**Magnolia ISD Science Fair – 2017-2018**

Why Do Magnolia ISD Students Participate in Science Fair?

* It allows students to participate in each step of the scientific process in a meaningful way.
* It provides an opportunity for students to participate in independent research which develops skills that can be used for lifelong learning.
* It allows students a chance for in depth investigation in an area of interest.
* It prepares the student for advanced science classes in High School.

Calendar of Events

|  |  |
| --- | --- |
|  | Campus Science Fair |
| Jan. 12-13, 2018 | District Science Fair at Magnolia West High School |
| Feb. 23-24, 2018 | Science Engineering Fair at the University of Houston |
|   | Texas State Science Engineering Fair in San Antonio |
|  | International Science and Engineering Fair |

What Do Students Have to Do?

1. Fill out and turn in all the appropriate forms.
2. Set up and keep a Science Fair Project Notebook.
3. Write a Science Fair Project Research Paper.
4. Write a Science Fair Project Abstract.
5. Create a Science Fair Project Display.

Helpful Websites

SEFH (Science Engineering Fair of Houston)

<http://www.sefhouston.org/>

Texas Science and Engineering Fair

 <https://emtsef.utsa.edu/>

Intel International Science and Engineering Fair <http://www.sciserv.org./isef/index.asp>

**Checklist**

|  |  |  |  |
| --- | --- | --- | --- |
| **Assignment** | **Due Date** | **Type of Grade** | **Date Completed** |
| 1. Pick project topic and receive teacher approval.
 |  |  |  |
| 1. Set-up log book.
 |  |  |  |
| 1. Research on your topic and find at least 5 sources. Make notes in your Log Book.
 |  |  |  |
| 1. The first draft of your Background Information Report is due.
 |  |  |  |
| 1. The final draft of Background Information Report is due.
 |  |  |  |
| 1. See teacher for required forms if you are using human / animal participants.
 |  |  |  |
| 1. The rough draft of the Research Plan is due.
 |  |  |  |
| 1. The final, typed Research Plan is due.
 |  |  |  |
| 1. Begin experimentation. Record your observations, data tables, and results in your notebook during experimentation.
 |  |  |  |
| 1. Complete experimentation.
 |  |  |  |
| 1. Record Data Table(s), Graph(s), Analysis of Data, and a Conclusion into your Log Book.
 |  |  |  |
| 1. Rough draft of your abstract is due.
 |  |  |  |
| 1. Final draft of your abstract is due.
 |  |  |  |
| 1. Project Display due
 |  |  |  |

If you are planning a long-term experiment you need to complete the steps before the due dates.

**Science Fair Topic**

Choosing the research topic is probably the most difficult part of the entire project! No “perfect” method exits…but here are some ideas that might help.

**When looking at possible projects, be sure to keep these things in mind:**

The project should be:

* Measurable (in numeric terms)
* Reproducible (others can get the same result)
* Affordable and practical: remember that several trials will be necessary!
* Your own idea: this will be more meaningful when you take the time to make the science fair project your own

What to avoid:

* Brand comparison experiments
* Single greatest error: too few trials and/or too small sample size
* Plagiarizing (copying exactly) another person’s project

**IDEA #1:**

Adults who are experts in a particular field of interest often have great ideas. They might even be willing to mentor (assist) a student through a project! Check with science teachers, too.

**IDEA #2:**

Select a topic you are interested in. Something that sparks your curiosity or a question that you want answered.

**Testable question:** A specific question where one variable (factor) is changed. Testable questions can be tested in an investigation and should produce results that can be observed or measured. They should not include personal opinion.

**Project Categories**

**Animal Sciences:** Animal genetics, ornithology, ichthyology, herpetology, entomology, animal ecology, anatomy, paleontology, cellular physiology, animal biorhythms, animal husbandry, cytology, histology, animal physiology, neurophysiology, invertebrate biology, etc.

**Behavioral/Social Sciences:** Psychology, sociology, anthropology, archeology, ethiology, ethnology, linguistics, animal behavior (learned or instinctive), learning, perception, urban problems, gerontology, reading problems, public opinion surveys, and education testing, etc.

**Biochemistry/Microbiology:** Molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones, bacteriology, virology, protozoology, fungal and bacterial genetics, yeast, etc.

**Chemistry:** Physical chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, metallurgy, soil chemistry, etc.

**Computer Science:** New developments in software or hardware, information systems, computer systems organization, computer methodologies, and data (including structures, encryption, coding and information theory), etc.

**Earth/Space Sciences:** Geology, geophysics, physical oceanography, meteorology, atmospheric physics, seismology, petroleum, geography, speleology, mineralogy, topography, optical astronomy, radio astronomy, astrophysics, etc.

**Energy & Transportation:** Aerospace, aeronautical engineering and aerodynamics, alternative fuels, fossil fuel energy, green energy science & technology, vehicle development, renewable energies, etc.

**Engineering:** Civil, mechanical, aeronautical, chemical, electrical, photographic, sound, automotive, marine, heating and refrigerating, transportation, environmental engineering, etc. Power transmission and generation, electronics, communications, architecture, bioengineering, lasers, etc.

**Environmental Science:** Pollution (air, water, land), pollution sources and their control, waste disposal, impact studies, environmental alteration (heat, light, irrigation, erosion, etc.), ecology.

**Mathematics:** Calculus, geometry, abstract algebra, number theory, statistics, complex analysis, probability, topology, logic, operations research, and other topics in pure and applied mathematics.

**Medicine/Health:** Medicine, dentistry, pharmacology, veterinary medicine, pathology, ophthalmology, nutrition, sanitation, pediatrics, dermatology, allergies, speech and hearing, optometry, etc.

**Plant Science:** Agriculture, agronomy, horticulture, forestry, plant biorhythms, palynology, plant anatomy, plant taxonomy, plant pathology, plant genetics, hydroponics, algology, mycology, etc.

**Physics & Astronomy:** Optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, fluid and gas dynamics, thermodynamics, semiconductors, magnetism, quantum mechanics, biophysics, astronomy, lasers, etc.

**Understand that if you are proposing an experiment that involves humans, vertebrate animals, human or animal tissue, or hazardous materials, that you will have to complete extra forms, follow special rules, and work under professional supervision (such as a scientist) that YOU must arrange.**

**Laboratory Notebook**

A properly maintained laboratory notebook is one of a researcher's most valuable tools. It contains the permanent written record of the scientist's activities from both experiment and observation. The act of writing in the notebook forces the researcher to stop and think about what he/she is about to do and what is actually done. Because of this, the proper writing of a project laboratory notebook is an essential part of doing "good" science. The following guidelines will be helpful:

1. Use a hard-bound notebook or composition book.
2. The front cover of the notebook should have the title of your project on it. Put your name on the inside front cover.
3. Use the first few pages for your table of contents. You will add to your table of contents as you add to your log book.
4. Start numbering your pages after the table of contents.
5. The right-hand pages should be used for making formal entries. The left-hand pages should be used for calculations, doodling, scratch paper, etc.
6. All right-hand pages should be dated when information is recorded on them.
7. No pages should be removed from the notebook. Just draw a line through any mistake and keep writing.
8. Glue, tape, or staple any loose papers into your notebook so they won’t be lost.
9. If you change your procedure, be sure to make the changes in your notebook.
10. Do not worry about neatness (too much). It still needs to be readable but it’s like a “rough draft” of your work on your science fair project.

|  |
| --- |
| **What To Include in the Notebook** |
| Cover:Title of ProjectTime Span of ProjectDo Not Include Your Name |
| Table of Contents |
| Problem |
| Research Notes |
| Works Cited |
| Hypothesis |
| Procedure |
| Variables |
| Materials List |
| Data |
| Description of Data |
| Conclusion |
| Acknowledgements |

**Background Research Report**

The purpose of this report is to help you understand why your experiment turns out the way it does. The research paper could include topics such as:

* The history of similar experiments or inventions
* Definitions of all important words and concepts that describe your experiment
* Mathematical formulas, if any, that you will need to describe the results of your experiment

Use the Grading Rubric to help you plan for your report.

Your report should have these sections, in order:

* Title page (with the title of your project, your name, and the date)
* Your report
	1. Introduction (First Paragraph)
		+ Will state the topic sentence
		+ Will state the main ideas of the paper
	2. Body of the paper (At least 3 paragraphs)
	3. Conclusion (Last paragraph)
		+ Will restate the topic
		+ Will restate main ideas
		+ Will have a closing that ends the paper and ties it all together
* Work cited

Your report must have in-text citations. What that means is for every fact or picture in your research paper you should follow it with a citation telling the reader where you found the information. A citation is just the name of the author and the date of the publication placed in parentheses like this:

**(Author, page #)**

Its purpose is to document a source briefly, clearly, and accurately. If you copy text from one of your sources, then place it in quotation marks in addition to following it with a citation. Be sure you avoid plagiarism! Do not copy another person's work and call it your own. Always give credit where credit is due!

Remember the following:

* Need at least 5 sources; 2-3 sources from the Internet
* At least 2 pages in length
* Double spaced
* 12 pt font
* 1.5 inch margins
* Includes an alphabetical works cited page of all the sources in MLA format. (The following websites allow you to enter in your source information and then generates a bibliography that is in the correct format. All you have to do is copy and paste it into your document: <http://www.easybib.com> and <http://www.bibme.org/>)

**See Teacher for examples**

**Background Research Report Grading Rubric**

|  |
| --- |
| **Quality of Information** |
| 25 | 20 | 15 | 10 |
| * + Comprehensive information
	+ Clear, focused, interesting
	+ Includes several supporting details/examples
 | * + Information clearly covers the topic
	+ Focused, not captivating
	+ Provides 1-2 details/examples
 | * + Information relates to subject but has gaps
	+ Hard to follow
	+ No details/examples
 | * + Information has little to do with or does not cover topic
 |
| **Amount of Information** |  |  |  |
| 25 | 20 | 15 | 10 |
| * + All topics addressed
	+ 2 pages
	+ MLA-formatted bibliography
	+ MLA citations used throughout
 | * + Topics addressed
	+ 2 pages
	+ MLA-formatted bibliography and MLA citations used throughout with a few corrections to format/order
 | * + Some topics addressed
	+ Less than 2 pages
	+ MLA-formatted bibliography and MLA citations used throughout with a major corrections to format/order
 | * + Topics not addressed
	+ Less than 2 pages
	+ No MLA-formatted bibliography or citations
 |
| clear**Organization** |  |  |  |
| 10 | 8 | 5 | 3 |
| * + Information well organized
	+ Well-constructed paragraphs enhance the reading of the paper
 | * + Information well organized
	+ Paragraph construction makes it easy to follow
 | * + Information organized
	+ Paragraph construction makes it a struggle to follow
 | * + Information disorganized
	+ Hard to follow
 |
| clear**Bibliography** |  |  |  |
| 15 | 12 | 8 | 3 |
| * + 5 sources
	+ Correct MLA format
	+ All sources are credible
 | * + 4 sources
	+ Correct MLA format
	+ All sources are credible
 | * + 3 sources
	+ Some errors in MLA format
	+ Most sources are credible
 | * + 2 or less sources
	+ Errors in MLA format
	+ Sources not credible
	+ No bibliography
 |
| clear**Mechanics** |  |  |  |
| 15 | 12 | 8 | 3 |
| * + No grammatical, spelling, or punctuation errors
 | * + Few grammatical, spelling, or punctuation errors
 | * + Some grammatical, spelling, or punctuation errors
 | * + Paper difficult to read and understand due to grammar, spelling, and punctuation errors
 |
| **Typed** |  |  |  |
| 10 | 8 | 5 | 3 |
| * + Typed
	+ Double-spaced
 | * + Typed
	+ Single-spaced
 | * + Not typed
	+ Neatly written
 | * + Not typed
	+ Not neatly written
 |

Grade = **\_\_\_\_\_**

**Research Plan**

A research plan must be completed before you start experimentation. This is an idea of how you want to complete your science fair project. Some of the information may change as you complete your experiment and that’s ok.

*Use this page to write the rough draft of your research plan. Your typed research plan should look similar to this page—leave out the words in parentheses.*

Name:

Project Title:

Question Being Addressed:

Hypothesis/Problem/Engineering Goal (If…Then format):



Procedures/Method (in numbered list):

Data: include a table / chart to show how you will organize information collected.

 **The Scientific Method**

Review of Variables

**Manipulated Variable** - What you change **on purpose** in your experiment.

**Responding Variable** - What changes by itself in **response to** changes in the manipulated variable.

**Controls:** - The factors you keep constant. A control is held constant so that it doesn’t affect the outcome of the experiment.

**You must only change one variable at a time and conduct repeated trials.**

Scientific Method

**Question Being Addressed/Problem/Purpose**

* What is the scientific question you are trying to answer?
* Write this in one complete sentence. Describe for the reader the reason for doing the experiment.
* Ex. What liquid helps mint plants grow the fastest?

**Hypothesis**

* Make a prediction regarding the outcome of your experiment.
* The hypothesis is written in one sentence in an If/then format.
* Ex. If mint plants are given water, tea, and soda over a five week period then the mint plant being given water will grow the fastest.

**Materials:**

* Your list should include what you used during the procedure and the amounts used.
* If you make changes to what materials you use or how much you use, be sure to update that in your logbook.
* The materials can be written in a bulleted list.

**Procedure**

* Give a detailed explanation of how the experiment will be performed to test your hypothesis.
* Be very specific about how you will measure results to prove or disprove your hypothesis.
* Develop a regular timetable for measuring results or making observations (i.e. every hour, every day, every week).
* The procedure should be written in a numbered list.
* If you change your procedure during experimentation, be sure to update you logbook.
* Include multiple trials (3 or more) of your experiment for results that are more valid

**Data / Observations / Results**

* Keep a detailed log book of observations, data and/or results. They can be measurements and written notes about what you are sensing (hearing, seeing, or touching) about your experiment.
* Be sure to measure in the metric system.
* Photograph your project results or phases of the project if appropriate to help your analysis and possibly to demonstrate your experiment on your exhibit board.
* Use data tables when collecting results to make your results easy to read and understand.
* Data table need to have a title and it needs to be clear what information needs to be in each row and column.
* Use charts and graphs to summarize your data.
* Be sure the use the correct kind of graph.
* Graphs need to have titles and the x and y axes need to always be labeled.
* Be sure to include the appropriate unit of measurement if necessary.

**Analysis of Data**:

* Explain your observations, data and/or results. This is a summary of what your data has shown you.

**Conclusion:**

* Answer your problem/purpose statement.
* The conclusion should state if the hypothesis was proven true, proven wrong, or was inconclusive and should explain why.

**Application:**

* Describe what you would change if you repeated your experiment.
* Describe how you could extend your project based on your results.
* Describe how your project can be applied to real-world situations.

**Abstract**

The abstract is a summary of your entire project. It is a useful resource for anyone judging your project. It is written in paragraph form and is included along with display board and log book.

Here are the parts of an abstract:

1. **Purpose of the experiment**
	* An introductory statement of the reason for investigating the topic of the project.
	* A statement of the problem and/or hypothesis being studied.
2. **Procedures used**
	* A summarization of the key points and an overview of how the investigation was conducted.
	* An abstract does not give details about the materials used unless it greatly influenced the procedure or had to be developed to do the investigation.
	* An abstract should only include procedures done by the student. Work done by a mentor (such as surgical procedures) or work done prior to student involvement should not be included.
3. **Data**
	* This section should provide key results that lead directly to the conclusions you have drawn.
	* It should not give too many details about the results nor include tables or graphs.
4. **Conclusions**
	* Conclusions from the investigation should be described briefly.
	* The summary paragraph

Reminders:

* Do not use “I” or “we” when writing scientific papers.
* 250 words or less
* The title should be the title of your project
* Do not include your name on the abstract when it is used for judging. Put your name on the abstract for grading purposes but when making a copy of your abstract for judging be sure to remove your name.
* Do not include acknowledgments.

**Abstract Grading Rubric**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **100** | **80** | **60** | **40** |
| **Quality of Information** | Describes all parts of the science fair project | Describes most parts of the science fair project | Describe some parts of the science fair project | Describes very little of the science fair project |
| **Amount of Information** | 250 words or less |  |  | More than 250 words |
| **Organization** | Very easy to understand and follow | Mostly easy to understand and follow | Somewhat confusing and hard to follow | Confusing and hard to follow |
| **Mechanics** | No grammatical mistakes including the use of first person pronouns | A few grammatical mistakes | Some grammatical mistakes | Many grammatical mistakes |

Total Points \_\_\_\_\_\_ / 4 = Grade \_\_\_\_\_\_

**Display**

You need to prepare a display board to communicate your work to others. In most cases you will use a standard (36” x 48”), three-panel display board. The boards can usually be found at an office supply store or craft store.

**Parts of the Display**

* The **Title** should be big and easily read from across the room. Choose one that accurately describes your work, but also grabs peoples' attention.
* The **Problem** clearly states what your experiment was about. The **Hypothesis** is your prediction of the outcome of the experiment based on your research and experience. (Refer to the “Research Plan” section on how to write a hypothesis correctly.)
* The **Background Information Report** can either be your report or a summary of your report.
* The **Variables, Materials and Procedures section** identifies the manipulated/independent variable, the responding/dependent variable, and the controlled variables. The materials should be listed with quantities. The procedure should be numbered.
* The **Data section** of your display should be in data table format. The graphs should be properly labeled with a title, an x-axis label and a y-axis label. Also, include units of measurement.
* The **Analysis of Data** section is a written description of the results of the experiment.
* The **Conclusion** should state if the hypothesis was proven true, proven wrong, or was inconclusive and should explain why.
* The **Application** section describes what you would change if you repeated your experiment, how you could extend your project based on your results, and how your project can be applied to real-world situations.
* Place the **Laboratory Notebook** and **Abstract** in front of the display. For a high quality project either make 5-6 copies of the **Abstract** or place a copy of the **Abstract** in a document frame. Also, a **model** of the experiment can be placed in front of the display if appropriate.

**Helpful Hints**

* **Organize your information** like a newspaper so that your audience can quickly follow the thread of your experiment by reading from top to bottom, then left to right. Include each step of your science fair project.
* Use a **font size** of at least 16 points for the text on your display board, so that it is easy to read from a few feet away. It's OK to use slightly smaller fonts for **captions on picture and tables**
* A **picture** speaks a thousand words! Use photos or draw diagrams to present non-numerical data, to propose models that explain your results, or just to show your experimental setup. But, don't put text on top of photographs or images. It can be very difficult to read. If your pictures include faces of people, **be sure to obscure the face**. You can use a small, round sticker or something similar.
* If you use a **graphic** from the Internet be sure to include the full web address near the graphic. Always cite your sources.
* **Do not** include **your name** anywhere on your project. Your teacher will tell you how to label it.

Display Grading Rubric

Parts of the Display

|  |  |
| --- | --- |
| Title (6 words or less; Interesting; Relevant) | 5 4 3 2 1 0 |
| Problem | 5 4 3 2 1 0 |
| Variables | 5 4 3 2 1 0 |
| Hypothesis | 5 4 3 2 1 0 |
| Procedure | 5 4 3 2 1 0 |
| Data (Includes graphs, photographs, drawings, charts, and/or models; Graphs properly labeled) | 25 20 15 10 5 0 |
| Analysis of Data | 10 8 6 4 2 0 |
| Conclusion  | 10 8 6 4 2 0 |
| Application | 10 8 6 4 2 0 |
| Laboratory Notebook | 10 8 6 4 2 0 |
| Abstract | 10 8 6 4 2 0 |

Parts of the Display Points = \_\_\_\_\_

Overall Appearance of the Display

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excellent** | **Acceptable** | **Minimal** | **Not Acceptable** |
| Correct grammar and spelling | 25 | 20 | 15 | 10 |
| Display easy to read—typed or neatly written | 25 | 20 | 15 | 10 |
| Display is eye-catching, colorful | 25 | 20 | 15 | 10 |
| Display is organized in a logical way | 25 | 20 | 15 | 10 |

Overall Appearance Points = **\_\_\_\_\_**

Parts of the Display Points \_\_\_\_\_ + Overall Appearance Points \_\_\_\_\_ / 2 = Grade \_\_\_\_\_