance the exhibit - not overwhelm it. Live animals and/or food should NOT be a part of your display, but, may be shown by using a picture or sketch.

**Option 2 – Digital Display**

Digital displays are to be exact digital replicas of a real Poster Board Display. This means that the digital display must:

- Be in a one page, poster format
- Include all of the required info stated above
- Able to be viewed in a single screen shot
- Not in multiple slides (i.e. – PowerPoint)

Think of the traditional Science Fair Poster Board Display and imagine it filling up your computer screen. These can be printed on large plotter sized paper.
# Saskatoon Regional Science Faire Evaluation Rubric

## PART A: SCIENTIFIC THOUGHT – 45%

<table>
<thead>
<tr>
<th>Level 1 (Low) – Mark Range 6 to 15</th>
<th>Level 2 (Fair) – Mark Range 16 to 25</th>
<th>Level 3 (Good) – Mark Range 26 to 35</th>
<th>Level 4 (Excellent) – Mark Range 36 to 45</th>
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<tbody>
<tr>
<td><strong>Experiment</strong></td>
<td><strong>Innovation</strong></td>
<td><strong>Study</strong></td>
<td><strong>Design and build innovative technology, or provide adaptations to existing technology or to social or behavioural interventions; extend or create new physical theory. Human benefit, advancement of knowledge, and/or economic applications should be evident.</strong></td>
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<tr>
<td>Undertake an investigation to test a scientific hypothesis by the experimental method. At least one independent variable is manipulated; other variables are controlled.</td>
<td>Develop and evaluate new devices, models, theorems, physical theories, techniques, or methods in technology, engineering, computer, natural science, or social science.</td>
<td>Analysis of, and possibly collections of, data using accepted methodologies from the natural, social, biological, or health sciences. Includes studies involving human subjects, biology field studies, data mining, observation and pattern recognition in physical and/or social/behavioural data.</td>
<td>The study is based on systematic observations and a literature search. Quantitative studies should include appropriate analysis of some significant variable(s) using arithmetic, statistical, or graphical methods. Qualitative and/or mixed methods studies should include a detailed description of the procedures and/or techniques applied to gather and/or analyse the data (e.g., interviewing, observational fieldwork, content analysis).</td>
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<tr>
<td>Replicate a known experiment to confirm previous findings.</td>
<td>Build a model or device to duplicate existing technology or to demonstrate a well-known physical theory or social/behavioural intervention.</td>
<td>Existing published material is presented, unaccompanied by any analysis.</td>
<td>The study consists information from a variety of peer-reviewed publications and from systematic observations, and reveals significant new information, or original solutions to problems. Serves criteria for analysis of significant variables and/or description of procedures/techniques as for Level 3.</td>
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## PART B: ORIGINAL CREATIVITY – 25%

<table>
<thead>
<tr>
<th>Level 1 (Low) – Mark Range 6 to 10</th>
<th>Level 2 (Fair) – Mark Range 11 to 15</th>
<th>Level 3 (Good) – Mark Range 16 to 20</th>
<th>Level 4 (Excellent) – Mark Range 21 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td>The project design is simple with little evidence of student imagination. It can be found in books or magazines.</td>
<td>The project design is simple with some evidence of student imagination. It uses common resources or equipment. The topic is a current or common one.</td>
<td>This imaginative project makes creative use of the available resources. It is well thought out, and some aspects are above average.</td>
<td>This highly original project demonstrates a novel approach. It shows resourcefulness and creativity in the design, use of equipment, construction, and/or the analysis.</td>
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**PART C: VISUAL DISPLAY – 15%**

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<tr>
<td>Layout logical and self-explanatory</td>
<td>1 2 3 4 5</td>
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<tr>
<td>Information content / substance</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>Readability / clarity</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Exhibit attractive and well-constructed</td>
<td>1 2 3</td>
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**PART D: ORAL PRESENTATION – 8%**

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<tr>
<td>Clear, logical, enthusiastic presentation</td>
<td>1 2 3 4 5</td>
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<tr>
<td>Response to questions</td>
<td>1 2 3</td>
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**PART E: PROJECT REPORT & PROJECT LOG – 7%**

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<tbody>
<tr>
<td>Bibliography and citations</td>
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<tr>
<td>Project log (hard copy or electronic)</td>
<td>1 2 3 4</td>
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**PROJECT EVALUATION SUMMARY**

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<th>Part</th>
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<td>B</td>
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**TOTAL MARK AWARDED TO THIS PROJECT**

**FEEDBACK FOR THE STUDENTS**

**Strengths**

**Recommendations**

**Judge’s Name (Please print.)**

**Judge’s Signature**