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SCIENCE FAIR RESEARCH PACKET

**The Science Fair Process**

**This is the goal (STEP 11)**



**STEP 1**

**Topic/Question**

First, use some sort of log book to record your project from beginning to end. Once you have chosen your topic, you should form a question about your research. Make sure it is original and not taken from another source.

 What is the question you want to investigate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Next, why do you want to investigate it?

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**STEP 2**

**Title**

The title should be catchy (remember it will go on the board). Start with “A study of…” or “An investigation of…” Or rearrange your question to make your title.

Example Title and Question

* Title: The Effect of Temperature on a Lightning Bug’s Flash rate
	+ Lighting Up the Summer Nights: A Lightning Bug Tale
* Question: How does temperature affect rate of a lightning bug’s flash rate?

What is your title?

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**STEP 3**

**Hypothesis**

* This is a testable statement: **An increase in temperature will cause an increase in a lightning bug's flash rate**.

An Example of How to Write a Hypothesis

A worker on a fish-farm notices that his trout seem to have more fish lice in the summer, when the water levels are low, and wants to find out why. His research leads him to believe that the amount of oxygen is the reason - fish that are oxygen stressed tend to be more susceptible to disease and parasites.

He proposes a general hypothesis. “Water levels affect the amount of lice suffered by rainbow trout.”

This is a good general hypothesis, but it gives no guide to how to design the research or experiment. The hypothesis must be refined to give a little direction. “Rainbow trout suffer more lice when water levels are low.”

Now there is some directionality, but the hypothesis is not really testable, so the final stage is to design an experiment around which research can be designed, a testable hypothesis. “Rainbow trout suffer more lice in low water conditions because there is less oxygen in the water.”

What is your hypothesis?

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**STEP 4**

**Experimental Design**

**Materials**

Keep a log (**outline form**) of ALL of the materials you use in your project. Take pictures of item of special interest used in your research. This is usually the lesser common materials. Materials **DO NOT** need to be numbered; bullets can be used if preferred.

What are your materials? You can always add to this!

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­\_\_\_\_\_\_\_\_ 6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Procedure**

This is the method (methodology) or steps that you take to do your research.

You must write and explain, in detail, everything you do. You should be able to hand your procedure to someone who knows nothing about your research and they should be able to completely reproduce your research investigation. Include any surveys or interview questions you will use separately.

It is best to write this in **outline form** and you can always revise it.

What is your initial procedure? (You will revise this and keep it as you do your project)

You will repeat the trials at least three times (or more) for better results.

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**STEP 5**

**Background research for Research Plan**

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| **Student Name:**  |
| **Category:**  |
| **Science Teacher’s Name:**  |

**Question or Problem being addressed – Title**

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**Hypothesis/Engineering Goals**

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 **Rationale**Brief synopsis of the background research that supports your research problem and explains why this research is important scientifically.

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**Material List**Bulleted list of all items used in research. Make sure to include concentration of all chemicals, source, amount of all living organisms, and all equipment used.

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 **Subject Specific Items**Items 1–4 below are subject-specific guidelines for additional information to be included in your research plan/project ONLY if you are doing any of the following types of projects.Write your answer below the question delete the items you do not use. **See the subject specific rules in the ISEF rule book BEFORE beginning this section (**[**https://www.societyforscience.org/isef/international-rules/human-participants/**](https://www.societyforscience.org/isef/international-rules/human-participants/)**)**

1. **Human participants research:**
**a. Participants:** Describe age range, gender, racial/ethnic composition of participants. Identify vulnerable populations (minors, pregnant women, prisoners, mentally disabled or economically disadvantaged).
**b. Recruitment:** Where will you find your participants? How will they be invited to participate?
**c. Methods:** What will participants be asked to do? Will you use any surveys, questionnaires or tests? What is the frequency and length of time involved for each subject?
**d. Risk Assessment:** What are the risks or potential discomforts (physical, psychological, time involved, social, legal, etc.) to participants? How will you minimize risks? List any benefits to society or participants.
**e. Protection of Privacy:** Will identifiable information (e.g., names, telephone numbers, birth dates, email addresses) be collected? Will data be confidential/anonymous? If anonymous, describe how the data will be collected. If not anonymous, what procedures are in place for safeguarding confidentiality? Where will data be stored? Who will have access to the data? What will you do with the data after the study?
**f. Informed Consent Process:** Describe how you will inform participants about the purpose of the study, what they will be asked to do, that their participation is voluntary and they have the right to stop at any time.
2. **Vertebrate animal research:**
a. Discuss potential ALTERNATIVES to vertebrate animal use and present justification for use of vertebrates.
b. Explain potential impact or contribution of this research.
c. Detail all procedures to be used, including methods used to minimize potential discomfort, distress, pain and injury to the animals and detailed chemical concentrations and drug dosages.
d. Detail animal numbers, species, strain, sex, age, source, etc., include justification of the numbers planned.
e. Describe housing and oversight of daily care
f. Discuss disposition of the animals at the termination of the study.

**3. Potentially hazardous biological agents research:**
a. Give source of the organism and describe BSL assessment process and BSL determination.
b. Detail safety precautions and discuss methods of disposal.

**4. Hazardous chemicals, activities & devices:**
a. Describe Risk Assessment process, supervision, safety precautions and methods of disposal.

**Procedure**Describe in detail the method or procedure required to complete your project, including risk and safety, proper disposal of materials if needed.

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 **Data Analysis**Describe the procedure you will use to analyze the data that will answer the research question, hypothesis, or engineering goal?

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 **Bibliography**

 List at least five major references (e.g. science journal articles, book, credible internet sites) from your literature review/background research.

* If you plan to use **vertebrate animals**, one of these references must be an animal care reference.
* If you plan on using **human subjects**, one of these references must be from the list of human subjects
* If you plan on using **potentially hazardous biological agents,** one of the references must include aseptic technique.
* If you plan on using **chemicals,** each chemical should include a reference for a MSDS/SDS. (Chemicals does not include water or any household product)

List of possible references/resources are included in the ISEF Rules and guidelines.

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**ISEF Rules and Guidelines:**

[**https://www.societyforscience.org/isef/international-rules/rules-for-all-projects/#sources**](https://www.societyforscience.org/isef/international-rules/rules-for-all-projects/#sources)

**EMCC Library:** <http://eric.ed.gov/> Ask your English teacher if a password is needed

**Google Scholar:** <https://scholar.google.com/>

For each source write all of the interesting facts you find on one side of a notecard (or paper) and write the citation on the other side. For **ALL** Sources used on your board, your citation should follow the following format.

**Example Citations:**

CDC. (2021, August 10). *Insulin resistance and diabetes*. Centers for Disease Control and Prevention. Retrieved October 18, 2022, from https://www.cdc.gov/diabetes/basics/insulin- resistance.html#:~:text=Insulin%20helps%20blood%20sugar%20enter,signaling%20insulin%20to%20decre ase%20too.

Graham, P., & Pick, L. (2017). Drosophila as a Model for Diabetes and Diseases of Insulin Resistance. *Current topics in developmental biology*, *121*, 397–419. https://doi.org/10.1016/bs.ctdb.2016.07.011

**Online Resource for writing citations in APA format:**

<https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/general_format.html>

**STEP 6**

**Forms**

All forms are different depending on projects. They MUST be filled out before you begin your project. Visit the Rules Wizard (<https://ruleswizard.societyforscience.org/> ) to better guide you through your topic choices.

**STEP 7**

**The Project**

After the research plan and forms are submitted and approved, you can begin the fun! Follow your procedures in the research plan and keep all information in a Log Book.

**STEP 8**

**Results/Data**

You will need to collect data and represent it using graphs/charts/tables designed and made by you.

**Results/Discussion**

This is the data (your charts and graphs) written in paragraph form. These are **NOT** an opinion. Just simply state your findings.

Use complete sentences Describe anything of interest, the “WOW” factors

Use average or number results Be short and concise; to the point

Discuss what the numbers in the data mean

**STEP 9**

**Conclusion**

This is a summary of your investigation.

**STEP 10**

**Abstract**

Does not go on board but needed for registration.

**Example**

Severe distances between grocery stores and a lack of transportation restrict residents from making trips for nutritious food, discriminating against poverty-ridden areas. Often trade-offs between traveling long distances for nutritious food and traveling short distances for unhealthy food take place where families choose the option in closer proximity. With about 12% of the children in the U.S. being food insecure since 2010, acts such as the Healthy Hunger-Free Kids Act (HHFKA) and the National School Lunch Program (NSLP) seem to have no effect on this number despite lowering the percent of obese students. Food Intelligence and Child Health are measured in a survey intended for parents of students enrolled in school. This research tested the relationship between household structure, sociodemographics, and food-oriented beliefs with eating behavior among children. It was found that household structure, sociodemographics, and food-oriented beliefs are valuable predictors in analyzing the access to nutrition in students. Parental food-oriented beliefs along with food availability and financial success are determining factors in quality nutritional intake in children. It is presented that food availability is not the only hinderance that parental figures face when providing nutritional meals.

**STEP 11**

**Science Fair Project Board**

You can use a tri-fold board or make a poster and print it. If you make a poster you will be responsible for the cost

of printing.



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**Things to keep in mind**

1. Use the metric system (cm, m, g…) not inches, feet, miles, pounds.
2. **DO NOT** include faces in your pictures; you will be disqualified!!!!
3. No food/petri dishes/living plants (such as roots, etc) of any kind can be placed on the board.
4. Keep a composition notebook filled with what you do every time you work on your investigation. Loose leaf paper is not recommended.
5. For more information on any of the steps in this packet, please see the website resources page at <https://www.sciencefair.msstate.edu/resources/>
6. This statement should be on your board at the bottom left or right (small font): **“All graphs, diagrams, math calculations, and charts designed by student researcher unless otherwise noted.”** (See \*\* on the board above for placement)

 