First Class Homeschooler's Science Fair

-March 12th, 2010-

Faith Fellowship Church in Silverdale

Information,

Instructions and Registration

To show students that God has made a splendid world for us that can challenge, delight, and bless us

To teach children that science is not just interesting facts, but it involves careful thinking, planning, and experimentation to see if those facts are true

To provide an opportunity for excellence in scholarship

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Categories

Competition Categories: There are three (3) categories for competition: **Collection Project,** a **demonstration Project or** a **Research Project/Experiment.** The different skills required for each category is meant to provide a way for students to find a comfort level and get experience in science fairs. We will allow students of all grades to participate in any one of the categories they choose, but we would expect older or more experienced students in most cases to move toward a Research Project. All the categories will be judged in a grade specific manner (e.g., a high school senior's project would be judged more rigorously than a 1st graders'.)

Within each category there are two levels for competition, **Junior** and **Advanced.** The differences in the levels include more required elements, in particular, a report paper. The Advanced levels are based on experience, not grade or age, and the choice to participate in the Advanced level is strictly the parents' and student's. A student will not be assigned to the Advanced level unless they request it. We do encourage older students (7th and up) to participate in the Advanced level.

Parental and Teacher Involvement: This is a STUDENT'S science fair for STUDENTS. The parent/teacher will be a critical element of the process, especially for the younger students. The parent/teacher will keep the student motivated and help them understand and think about the problem chosen. It is also up to the parent/teacher to decide how much help a student needs at various stages of the work **so that the work presented truly reflects the efforts of the student and not the work of the parent.** Parents need to resist stepping in when things don't look so great or when time is running short. The student will be much, much better off presenting his or *her very own work*, no matter what the results are. Just ask the previous Science Fair winners! **Note:** Not every experiment works – some projects seem to be disasters, at least in terms of the outcome of the experiment itself. In fact, in some years the **winning projects** were, at one point, "failures" in this regard. What impressed the judges was the depth of study, effort and expertise that the students exhibited. So, be encouraged to try and help your kids to do their best.

Eligibility: The Homeschooler's Science Fair is open to all Homeschoolers in grade levels, K through 12, who have completed the application process and followed the guidelines presented here. **Group entries:** Teams of up to three students may enter, and these teams may or may not be judged separately from the individual projects. Each student may enter only one (1) science fair project (single or team).

A Few Helpful Hints:

- Check your spelling
- Spend more time on your research (notebook, reading, experiments, documentation) and less time on your Display
- Get help if you are stumped, confused or frustrated
- Clearly label all the required elements on your display!!! These are listed under Display Checklist on the Science Fair Guides for each project category.
- Have fun – the judges will like it if you are interested in your subject, if you learned something, if you had fun and if you understand what you would do differently next time.

Elements of the Project

Research Notebook: All students must maintain a project notebook, which will be presented at the Science Fair. The notebook is a place to jot down ideas, record data, work through analysis, and document the progress of your experiment (including the blind alleys and parts that caused you to re-think your approach). A neat, logical notebook will show the judges how your experiment happened and assist in writing your paper. You should start using your notebook as soon as possible to record all your brainstorming, planning and research activities. For the younger entrants, the notebook can be more of a portfolio of work like drawings, scrapbook items, and so on. For older students (generally 4th grade on) the notebook should contain more writing and observational information, references found, ideas for development and a place for documentation of activities. **Each entry must be clearly dated.**

Abstract: Each project is **required** to have an abstract of no more than 250 words length. This is best written at the end of the project because it is a careful **summary** of the entire project. The abstract should include the experimenter's purpose and the general procedure used, the type of data generated, and the conclusion. It should not be one long sentence and should be **labeled prominently on your display.**

Report: A report is suggested for all the projects and **required for some categories.** A suggested format is given below. Except for the discussion section, most sections will be short. If you have access to a word processor, use it because it will help writing the paper. Be sure to get someone not directly involved with your project to read the paper for clarity and logical flow, and to find spelling and grammar mistakes. The sections of a research paper are:

1. **Title Page –** Center the title of the project in the middle of the page: place your name, address, and grade at the bottom right.
2. **Table of Contents –** The title of each section and the page it starts on listed as a table.
3. **Introduction –** Describe the background for your project including similar or previous projects performed by yourself or others, how what you are doing may be different than what others have done, how you got interested in the topic area. Be sure to clearly state refer to other's work, include a footnote or a reference number.
4. **The Project-** Carefully and completely describe the methodology used in performing you work. This should be so complete and logical that another person could use only you description and exactly reproduce you project and the results. If you use a standard methodology, give a reference citation. Include detailed drawings of photographs of your experimental equipment and procedures.
5. **Discussion –** This is the bulk of the paper and the most important part because here is where you tie together everything you did. For a Research Project or a Demonstration, discuss the relationship between the experimental results, the existing theory in the field, and you interpretation of how the experiment worked. You will need to compare, if required, your results with those of former investigations. You will also need to compare the results with the control

group, if required. You should speculate about follow-on experiments to extend your results or what needs to be changed for the next round of experiments. Include a discussion of sources of error or bias and how significant the results are.

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6. **Conclusion –** Briefly summarize your results. Explain if accepted or rejected your hypothesis and why you came to that conclusion. Do not bring up issues not discussed in an earlier section.
7. **Acknowledgments –** Credit all sources of support from persons or individuals.
8. **References –** You should have a citation for everything that is not your own original work. Every source cited in your paper must be listed here and every reference listed here must be cited in your paper. Use a format familiar to those in your discipline or consult one of the many standard style manuals.

Visual Display: The point of the display is to favorably attract and inform visitors and to "tell the story" of your project. The title of the exhibit will do much to draw interest to your exhibit. Clear, logical, and concise displays will be required. Judges will be looking to quickly locate **the appropriate sections of your display.** Titles should be visible from six feet (two meters) away. Clearly and correctly label all graphs, photographs, and drawings; all visuals should be explanatory. Be sure to stay within the exhibit size limitation and the restrictions on what can be displayed. Good-quality photographs are a better way to exhibit the experiment than bringing all of the experiment apparatus.

Each project must be displayed so that others can understand what your project is about. At the Science Fair, tables will be provided for your display. Each student will have about 4 feet of space on the table to use for a display. The display you use should be: 1) Self supporting, 2) large enough for showing charts, pictures and information, 3) tall enough for viewing at eye level. Materials often used for making a display include sturdy cardboard or plywood joined together with hinges, rings, tape or twine. The display may be covered with colored paper, fabric or paint. The construction of the display should be done with affordable materials which are easily obtainable in a way which presents your work in the best manner. Here are some example display dimensions and layouts:

Other elements of the project are listed on the Project Guide Sheet: these guide sheets must be completed and turned in on the day of the Science Fair.

Science Fair Steps

The **10 EASY STEPS** for completion of a successful science fair project are: (Check them off as you go.)

∆ **1.** Decide between a Collection, Demonstration, or a Research Project (please read the definitions to make sure you understand the differences.

∆ **2.** Pick a Topic (ideas on pages 5)

∆ **3.** Prepare and Submit the Application Form (page 6)

∆ **4.** Begin the Project – Begin with library work, locate sources, get help, start filling up the lab notebook with info, observations and ideas.

∆ **5.** Make mistakes and correct them

∆ **6.** Continue – Don't give up!

∆ **7.** Complete the Collection, do the Demonstration or Finish the Research experiment.

∆ **8.** Start Writing Finial Research Report, Conclusions, Discussion

∆ **9.** Prepare Science Fair Exhibit

∆ **10.** Attend Science Fair

Start using your research notebook. Date each entry you make in it and write down your activities, thoughts, findings and ideas. Write neatly, and use sketches or diagrams. You don't have to be so meticulous that keeping the notebook is onerous, but make entries of important events and information. Keep it neat enough that it will make sense to you later when you refer back to it.

Science Fair Ideas

Following is a list of topics and ideas to get those mental juices flowing. The questions and topics are meant to be a brainstorming tool and not a definitive list of science fair topics. If you see something that interests your students on it, help them form a complete question or statement about that topic, do some reading and come up with a project idea. The public library and the Internet are wonderful sources for Science Fair ideas.

I. Collections Project: A collection is a properly collected, persevered, documented and presented assembly of items from a science-related field that the student is interested in.

The student must have
* a **plan** for the collection (why, what, where & how, for example),
* **document** the collection process and the items collected (where, when & how),
* **research** the items collected (history, identification, classification, etc.),
* **care** for the items collected (clean, restore, preserve, etc.), and
* properly **present** the items.

The student should keep
Δ a **notebook** of these activities,
Δ prepare a **report** and
Δ learn enough about the collection to be conversant about it with the judges.

COLLECTIONS IDEAS

Chemical elements (carbon, lead, iron, etc.)	Animal Tracks
Feather	Fossils
Solids, liquids, gases	Simple Machines
Seashells	Leaves
Rocks	Seeds
Different types of sand	Bones
Different types of soil	Flowers

II. Demonstration Project: Demonstration projects study or explore already established scientific facts. There are two general types of demonstrations. One is similar to a research project in that it involves an experiment but without a testable hypothesis. Since the fact is already established; a second type of demonstration project is to show or explore how some scientifically related tools, apparatus or concepts work. Examples would include: well-known scientific fact – plants need water; scientifically related tool or apparatus – how a telescope works. The demonstration is **NOT to be a performance** for the judges or an audience. The student should carefully plan one or more science experiments that demonstrate the scientific fact, or that show the scientific principle behind the object they are demonstrating. The student plans, documents, researches and evaluates **before** the science fair. The student must:

* **plan** the experiment (find an interesting one, get supplies, get or build equipment, evaluate safety aspects, research possible variations, predict the outcome, etc.), or build a model or find an in example of the apparatus 14

* **perform** the experiment (practice or repeat the experiment, vary the conditions, optimize, collect data, document results), or explore the workings and performance of the model

* **analyze** the results of the experiments and/or models (plot data, calculate the effect, evaluate the effectiveness, etc.)

* **discuss** the results (draw conclusion, discuss other forms of the experiment, show similarities between this experiment and others, or between this tool and others, talk about the implications and why it is important), and

* **present** the experimental project or model.

The student should keep

Δ a **notebook** of these activities,

Δ prepare a **report** and

Δ learn enough about the experiment to be conversant about it with the judges.

DEMONSTRATIONS

How do they work?

Binoculars, microscope, telescope, periscope
Why elevators have counterweights
How seeds travel
What causes echoes
How airplanes fly (or rockets)
Weather phenomena
How heat is transmitted (transferred)
Light, color and their properties
How tree rings are formed
What is ground water
How sounds are produced
Acids, bases, and pH
An energy-efficient home

Our solar system
Hydroponics
Submarines
Human ear (or heart, lungs, etc.)
Record player (or CD player!)
Transformer (or transistor)
Movement on movie film
Circuits – series and parallel, open and closed
Simple machines (lever, ramp, pulley, wedge, etc.)
Polaroid glasses
Batteries
Compass, Magnets, or Electro magnets
Bird beaks

Inside our earth, earth surface features
Doppler effect
Photosynthesis, Water Cycle, Rainbows
Thermometers (or thermostat)
Looping roller coasters
Hot air balloon

Radioactivity and Geiger counters
Phases of the moon
Wings, airplanes, paper airplanes
Prism
Cana lock, Sundial or windmill
Hypdo-electric power or steam engines

III. Research Project/Experiment:

A research project is a directed science project with the goal of testing a well-formed *hypothesis*. To enter **a Research Project**, the student must

* **develop a hypothesis** (testable, well stated),

* **design an experiment** (research the problem, plan the experiment, gather materials, consider safety aspects evaluate different ways of doing the experiment, think of complication or confounding factors, plan data collection, plan a control experiment),

* **perform the experiment** (practice it, repeat it a sufficient number of times, collect data, redesign the experiment if necessary),

* **analyze** the results (data analysis, statistics, judgment, evaluate hypothesis, etc.),

* **discuss** the results (draw conclusion, discuss other forms of the experiment, show similarities between this experiment and others, talk about the implications for your hypothesis), and

* **present** your work.

The student should keep

Δ a **notebook** of these activities,
Δ prepare a **report** and
Δ learn enough about the research to be conversant about it with the judges.

RESEARCH PROJECTS

BRANDS: Which brand is best? Why is it best?

WATER: Which liquid evaporates most quickly? Does the shape of ice affect its melting rate: Which liquid evaporates most quickly: Which liquid dissolves pills faster? Does age affect the time hands wrinkle in water: Which soil absorbs water most quickly?

PLANTS: Do bigger seeds make bigger plants? Does a vitamins affect germination of seeds: What are the effects of coffee on germination? Does the type of soil affect plant growth? Does music affect plant growth? How does a tree drink? Does temperature affect mold growth? Can ground vegetables be good fertilizers? Which mulch covering works best? How does gravity affect the growth of seeds: Which potting soil is best for plants? Which works best with plants: natural or artificial light? Tap water or distilled water? Can you give a plant too much fertilizer? Does electricity affect the growth of plants? Do roots always grow down? Do mirrors affect the way plants grow? Does leaf surface area affect plant growth? Does location make a difference in leaf size?

ANIMALS: Does temperature affect the way ants behave? Do different light colors and levels affect insects? Do sounds affect the behavior of crickets? How does overpopulation affect the behavior of an ant colony? What foods attract different insects? Are the same insects attracted to traps placed at different heights above ground? Does size affect the speed of an insect? How do fish breathe?

COLOR: Does color affect: the rate an ice cube melts? The feeding habits of bird? The taste of food? The behavior of people? How easily things are found? Do animals have a color preference? Under which color do plants grow best? Why are flowers colored?

FOOD: Does smell affect the taste of food? Does the way food is stored affect its freshness?

PHYSICS: Through which materials will magnetism pass? What can you do to make a toy parachute fall more slowly? Do bigger wheels roll faster? Does the design of paper airplanes affect their flight patterns? Does a magnetic field affect the way a solution conducts electricity? Do oil additives reduce friction of engine parts? How many rotor blades give maximum lift for helicopter? Which bridge design is best? Why is the earth (nearly) round? What causes the tides?

SOCIAL: What do elementary students fear most? Does music affect the time to put a puzzle together? Do the moon's phases affect the way children perform in school? Does age affect the number of planets people can name? Why are people afraid of heights? Are TV commercials louder than regular programming?

Judging Criteria and Interview

Judges are to determine how well each student or team has followed good scientific or engineering thought and procedure, the detail and accuracy of the research notebook, and if tools, equipment, and analysis were used in the best possible way. **Please see the appropriate form at the end of the booklet to see the required elements for judging.**

Each project is to be evaluated by at least two judges. The interview is part of the overall evaluation of the student's exhibit. Because of this, the student must be physically present in the exhibit area at the time the interviews are conducted. No project will be allowed for exhibit without the experimenter physically being present for Fair Day. Students may not by-pass the interview by substituting a proxy such as a parent, teacher, or fiend nor may a mechanical aid such as a videotape or audiotape be substituted for the interview. If the student cannot be present on Fair Day, then the student is effectively disqualified from awards, but the display may be presented if space allows. 17

All children will have a judge's interview on the day of the science fair lasting 10 to 15 minutes. The older children (4th and up) should be prepared to give the judges a short presentation prior to the interview. The purpose of the interview is to give the children experience in being interviewed and questioned, as well as to give the judges an idea of the child's understanding of his project. Here are some sample questions:

> **K-3rd:** Did you enjoy the project? What did you like best? I notice a photo here. Who is that? What are you doing there? Why did you pick this subject to explore?
>
> **4th-6th:** Did you have to learn any new skills to do this experiment? What does that graph show? Why did you repeat the experiment 3 times? Why do you think you got the results you did: What would you do differently next time? What biblical principle most closely parallels your research?
>
> **6th-12th:** Why did you do Part A of your experiment as you did? If you had used ______ instead of what you used, what might be the difference in your outcome? What impact might your experiment and results have on business and society? When you get to be an adult, would you consider going into this field of science as a full-time job? What have you learned about God and His world?

Documentation & Certification

Scientific research can be dangerous to the researchers and the subject. Certain guidelines have been developed by various federal agencies to help pre-college researchers be aware of and avoid unethical situations in their research. If you project includes **Human Subjects (including interviews)** Animal Subjects, Recombinant DNA, Controlled Substances (drugs, anesthetics, gasohol, alcohol, and other substances), you must be aware of the procedures and policies that apply. For the most part, common sense and Christian ethics should tell you when care should be taken in experiments, but if you have questions contact us or refer to the ISEF guidelines.

In the Forms section you will find the Informed Consent section, which represents the minimum level of procedural guidelines for human research.

Display & Safety Regulations

To prevent hazards to the viewers, judges, and other exhibitors, we will restrict the size and objects for display. Exhibitors are not downgraded on their evaluations because pictures or drawings are used in place of the actual hardware or specimens. **Exhibitors are encouraged to use photographs and displays that can be easily assembled and disassembled.** The ISEF rules are very restrictive about what can and cannot be used in a display. The following rules apply:

***NOTE: IF YOU STILL FEEL YOUR PROJECT IS SAFE PLEASE FEEL FREE TO CALL RENEE GERKEN AT 830-5765 FOR APPROVAL. THIS MAY BE THE CASE.**

Acceptable for Display Only (Not Operable)

The following items are permitted within the project display area for display purposes only. They must not be operable as part of the exhibit. If found to be operable, they are considered to be in violation and must be made inoperable.

1. Projects with unshielded belts, pulleys, chains, and moving parts with tension or pinch points

2. Class III and IV lasers

3. Any device requiring over 110 volts

Acceptable for Display and Operation (Within Restrictions)

The Following items are permitted within the project display area and may be operable if the stated restrictions are followed. If the restrictions are not followed, then the exhibit is in violation of the display regulations.

1. Class II lasers if and only if (a) student operated, (b) posted with a sign reading "Laser radiation: Do Not Stare Into Beam", (c) must have a protected housing preventing access to beam, and (d) must be disconnected when not operating

2. Large vacuum tubes or dangerous ray-generating devices must be shielded properly

3. Pressurized tanks that contain non-combustibles may be allowable if secured

4. Any apparatus producing temperatures that will cause physical burns or localized freezing must be adequately insulated

5. High-voltage equipment must be shielded with a grounded metal box or cage to prevent accidental contact

6. High-voltage wiring, switches, and metal parts must have adequate insulation and overload safety factors, and must be inaccessible to others

7. Electric circuits for 110-volt AC must have a minimum of a nine-foot cord. The cord must have sufficient load-carrying capacity and be approved by Underwriters Laboratories

8. Electrical connections in 110-volt circuits must be soldered or made with approved connectors and connecting wires must be insulated

9. Bare wire and exposed knife switches may be used only in circuits of 12 volts or less; otherwise, standard enclosed switches are required.

Unacceptable for Display

1. materials or goods that would be recognized as offensive by the majority of Christian parents and/or the group of people responsible for putting this science fair together

2. preserved vertebrate or invertebrate animals, including embryos

3. dangerous chemicals

4. human or animal parts with the exception of teeth, hair, nails, dried animal (but not human) bones, histological sections, and wet-mount tissue slides

5. sharp items, including syringes, needles, and pipettes

6. poisons, drugs, or controlled substances

7. dry ice or other sublimating solids

8. flames or highly flammable display materials, including model rocket engines

9. tanks that have contained combustible liquids or gases, unless purged with carbon dioxide

10. batteries with open-top cells

11. awards, medals, business cards, flags, advertisement, etc.

12. photographs or other visual presentations depicting vertebrate animals in other-than-normal conditions, including surgical techniques, dissection, necropsies, or other lab techniques.