Elementary
Science Fair Notebook

Name:_____(partner)_____

School:_____ Grade _____

Project Due Date: _____

School Science Fair Date _____

District Fair Date _____

Project Overview

What is a science fair project?

The science fair project is a long-term project where you will plan, conduct and share your results from your own independent investigation. It includes the following steps.

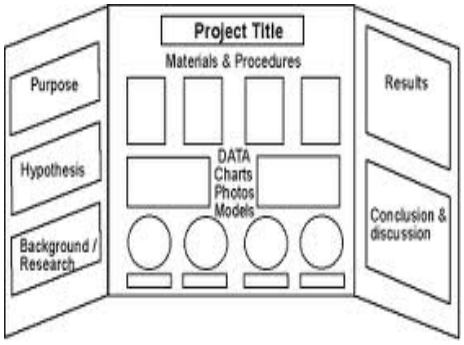
- Pre-planning and brainstorming ideas that interest you.
- Conducting an experiment.
- Recording and Analyzing data.
- Creating a trifold poster to share the project.

What makes a good project?

- Choose a topic that interests you.
- Do research before you begin so you can understand the subject.
- Originality. You may have an idea that's done before, so find a way to adjust the idea by coming up with your own question or digging deeper.
- Do multiple trials to give you more data.
- If something doesn't go as planned and you have an idea to test why, keep going and relect why it didn't work by adding that to your conclusion section.
- Make the poster informative, clear and attractive.

What should my display board look like?

- It should showcase what you learned in your experiment since you can't conduct the experiment during the fair.
- Type the sections and use nice colors and visuals to make it stand out. It should be easy to read and understand.
- Include your title, purpose, hypothesis, background and research information, the results, and your conclusion.
- Include pictures, charts, graphs, and information about the materials used and steps of the experiment.



Science Fair Timeline

Dates	Steps
About a month in advance. Date:	**Topic and Question** Read science magazines, make observations, and find out what interests you. Based on your interests you will develop a testable question. A testable question is a question that can be answered through experimentation.
About a month in advance. Date:	**Research** After you have chosen a question you need to research more about your topic. Come up with some questions related to your topic and search for the answers. Then write a paragraph about what you learned.
About a month in advance. Date:	**Hypothesis** Write a hypothesis that shares your reasoning (don't forget to include *because*). Use what you learned doing background research to help you write your hypothesis.
A few weeks before you begin the experiment. Date:	**Plan the Experiment: Materials and Procedures written out.** Think about how you will conduct a fair experiment by considering the variables you will control. List your materials, including quantities. Write step-by-step procedures so that others could replicate your experiment.
A few weeks before you begin the experiment. Date:	**Teacher Approval Form** Before you can begin your experiment your teacher must sign an approval form. The form is on the last page of this notebook.
Depending on the experiment, make sure you have time to complete. Date:	**Collect Data & Make Observations** This is the fun part! Set up your experiment, gather data, and make observations. Take your time and collect accurate data. If you need to adjust your procedures that is fine. You may even come up with another thing you want to test as you learn more! Be sure to run your experiment multiple times.
1 week before the fair. Date:	**Data Charts and Graphs** Collecting data and observations throughout your experiment is very important. Record everything! Then use charts and graphs to organize your data so that others will be able to see what you learned.
1 week before the fair. Date:	**Conclusion** Share what you learned from your experiment in your conclusion. Your conclusion will be 1 – 3 paragraphs long. **Type the conclusion.**
2 days before the fair. Date:	**Poster or display board** Your poster should include all the sections of your project in a clear display. The goal of the poster is to teach others about your experiment and what you learned through your investigation.

Topic Brainstorm and Interest survey

What do you like to do outside of school? (examples: art, theater, sports, build things, cook, etc.)

_____

_____

_____

_____

What is your favorite thing you have done related to science? (examples: experiments, tv shows, museums, etc.)

_____

_____

_____

_____

1. Do you like building or repairing machines? (Engineering)
2. Do you enjoy gardening and working with plants? (Plant Biology)
3. Are you curious to understand things like gravity and magnetism? (Physics)
4. Does observing the behavior of different people fascinate you? (Psychology)
5. Do you enjoy working on computers or learning about how computers work? (Computer Science)
6. Do you like to go hiking or snorkeling so that you see different animals in their natural environment? (Zoology)
7. Do you enjoy learning about the forces of nature like weather and earthquakes?(Meteorology)
8. Do you enjoy learning about memory and how our brain works? (Psychology)
9. Are you curious about the way different animals grow, develop, and live? (Zoology)
10. Are you interested in science fiction stories involving faster than light travel and "beams" that do amazing things? (Optics in physics)
11. Do you want to understand more about how people are affecting the environment? (Environmental Science)
12. Do you enjoy learning about outer space and astronauts? (Astronomy)
13. Do you enjoy learning about lakes, rivers, the ocean, and beaches? (Oceanography)
14. Have you built inventions or other things for fun and not a school project? (Engineering)
15. Do you enjoy learning about chemicals and things that bubble, fizz, or explode?(Chemistry)
16. Do you enjoy discovering new ways to recycle, restore, or re-use old stuff? (Environmental Science)
17. Do you like to go on drives or hikes specifically so that you can see interesting mountains, rock, or caves? (Geology)
18. Do you enjoy watching or participating in sports? (Sports science)
19. Do you like learning about what makes us healthy and what makes us sick? (Biology)
20. Are you interested in how to build roads, bridges, and buildings? (Engineering)

Question

Your science fair question needs to be a testable question. This means that in order to answer your question you will have to conduct an experiment and not just do a demonstration.

For example, growing a plant is a demonstration, but determining how the amount of fertilizer in the soil affects the height of a plant is an experiment.

Most testable questions will fit into one of these question frames.

- What is the effect of _____ on _____?
- How does _____ affect _____?
- Which/What _____(verb) _____?

Excellent questions are creative and meaningful. If you found your question on the Internet, ask yourself if there is a way to make the question your own. When you develop your question, you also want to make sure your idea is meaningful.

What is the purpose of your project?

_____
_____
_____
_____

Who might it help?

_____
_____
_____
_____

Write your question in the space below:

_____
_____
_____
_____

Research

Before you plan your experiment it is very important that you understand the science behind your topic and your question. The more you know, the better your experiment will be.

What do you already know about your topic?

_____
_____
_____
_____

Question 1: _____
_____
_____

Answer:_____
_____
_____

Works Cited: (give the URL or search terms so you can find it again)

_____
_____

Question 2: _____
_____
_____

Answer:_____
_____
_____

Works Cited: (give the URL or search terms so you can find it again)

_____
_____

After researching, what have you now learned about it that will help you with the experiment?

_____
_____
_____
_____
_____
_____

Hypothesis

A hypothesis is more than just an educated guess. A hypothesis is a probable answer to your question; it is based on the research that you have just completed.

A good hypothesis shares what you plan to change, what you predict will happen, and your reasoning for your prediction. Here is an example of a good hypothesis:

If I give different amounts of fertilizer to bean plants, ***(what you plan to change)*** *then the plant that receives the most fertilizer will grow the tallest* ***(what you predict will happen)*** *because fertilizer provides plants with nitrogen. Nitrogen is an important nutrient for plants because it is used by plants to grow new stems and leaves.* ***(reason for your prediction because of background information)***

Your hypothesis might be one or more sentences long. Be sure that your hypothesis is a probable answer to your question, and gives your reader information about how you will conduct your experiment. Use the hypothesis frame below to help you do that.

Write your hypothesis in the space below:

If _____

_____

_____,

then _____

_____

_____

_____

because_____

_____

_____

_____ .

Experiment: Materials and Procedures

Design an experiment that will allow you to answer your question. Before you start, think about **what you are changing** in the experiment (your independent variable), **what you will measure** in the experiment (your dependent variable), and **what factors you will keep the same** in order to design a "fair" experiment (controlled variables).

Write down EXACTLY what *materials* you need to conduct your experiment. Be specific. Others may want to replicate your experiment in the future and it is important they use the same materials. Be very thorough and list each and every item needed.

_____

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_____

Scientists write very detailed *procedures* so that if someone tries to repeat the experiment, they do it exactly the same. Be specific with measurements, times, types of materials, brands, tools, and any other information.

_____

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STOP: Before you start your experiment be sure that your teacher has signed and collected your science fair approval plan (the last page of this packet).

Collect Data & Make Observations

- Make a plan for how you will organize and record the data that you collect.
- Think about what you will be changing and what you will be measuring.
- Think about how much data you will collect.
- How often will you collect data and for how long?
-
    - The more data you collect, the better your results will be. Consider doing more than one trial. This means you might end up conducting your experiment 3 or 4 times.

- What is your independent variable (what you will change)?

  _____

- What is your dependent variable (what you will measure)?

  _____

- How many trials will you conduct or how many samples will you use?

  _____

Observations

While you are conducting your experiment you will also want to record observations. Observations can be photographs, drawings or written descriptions. Be sure to record the date for each observation that you make. Below is a sample observation.

Date: 1 /06/ 25

All of the plants have sprouted. The plants that have no fertilizer have 2 green leaves each. The plants that have 5 mL of fertilizer have 2 green leaves each. Two of the plants with 10 mL of fertilizer have 2 green leaves each. One of the plants with 10 mL of fertilizer has one green leaf and one white leaf.

Record the observations you make while conducting your experiment in a notebook or paper.

Other things to consider.

Will you be using a data table?

Will you be using a graph to indicate data? Will it be a line graph or a bar graph?

How many pictures will you need to show the experiment's steps? Do you have a way to get the photos developed or printed out?

Conclusion

The conclusion is a place for you to share what you learned from conducting your experiment and analyzing your data. Your conclusion should be one to three paragraphs long. In your conclusion you should:

- Evaluate your hypothesis. Was it correct?
- Explain what you found out.
- Use data to support your findings.
- Infer why your experiment turned out as it did.
- Explain why your findings are important.
- Who might benefit from what you learned?

In my hypothesis, I said, _____

_____

_____

After doing the experiment, I learned, _____

_____

_____

This shows that my hypothesis was (correct/incorrect) because _____

_____

_____

_____

My findings are important because _____

_____

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_____

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_____

_____

_____

DISPLAY BOARD LAYOUT

Use the display below for general guidelines on how to organize research information.

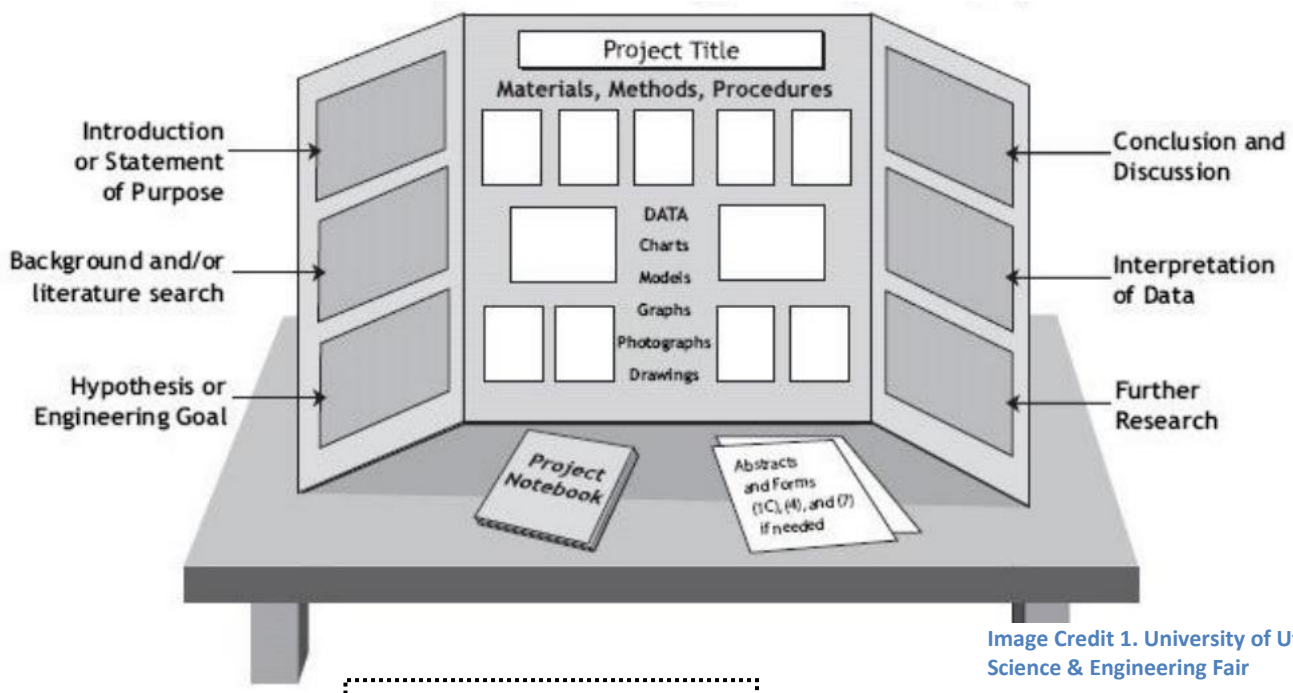

Image Credit 1. University of Utah Science & Engineering Fair

Poster Dimensions

48" x 48" or *48" x 72"*

International maximum display limits

30" deep, 48" wide, 72" high

Back of Board:

Name, School

Grade

Other helpful hints

Title: Make it catchy and descriptive. You can have a fun or short main title with a more descriptive sub-title underneath in smaller lettering.

Theme & Colors: Often it is best to choose only 2 or 3 colors for your entire poster. Maintain the same theme and fonts throughout the entire poster. Print graphs and pictures in color.

Neatness & Organization: Although the look of your poster doesn't officially affect your score, it can subconsciously affect the way the judges feel about you and your project. Make sure lines are straight, everything is cut out nicely, and that the organization is easy to follow. Use "zots" or "adhesive mounting pads" for a 3D effect.

Font: Choose at least size 14 font so it can be read from a distance of 3 feet. Use a simple font like Times or Arial.

Fitting it all in: When printing out your sections, you can use the most narrow margins to fit more words on a page as long as it will fit in your poster. You can also choose to layer multiple graphs, tables, or testing materials by placing in sheet protectors, overlapping, and attaching with brad fasteners. Use this "flip chart" style only with related data, series of photos, or steps.

Pts.	Evaluation Criteria	Excellent 17-20 points	Good 13-16 points	Fair 9-12 points	Poor 0-8 points
20 score	**Science Project:** • Objectives	-- Clearly stated & well-written -- Appropriate for grade level & original -- Creative approach to problem solving	--Lacking in **1** area: clarity, appropriate level, or creativity	--Lacking in **2** areas: clarity, appropriate level, and/or creativity	--Poorly conceived or lacking in all **3** areas
	• Hypothesis *(question)*	I. Testable, clear, bounded hypothesis	I. Hypothesis present, but not completely testable	I. Hypothesis incomplete or not testable	I. Hypothesis **missing** or poorly defined
	• Use of Resources* ***jr/sr projects only***	– A comprehensive, correctly formatted bibliography was included & footnotes are present in text and display – Student(s) used full resources available (e.g. labs, advisors, experts, scientific periodicals & texts, internet)	– Incomplete citations – Used **most** available resources – **Most** internet resources are scientific & reputable	– **Minimal** effort on citing sources – Used **some** available resources – **Some** internet resources are scientific & reputable	– **No** sources or citations – Project suffered as a result of **not** using available resources – Internet resources are **not** scientific or reputable
	Engineering Project: • Problem Statement *(design criteria)*	A. Clear, original problem statement that meets potential users' needs B. Clearly defined design criteria and goals	A. Statement is **not** original B. Goals/criteria are measurable but **vague**	A. **Incomplete** statement B. Goals/criteria are **poorly defined**/not measurable	A. Statement **missing** or poorly defined B. Goals/criteria **missing**
20 score	**Science Project:** • Design & Procedures *Experimental design & implementation (hypothesis testing)*	I. Exemplary, creative plan to support / refute hypothesis with valid testing II. Sequential experimental procedures are quantitatively and/or qualitatively listed, and connect hypothesis, data & results III. Procedures are logical and repeatable IV. Sample sizes, number of trials are sufficient. Valid control group. V. All other variables are carefully controlled	I. Sufficient plan to support / refute hypothesis with all other criteria met, **or** II. Exemplary plan and **3** of **4** other criteria for excellence met, **or** III. **Some** improvements needed throughout	I. Sufficient plan with **3** of **4** other criteria for excellence met, **or** II. Exemplary plan and **2** of **4** other criteria for excellence met, **or** III. **Major** improvements needed throughout	I. Sufficient plan with **1-2** of **4** other criteria for excellence met, **or** II. Plan information is unclear / missing / insufficient, **or** III. Criteria II-V are **lacking** or grossly defficient
	Engineering Project: • Engineering process *(design & prototype)*	A. Design goals & approach clearly stated & reproducible, alternatives considered B. Design creative, schematics / software provided (as applicable), well labeled C. Assembly details or set-up instructions for device are clearly laid out D. Photos provided or prototype on display E. Materials used in appropriate ways	A. **3-4** of 5 criteria required for excellence are met **or** B. **Some** improvements could be made	A. **1-2** of 5 criteria required for excellence are met **or** B. Existing information is **incomplete**, or needs **major** improvement	A. Description of design & implementation not included or **inadequate** to show how design works and/or if design meets requirements B. No engineering. Project was merely **tinkering**.
20 score	**Science Project:** • Data & Results *(experimentation)*	I. Experiments run are appropriate for hypothesis being tested II. Sufficient data. Repetition of experiments III. Correct & appropriate statistical tests run	I. **2** of the **3** criteria for excellence met II. **Some** improvements could be made	I. **1** of the **3** criteria for excellence met II. **Major** improvements required	I. **Incorrec**t experiments and data analysis for hypothesis II. **Insufficient** data
	• Documentation* *(notebook)* ***jr/sr projects only***	– Clearly written, complete and clear – Procedures are easy to follow – Comments, observations included – Records include dates, signatures	– **3** of **4** standards for excellence were met **or** – **Some** improvements could be made	– **2** of **4** standards for excellence were met **or** – **Major** improvements required	– **1** of the standards for excellence were met **or** – No notebook or **missing**
	Engineering Project: • Problem Solution *(testing and redesign)*	A. Measures of performance/improvement have been made (including cost) B. Functionality is fully tested & validated C. Records on testing are included D. Prototype was redesigned or potential design improvements were identified	A. Final design **works** but has not been fully tested B. **No advantage** over original C. **Some** improvements could be made	A. Final design does **not** meet end user's needs B. **No improvement** over original C. **Major** improvements required	A. Little or **no** testing B. **No** records C. **No** redesigns
20 score	**Science Project:** • Discussion & Conclusions	I. Status of the hypothesis is correctly and logically addressed, and stated in an unbiased manner (confirmed / refuted) II. Completeness of work and validity of conclusions are substantiated III. Discussion is insightful, demonstrates clear understanding of research project, broader subject & suggested new work	I. **2** of **3** criteria for excellence met, **or** II. **Some** improvements could be made	I. **1** of **3** criteria for excellence met **or** II. Overall information is **lacking** in quality and perspective	I. **No** discussion / conclusions provided
	Engineering Project: • Evaluation	A. Significance, relevance, applications, utility, cost effectiveness, improvements, benefits and performance addressed	A. **Some** evaluation areas not addressed	A. **Many** evaluation areas not addressed	A. **No** evaluation areas addressed
20 score	**Science+Engineering:** • Interview	Exemplary understanding… – Research findings / design results – Ability to interpret graphs, statistics, etc... – Related background information – Project rational, details & validity	**Good** understanding... – Research findings – Ability to interpret graphs, statistics, etc. – Related background information	**Fair** understanding… – Research findings – Ability to interpret graphs, statistics, etc… – Related background information	**Poor** understanding… – Cannot answer questions adequately and precisely – Does not incorporate display into interview – Unfamiliar with related background information
	• Display	Exemplary display… -- Creativity, clarity, logic, interpretability, construction, writing, graphics, grammar -- All information directly relates to project	**Good** display -- Most information is appropriate, organized and easily accessible.	**Fair** display … -- Some information is appropriate, organized and easily accessible.	**Poor** display… -- Confusing, unorganized, incorrect or inappropriate information

University of Utah Science & Engineering Fair
Science Fair Form – Elementary & Junior Division

Student and Project Information

Team Project Yes ☐ No ☐ **Number of Participants** 1 ☐ 2 ☐ 3 ☐

Student 1 **Grade**: 5 ☐ 6 ☐ 7 ☐ 8 ☐ **Student 2** 5 ☐ 6 ☐ 7 ☐ 8 ☐ **Student 3** 5 ☐ 6 ☐ 7 ☐ 8 ☐

First Name:_____ **First Name:** _____ **First Name:**_____

Last Name:_____ **Last Name:**_____ **Last Name:**_____

School: _____ **District:** _____

Teacher Name: _____ **Teacher Email:** _____

Project Title: _____

☐ I have attached a written plan for my project, indicating all materials needed and my planned procedure.

Project Category: Select the category that best fits your project

☐ Behavioral & Social Science	☐ Biology & Biochemistry	☐ Chemistry
☐ Energy: Chemical & Physical	☐ Engineering: Civil & Environmental	☐ Engineering: Electrical & Computer Science
☐ Engineering: Materials & Biomedical	☐ Engineering: Mechanical	☐ Medicine & Health Sciences
☐ Physics, Astronomy & Math	☐ Plant Sciences	☐ Earth & Environmental Science

BEFORE Experimentation Begins – Project Safety Concerns and Pre-Approval Signatures

Certain projects require additional considerations and supervision. Read through each of the following restrictions carefully. Determine if any of these apply to your project. Some projects may be subject to multiple restrictions. If any of these restrictions apply to your project, check the "Applies to this Project" box for that area. **If no restrictions apply** only the science teacher signature is required. ***Before* beginning experimentation**, you will need to obtain any additional signatures listed in the restrictions.

Human Test Subjects (Example: surveys, taste tests, play a game or interact with another human in any way)

If you are working with humans of ANY age, you need PRE-approval from a **Science Teacher AND a Psychologist, Medical Doctor or Registered Nurse** to make sure your research is safe. During the review, if it is determined that there is more than minimal risk to the human subjects involved in the project, the student must receive written consent from each of the participants and **written parental consent for students under 18 years old. Required Signatures: Science Teacher AND a Psychologist, Medical Doctor or Registered Nurse. A copy of the surveys or test you intend to use must be attached.**

☐ **Check here if you are working with humans.**

Non-Human Vertebrate Animals (Example: fish, rabbits, dogs, etc)

Experiments involving laboratory animals (rats, mice, hamsters, gerbils, rabbits, etc) cannot be conducted in a student's home except for behavior studies on pets. Proper animal care must be provided daily, including weekends, holidays and vacations. Experimental procedures that cause unnecessary pain or discomfort are prohibited. Experiments designed to kill vertebrate animals are not permitted. Experiments with a death rate of 30% or higher are not permitted. Behavioral studies or supplemental nutritional studies involving pets or livestock may be done at home.

Required Signatures: Science Teacher AND a Veterinarian or other Biomedical/Biological Scientist

☐ **Check here if you are working with animals.**

Controlled Substances (Example: Over the counter or prescription drugs, tobacco, and alcohol)

Students must adhere to all federal, state and local laws when acquiring and handling controlled substances. Only under the direction of a qualified scientist or designated supervisor may a student use federally controlled or experimental substances for experimentation. Students under 21 may not handle or purchase smokeless powder or black powder for science projects.

Required Signatures: Science Teacher AND a Biomedical/Biological Scientist

☐ **Check here if you are working with controlled substances.**

Hazardous Substances or Devices (Chemicals, firearms, welders, lasers, radioactive substances, radiation)

Students must adhere to federal and state regulations governing hazardous substances or devices. **An adult must directly supervise experiments.** Students working with hazardous substances or devices must follow proper safety procedures for each chemical or device used in the research.

Required Signatures: Science Teacher AND a Biomedical/Biological Scientist

☐ **Check here if you are working with hazardous substances or devices.**

Potentially Hazardous Biological Agents (Example: Bacteria, Mold, Fungi, Viruses, Parasites, Recombinant DNA (rDNA), Human or Animal fresh tissues, blood or body fluids, etc)

All **Biosafety Level 1 and 2 projects can be performed in a school laboratory. BACTERIA MAY NOT BE GROWN AT HOME.** Standard microbiological practices must be used and all hazardous agents must be properly disposed of at the end of experimentation. The experiment must be supervised by a qualified scientist or a trained designated supervisor. For lab space or questions, please contact USEF.

Required Signatures: Science Teacher AND a Biomedical/Biological Scientist

☐ **Check here if you are working with hazardous biological agents.**

Teacher APPROVAL
(required for ALL projects)

I have reviewed and approved this student's research plan ***prior to experimentation and*** certify that it will comply with all of the experimental rules of the University of Utah Science & Engineering Fair.

_____

Teacher Signature Date

Additional Safety APPROVAL
(required if any boxes are checked above)

Name: _____ **Date:** _____

Position:_____

Email:_____

Signature: _____

If more than one signature is required, please use an additional copy of this form.

Supervisor Acknowledgement

Students must have an adult supervisor when working on the project. This may be a parent or guardian, a teacher, or a laboratory supervisor.

I, the Designated Supervisor, certify that:

- I have read the student's plan and understand all safety requirements.
- I have been trained in the techniques to be used by this student prior to the start of experimentation.
- I will provide direct supervision and take responsibility for the safety of my student(s) and any possible participants.

Designated Supervisor's Name _____ Signature _____ Date _____

Email or phone #:_____

Research Location

Research Locations: Please list the names, addresses and type of location for each place you plan to conduct your research or work on your problem.

Check all that apply.

Facility Type: Home ☐ School ☐ University ☐ Lab ☐ Public Facility (Park, Library, Etc) ☐ Other ☐

Location #1: _____ Location #2: _____

Student & Parent/Guardian Signatures

I certify the following:

☐ My science project complies with all the experimental rules of the University of Utah Science and Engineering Fair

☐ I have attached a written plan for my project, indicating all materials needed and my planned procedure.

Signature of Student_____ Date_____

If this is a team project, each additional team member must sign below.

Signature of Student_____ Date_____

Signature of Student_____ Date_____

I have read and understand the risks and possible dangers involved in the project plan, and I consent to my child participating in this project.

Signature of Parent/Guardian_____ Date_____

If this is a team project, each additional team member's Parent/Guardian must sign below.

Signature of Parent/Guardian_____ Date_____

Signature of Parent/Guardian_____ Date_____

___ I give permission for my student to have pictures taken and posted on school/district/ or USEF websites or in connection with promotional materials for science fair information.

___ I do NOT give permission for my student to have pictures taken and posted on school/district/ or USEF websites or in connection with promotional materials for science fair information.

Signature of Parent/Guardian_____ Date_____

Signature of Parent/Guardian_____ Date_____

Signature of Parent/Guardian_____ Date_____

This form must be submitted to your teacher or school fair coordinator. School fair coordinators must turn this form in to the district-level fair coordinators in order to qualify for USEF.

PLEASE KEEP A COPY FOR YOURSELF!!

Please contact Jody Oostema at jody.oostema@utah.edu or 801-585-9109 with any questions.

The University of Utah Science & Engineering Fair is presented by the Center for Science and Mathematics Education and the University of Utah.