WEST GEORGIA REGIONAL SCIENCE AND ENGINEERING FAIR

Sample Forms

UNIVERSITY OF WEST GEORGIA

WEST GEORGIA REGIONAL SCIENCE AND ENGINEERING FAIR
Sample Forms

CONTENTS

MIDDLE SCHOOL

Student Checklist (1A)

This form is required for ALL projects.

1. a. Student/Team Leader: Jane Doe Grade: 7

Email: _____ Phone: _____

b. Team Member: _____ c. Team Member: _____

2. Title of Project:

The Art and Science of Dyeing Eggs

3. School: Chapel Hill Middle School School Phone: _____

School Address: _____

_____

4. Adult Sponsor: _____ Phone/Email: _____

5. Does this project need SRC/IRB/IACUC or other pre-approval? ☐ Yes ☐ No Tentative start date: _____

6. Is this a continuation/progression from a previous year? ☐ Yes ☒ No

If Yes:

a. Attach the previous year's ☐ Abstract **and** ☐ Research Plan/Project Summary

b. Explain how this project is new and different from previous years on

☐ Continuation/Research Progression Form (7)

7. This year's laboratory experiment/data collection:

12/14/2011 12/30/2011

Actual Start Date: (mm/dd/yy) End Date: (mm/dd/yy)

8. Where will you conduct your experimentation? (check all that apply)

☐ Research Institution ☐ School ☐ Field ☐ Home ☐ Other: _____

9. List name and address of all non-home and non-school work site(s):

Name: _____ _____

Address: _____ _____

_____ _____

Phone/ email _____ _____

10. **Complete a Research Plan/Project Summary following the Research Plan/Project Summary instructions and attach to this form.**

11. **An abstract is required for all projects after experimentation.**

Research Plan/Project Summary Instructions

A complete Research Plan/Project Summary is required for ALL projects and must accompany Student Checklist (1A).

1. All projects must have a Research Plan/Project Summary
   a. Written prior to experimentation following the instructions below to detail the rationale, research question(s), methodology, and risk assessment of the proposed research.
   b. If changes are made during the research, such changes can be added to the original research plan as an addendum, recognizing that some changes may require returning to the IRB or SRC for appropriate review and approvals. If no additional approvals are required, this addendum serves as a project summary to explain research that was conducted.
   c. If no changes are made from the original research plan, no project summary is required.

2. Some studies, such as an engineering design or mathematics projects, will be less detailed in the initial project plan and will change through the course of research. If such changes occur, a project summary that explains what was done is required and can be appended to the original research plan.

3. The Research Plan/Project Summary should include the following:
   a. **RATIONALE:** Include a brief synopsis of the background that supports your research problem and explain why this research is important and if applicable, explain any societal impact of your research.
   b. **RESEARCH QUESTION(S), HYPOTHESIS(ES), ENGINEERING GOAL(S), EXPECTED OUTCOMES:** How is this based on the rationale described above?
   c. Describe the following in detail:
      - **Procedures:** Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by mentor or others.
      - **Risk and Safety:** Identify any potential risks and safety precautions needed.
      - **Data Analysis:** Describe the procedures you will use to analyze the data/results.
   d. **BIBLIOGRAPHY:** List major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

Items 1–4 below are subject-specific guidelines for additional items to be included in your research plan/project summary as applicable.

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? If yes and not your own, how did you obtain? Did it require permissions? If so, explain. 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:
   - Describe Risk Assessment process, supervision, safety precautions and methods of disposal.
   - Material Safety Data Sheets are not necessary to submit with paperwork.

Checklist for Adult Sponsor (1)

This completed form is required for ALL projects.

To be completed by the Adult Sponsor in collaboration with the student researcher(s):

Student's Name(s): Jane Doe

Project Title: The Art and Science of Dyeing Eggs

1. ☒ I have reviewed the Intel ISEF Rules and Guidelines.

2. ☒ I have reviewed the student's completed Student Checklist (1A) and Research Plan/Project Summary.

3. ☒ I have worked with the student and we have discussed the possible risks involved in the project.

4. ☐ The project involves one or more of the following and requires prior approval by an SRC, IRB, IACUC or IBC:
   - ☐ Humans
   - ☐ Vertebrate Animals
   - Potentially Hazardous Biological Agents
     - ☐ Microorganisms ☐ rDNA ☐ Tissues

5. ☒ Items to be completed for **ALL PROJECTS**
   - ☒ Adult Sponsor Checklist (1)
   - ☒ Student Checklist (1A)
   - ☒ Research Plan/Project Summary
   - ☒ Approval Form (1B)
   - ☐ Regulated Research Institutional/Industrial Setting Form (1C) (when applicable; after completed experiment)
   - ☐ Continuation/Research Progression Form (7) (when applicable)

Additional forms required if the project includes the use of one or more of the following (check all that apply):

☐ **Humans,** including student designed inventions/prototypes. (Requires prior approval by an Institutional Review Board (IRB); see full text of the rules.)
- ☐ Human Participants Form (4) or appropriate Institutional IRB documentation
- ☐ Sample of Informed Consent Form (when applicable and/or required by the IRB)
- ☐ Qualified Scientist Form (2) (when applicable and/or required by the IRB)

☐ **Vertebrate Animals** (Requires prior approval, see full text of the rules.)
- ☐ Vertebrate Animal Form (5A) - for projects conducted in a school/home/field research site (SRC prior approval required.)
- ☐ Vertebrate Animal Form (5B) - for projects conducted at a Regulated Research Institution. (Institutional Animal Care and Use Committee (IACUC) approval required prior experimentation.)
- ☐ Qualified Scientist Form (2) (Required for all vertebrate animal projects at a regulated research site or when applicable)

☐ **Potentially Hazardous Biological Agents** (Requires prior approval by SRC, IACUC or IBC, see full text of the rules.)
- ☐ Potentially Hazardous Biological Agents Risk Assessment Form (6A)
- ☐ Human and Vertebrate Animal Tissue Form (6B) - to be completed in addition to Form 6A when project involves the use of fresh or frozen tissue, primary cell cultures, blood, blood products and body fluids.
- ☐ Qualified Scientist Form (2) (when applicable)
- ☐ The following are exempt from prior review but require a Risk Assessment Form 3: projects involving protists, archae and similar microorganisms, for projects using manure for composting, fuel production or other non-culturing experiments, projects using color change coliform water test kits, microbial fuel cells, and projects involving decomposing vertebrate organisms.

☐ **Hazardous Chemicals, Activities and Devices** (No SRC prior approval required, see full text of the rules.)
- ☐ Risk Assessment Form (3)
- ☐ Qualified Scientist Form (2) (required for projects involving DEA-controlled substances or when applicable)

Adult Sponsor's Printed Name	Signature	Date of Review (mm/dd/yy)
		10/24/2011

Phone	Email

Approval Form (1B)

A completed form is required for each student, including all team members.

1. To Be Completed by Student and Parent

a. Student Acknowledgment:

- I understand the risks and possible dangers to me of the proposed research plan.
- I have read the Intel ISEF Rules and Guidelines and will adhere to all International Rules when conducting this research.
- I have read and will abide by the following Ethics statement

Student researchers are expected to maintain the highest standards of honesty and integrity. Scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include but are not limited to plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs and the Intel ISEF.

Jane Doe		10/24/2011
Student's Printed Name	Signature	Date Acknowledged (mm/dd/yy) (Must be prior to experimentation.)

b. Parent/Guardian Approval: I have read and understand the risks and possible dangers involved in the **Research Plan/Project Summary**. I consent to my child participating in this research.

		10/24/2011
Parent/Guardian's Printed Name	Signature	Date Acknowledged (mm/dd/yy) (Must be prior to experimentation.)

2. To be completed by the local or affiliated Fair SRC

(Required for projects requiring prior SRC/IRB APPROVAL. Sign 2a or 2b as appropriate.)

a. Required for projects that need prior SRC/IRB approval BEFORE experimentation (humans, vertebrates or potentially hazardous biological agents).

The SRC/IRB has carefully studied this project's **Research Plan/Project Summary** and all the required forms are included. My signature indicates approval of the **Research Plan/Project Summary** before the student begins experimentation.

SRC/IRB Chair's Printed Name

Signature

Date of Approval (mm/dd/yy) (Must be prior to experimentation.)

OR

b. Required for research conducted at all Regulated Research Institutions with no prior fair SRC/IRB approval.

This project was conducted at a regulated research institution (**not home or high school, etc.**), was reviewed and approved by the proper institutional board before experimentation and complies with the Intel ISEF Rules. **Attach (1C) and any required institutional approvals (e.g. IACUC, IRB).**

SRC Chair's Printed Name

Signature

Date of Approval (mm/dd/yy)

3. Final Intel ISEF Affiliated Fair SRC Approval (Required for ALL Projects)

SRC Approval After Experimentation and Before Competition at Regional/State/National Fair

I certify that this project adheres to the approved **Research Plan/Project Summary** and complies with all Intel ISEF Rules.

Regional SRC Chair's Printed Name	Signature	Date of Approval (mm/dd/yy)
State/National SRC Chair's Printed Name *(where applicable)*	Signature	Date of Approval (mm/dd/yy)

Official 2019 GSEF Abstract Form

This form is the *preferred* Official Abstract Form for the 2019 Georgia Science & Engineering Fair; however, the "OFFICIAL ABSTRACT and CERTIFICATION" form obtainable from the ISEF website (https://student.societyforscience.org/intel-isef-forms) will also be accepted at GSEF as meeting the Official Abstract Form requirement, as long as the form is properly completed (but does not have to be embossed).

The Art and Science of Dyeing Eggs

Jane Doe

Chapel Hill Middle School, Douglasville, GA 30135

Dyeing eggs is both an art as well as science. Using simple and safe household materials, brilliant colors and exciting designs can be created. The color results due to formation of a salt bridge from electrostatic interactions between positive charges on the egg and negative charges on the dye.
In this project, the chemical environment of the dye solution (independent variable) was altered to see its effect on the color intensity of the egg (dependent variable). Using a red dye, the egg was colored different shades of pink under neutral conditions due to color mixing of the red dye with white calcium carbonate in the egg shell. Increasing the concentration of the dye solution, temperature and the time of dyeing all increased the color intensity. In an acidic environment, the calcium carbonate in the egg shell chemically reacted with the acid and produced carbon dioxide gas exposing positive charges in the egg's cuticle to interact with the negative charges in the dye. No color mixing was possible in the absence of the white calcium carbonate and the color of the dyed egg was bright red instead of pink. When ionic solids were added to the dye solution, the color intensity decreased because these additional ions distracted the charges on the egg and dye from forming salt bridges, resulting in a fainter color of the dyed eggs.

CATEGORY
Pick one only — mark box at right

- Animal Sciences ☐
- Behavioral & Social Sciences ☐
- Biochemistry ☐
- Biomedical & Health Sciences ☐
- Biomedical Engineering ☐
- Cellular & Molecular Biology ☐
- Chemistry ■
- Computational Biology & Bioinformatics ☐
- Earth & Environmental Sciences ☐
- Embedded Systems ☐
- Energy: Chemical ☐
- Energy: Physical ☐
- Engineering Mechanics ☐
- Environmental Engineering ☐
- Materials Science ☐
- Mathematics ☐
- Microbiology ☐
- Physics & Astronomy ☐
- Plant Sciences ☐
- Robotics & Intelligent Machines ☐
- Systems Software ☐
- Translational Medical Sciences ☐

1. As part of this research project, the student directly handled, manipulated, or interacted with (check ALL that apply):
   ☐ human participants ☐ potentially hazardous biological agents
   ☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue

2. I/we worked or used equipment in a regulated research institution or industrial setting: ☐ Yes ■ No

3. This project is a continuation of previous research. ☐ Yes ■ No

4. My display board includes non-published photographs/ visual depictions of humans (other than myself): ☐ Yes ■ No

5. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only. ■ Yes ☐ No

6. I/we hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work. ■ Yes ☐ No

GSEF GEORGIA SCIENCE & ENGINEERING FAIR 2019

Completing the Abstract:

Abstracts are limited to a maximum of 250 words and must fit within the predefined area. Please be sure to consult the information from your local or regional fair for the proper formatting of the header information as fairs differ in what is required (or not allowed).

The abstract **should include the following:**

A) Purpose of the experiment
B) Procedure
C) Data
D) Conclusions

It may also include any possible research applications. Only minimal reference to previous work may be included. An abstract **must not include the following:**

A) Acknowledgements (including naming the research institution and/or mentor with which you were working), or self-promotions and external endorsements
B) Work or procedures done by the mentor

Tips for Writing an Abstract:

A project abstract is a brief paragraph or two (limited to 250 words or 1,800 characters) highlighting and/or summarizing the major points or most important ideas about your project. An abstract allows judges to quickly determine the nature and scope of a project.

- Emphasize these aspects: purpose (hypothesis), methods (procedures used), data summary or analysis, and conclusions.
- Focus only on the current year's research.
- Omit details and discussions.
- Use the past tense when describing what was done. However, where appropriate use active verbs rather than passive verbs.
- Use short sentences. Don't abbreviate by limiting articles or other small words in order to save space.
- Avoid jargon and use appropriate scientific language.
- Use concise syntax, correct spelling, grammar, and punctuation.

Avoid a Rewrite:

- Focus on what you did, not on the work of your mentor or of the laboratory in which you did your work.
- Do NOT include acknowledgements, self-promotion, or external endorsements. Don't name the research institution and/or mentor with which you were working, and avoid mentioning awards or honors (including achieving a patent) in the body of the abstract.
- Be sure to emphasize the current years' research. A continuation project should only make a brief mention of previous years' research (no more than a sentence or two).

Jane Doe

The Art and Science of Dyeing Eggs - Research Plan

Purpose/Research Question

The purpose of this project is to understand the scientific principles of dyeing eggs. The research question for this project is "What factors affect the process of dyeing eggs?"

Hypothesis

If the chemical environment of the dye solution is altered, then the rate and nature of the dyeing process of eggs will be affected.

Materials, Procedures and Data Analysis

Tables 1 and 2 show lab-ware and chemicals used in this project.

Table 1. List of lab-ware and their use in the project

Labware	*Use in project*
100 mL graduated cylinder	Dispense precise and accurate volumes of all liquids
250 mL beaker	Hold dye solution and dye bath
250 mL Erlenmeyer flask	Air dry eggs held at flask neck
Alcohol thermometers	Measure temperature of dye solutions
Pipet (dropper)	Fine adjustment of liquid volume
Timer	Measure time of dyeing

Tongs	Pull eggs out of dye bath (beaker)
1 teaspoon measuring spoon	Dispense solid additives
Camera	Take digital images
Computer with MS Paint	Analyze digital images for RGB values
Safety glasses	Protect eyes during experiment

Table 2. List of all chemicals with structure, properties and use in the project

Common name	Chemical formula/type	Use
36 Large eggs	Cuticle (protein), Shell ($CaCO_3$)	Two sets of material to be dyed
4 bottles red food coloring	FD&C Red # 3, ionic	Ionic acid dye
2 gallons distilled water	H_2O	No additives present
Household vinegar	Acetic acid (CH_3COOH)	Lower pH (acidic)
Household ammonia	Ammonium hydroxide (NH_4OH)	Higher pH (basic)
Table salt	Sodium chloride (NaCl)	Ionic additive, neutral
Sugar	Sucrose ($C_{12}H_{22}O_{11}$)	Non-ionic additive, neutral
Splenda	Sucralose ($C_{12}H_{19}Cl_3O_8$)	Non-ionic additive, neutral
Baking powder	Sodium bicarbonate ($NaHCO_3$) and cream of tartar	Ionic additive, acidic
Baking soda	Sodium bicarbonate ($NaHCO_3$)	Ionic additive, basic
Alum	Potassium aluminum sulfate ($KAl(SO_4)_2$)	Ionic additive, acid
pHydroin paper	Universal indicator	Measure approximate pH

Jane Doe

The steps needed to complete the project are:

A) *Effect of altering chemical environment of the dye solution (independent variables) on the color intensity of dyed eggs (dependent variable)*

1. Using a 100 mL graduated cylinder, dispense 150 mL of distilled water or solution into a 250 mL beaker.
2. Add required drops of the red food coloring and mix well.
3. Measure temperature of the dye solution with a thermometer and pH with pHydrion paper.
4. To adjust the temperature of the dye solution, heat in a microwave or cool in a refrigerator.
5. To adjust the pH, use household vinegar or household ammonia.
6. To alter the ionic environment, add one teaspoon of six common household solid additives.
7. Gently lower eggs in the dye bath (beaker) and keep fully submerged for desired time measured with a timer.
8. Gently lift eggs out of bath with tongs and place on the mouth of the flask to air dry.
9. Take digital images of the dyed eggs with a camera.

The experimental conditions for each batch of eighteen eggs are described in Table 3.

Jane Doe

Table 3. Experimental conditions for dyeing eggs.

Egg #	Volume of solution (mL)	Number of dye drops	Temp (°C)	Dye time (minutes)	pH	Additives
1	150 mL DW	0	13	5	6	None
2	150 mL DW	5	13	5	6	None
3	150 mL DW	10	13	5	6	None
4	150 mL DW	15	13	5	6	None
5	150 mL DW	20	13	5	6	None
6	150 mL DW	25	13	5	6	None
7	150 mL DW	15	30	5	6	None
8	150 mL DW	15	5	5	6	None
9	75 mL DW + 75 mL vinegar	15	13	5	3	None
10	125 mL DW + 25 mL ammonia	15	13	5	10	None
11	150 mL DW	15	13	5	6	1 tsp salt
12	150 mL DW	15	13	5	6	1 tsp sugar
13	150 mL DW	15	13	5	6	1 tsp Splenda
14	150 mL DW	15	13	5	4	1 tsp baking powder
15	150 mL DW	15	13	5	6	1 tsp baking soda
16	150 mL DW	15	13	5	5	1 tsp alum
17	150 mL DW	15	13	2	6	None
18	150 mL DW	15	13	10	6	None

B) Quantitative analysis of color intensity

1. Analyze digital images of dyed eggs using Microsoft Paint.
2. Open selected image and crop it to focus only on the egg.
3. Use the Color Picker (looks like an eye dropper) tool and extract the color of the egg.
4. Use Edit Colors to obtain the exact red-green-blue (RGB) values of the selected color.
5. Use the red in the RGB value to compare the color intensity of the various shades of reddish pink for the dyed eggs.

Bibliography

1) Douglas, G. W. (1978), The American Book of Dyes, Wilson Publishers, New York.
2) Fieser, L. F. and Williamson, K. L. (1992), Dyes and Dyeing in Organic Experiments, Chapter 66, 7th edition, D.C. Heath and Company Publishers.
3) Mebane, R.C. and Rybolt, T. R. (1987), "Chemistry in the dyeing of eggs," *Journal of Chemical Education*, Volume 64, No. 4, p. 291-293.
4) Silberberg, M. S. (2006), Chemistry, 4th edition, McGraw Hill Publishers, p. 29-30.
5) Toplis, R. (1998), "Ideas about acids and alkalis," *School Science Review*, Vol 80, No. 291, p. 67-70.
6) Websites
   a. www.straw.com/sig/dyehist.html
   b. www.fda.gov/forindustry/coloradditives/
   c. http://www.microsoft.com/resources/documentation/windows/xp/all/proddocs/en-us/mspaint_overview.mspx
   d. www.sigmaaldrich.com

HIGH SCHOOL

Student Checklist (1A)

This form is required for ALL projects.

1. a. Student/Team Leader: Jane Doe Grade: 7

   Email: _____ Phone: _____

   b. Team Member: _____ c. Team Member: _____

2. Title of Project:

   The Art and Science of Dyeing Eggs

3. School: Chapel Hill Middle School School Phone: _____

   School Address: _____

   _____

4. Adult Sponsor: _____ Phone/Email: _____

5. Does this project need SRC/IRB/IACUC or other pre-approval? ☐ Yes ☐ No Tentative start date: _____

6. Is this a continuation/progression from a previous year? ☐ Yes ☒ No

   If Yes:

   a. Attach the previous year's ☐ Abstract **and** ☐ Research Plan/Project Summary

   b. Explain how this project is new and different from previous years on

   ☐ Continuation/Research Progression Form (7)

7. This year's laboratory experiment/data collection:

   12/14/2011 12/30/2011

   Actual Start Date: (mm/dd/yy) End Date: (mm/dd/yy)

8. Where will you conduct your experimentation? (check all that apply)

   ☐ Research Institution ☐ School ☐ Field ☐ Home ☐ Other: _____

9. List name and address of all non-home and non-school work site(s):

   Name: _____ _____

   Address: _____ _____

   _____ _____

   Phone/ email _____ _____

10. **Complete a Research Plan/Project Summary following the Research Plan/Project Summary instructions and attach to this form.**

11. **An abstract is required for all projects after experimentation.**

Research Plan/Project Summary Instructions

A complete Research Plan/Project Summary is required for ALL projects and must accompany Student Checklist (1A).

1. All projects must have a Research Plan/Project Summary
   a. Written prior to experimentation following the instructions below to detail the rationale, research question(s), methodology, and risk assessment of the proposed research.
   b. If changes are made during the research, such changes can be added to the original research plan as an addendum, recognizing that some changes may require returning to the IRB or SRC for appropriate review and approvals. If no additional approvals are required, this addendum serves as a project summary to explain research that was conducted.
   c. If no changes are made from the original research plan, no project summary is required.

2. Some studies, such as an engineering design or mathematics projects, will be less detailed in the initial project plan and will change through the course of research. If such changes occur, a project summary that explains what was done is required and can be appended to the original research plan.

3. The Research Plan/Project Summary should include the following:
   a. **RATIONALE:** Include a brief synopsis of the background that supports your research problem and explain why this research is important and if applicable, explain any societal impact of your research.
   b. **RESEARCH QUESTION(S), HYPOTHESIS(ES), ENGINEERING GOAL(S), EXPECTED OUTCOMES:** How is this based on the rationale described above?
   c. Describe the following in detail:
      - **Procedures:** Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by mentor or others.
      - **Risk and Safety:** Identify any potential risks and safety precautions needed.
      - **Data Analysis:** Describe the procedures you will use to analyze the data/results.
   d. **BIBLIOGRAPHY:** List major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

Items 1–4 below are subject-specific guidelines for additional items to be included in your research plan/project summary as applicable.

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? If yes and not your own, how did you obtain? Did it require permissions? If so, explain. 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:
   - Describe Risk Assessment process, supervision, safety precautions and methods of disposal.
   - Material Safety Data Sheets are not necessary to submit with paperwork.

Approval Form (1B)

A completed form is required for each student, including all team members.

1. To Be Completed by Student and Parent

a. Student Acknowledgment:

- I understand the risks and possible dangers to me of the proposed research plan.
- I have read the Intel ISEF Rules and Guidelines and will adhere to all International Rules when conducting this research.
- I have read and will abide by the following Ethics statement

Student researchers are expected to maintain the highest standards of honesty and integrity. Scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include but are not limited to plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs and the Intel ISEF.

Jane Doe		10/24/2011
Student's Printed Name	Signature	Date Acknowledged (mm/dd/yy) (Must be prior to experimentation.)

b. Parent/Guardian Approval: I have read and understand the risks and possible dangers involved in the **Research Plan/Project Summary**. I consent to my child participating in this research.

		10/24/2011
Parent/Guardian's Printed Name	Signature	Date Acknowledged (mm/dd/yy) (Must be prior to experimentation.)

2. To be completed by the local or affiliated Fair SRC

(Required for projects requiring prior SRC/IRB APPROVAL. Sign 2a or 2b as appropriate.)

a. Required for projects that need prior SRC/IRB approval BEFORE experimentation (humans, vertebrates or potentially hazardous biological agents).

The SRC/IRB has carefully studied this project's **Research Plan/Project Summary** and all the required forms are included. My signature indicates approval of the **Research Plan/Project Summary** before the student begins experimentation.

SRC/IRB Chair's Printed Name

Signature

Date of Approval (mm/dd/yy)
(Must be prior to experimentation.)

OR

b. Required for research conducted at all Regulated Research Institutions with no prior fair SRC/IRB approval.

This project was conducted at a regulated research institution (**not home or high school, etc.**), was reviewed and approved by the proper institutional board before experimentation and complies with the Intel ISEF Rules. **Attach (1C) and any required institutional approvals (e.g. IACUC, IRB).**

SRC Chair's Printed Name

Signature

Date of Approval (mm/dd/yy)

3. Final Intel ISEF Affiliated Fair SRC Approval (Required for ALL Projects)

SRC Approval After Experimentation and Before Competition at Regional/State/National Fair

I certify that this project adheres to the approved **Research Plan/Project Summary** and complies with all Intel ISEF Rules.

Regional SRC Chair's Printed Name	Signature	Date of Approval (mm/dd/yy)
State/National SRC Chair's Printed Name *(where applicable)*	Signature	Date of Approval (mm/dd/yy)

Regulated Research Institutional/Industrial Setting Form (1C)

This form must be completed AFTER experimentation by the adult supervising the student research conducted in a regulated research institution, industrial setting or any work site other than home, school or field.

Student's Name(s) Jane Doe

Title of Project The Art and Science of Dyeing Eggs

To be completed by the Supervising Adult in the Setting (NOT the Student(s)) after experimentation:

(Responses must be on the form as it is required to be displayed at student's project booth; please do not print double-sided.)

The student(s) conducted research at my work site:

1. Did you or your proxy (e.g. graduate student, postdoc, employee) mentor or provide substantial guidance to the student researcher? ☑ Yes ☐ No
   a. If no, describe your and/or your institution's role with the student researcher and his/her project (e.g. supervised use of equipment on site without ongoing mentorship and sign below.

   b. If yes, complete questions 2–5.

2. Is the student's research project a subset of your ongoing research or work? ☐ Yes ☑ No
   Use questions 3, 4 and 5 to detail how the student's project was similar and/or different from ongoing research or work at your site.

3. Describe the independence and creativity with which the student:
   a. developed the hypotheses or engineering goals for the research project

   Literature search using Internet sites and magazines and journals available via Google Scholar.

   b. designed the methodology for his/her research project

   I trained and supervised Jane to get images and elemental composition of bio-char using a FEI Scanning electron microscope in my lab.

   c. analyzed and interpreted data

(Continued on next page)

Regulated Research Institutional/Industrial Setting Form (1C) Continued

Student's Name(s) Jane Doe

4. Detail the student's role in conducting the research (e.g. data collection, specific procedures performed). Differentiate what the student observed and what the student actually did.

She used sound scientific method and spectroscopic techniques to solve a real world environmental problem. My help with SEM images helped to enhance her project.

5. Did the student(s) work on the project as part of a group? ☐ Yes ☑ No
If yes, how many individuals were in the group and who were they (e.g. high school students, graduate students, faculty, professional researchers)?

I attest that the student has conducted the work as indicated above and that any required review and approval by institutional regulatory board (IRB/IACUC/IBC) has been obtained. Copies are attached if applicable.
I further acknowledge that the student will be presenting this work publicly in competition and I have communicated with the student research regarding any requirements for my review and/or restrictions of what is publicized.

Supervising Adult's Printed Name | Signature | Title

Institution | Date Signed (must be after experimentation) (mm/dd/yy)

Address | Email/Phone

Checklist for Adult Sponsor (1)

This completed form is required for ALL projects.

To be completed by the Adult Sponsor in collaboration with the student researcher(s):

Student's Name(s): Jane Doe

Project Title: The Art and Science of Dyeing Eggs

1. ☒ I have reviewed the Intel ISEF Rules and Guidelines.

2. ☒ I have reviewed the student's completed Student Checklist (1A) and Research Plan/Project Summary.

3. ☒ I have worked with the student and we have discussed the possible risks involved in the project.

4. ☐ The project involves one or more of the following and requires prior approval by an SRC, IRB, IACUC or IBC:
   - ☐ Humans
   - ☐ Vertebrate Animals
   - Potentially Hazardous Biological Agents
     - ☐ Microorganisms ☐ rDNA ☐ Tissues

5. ☒ Items to be completed for **ALL PROJECTS**
   - ☒ Adult Sponsor Checklist (1)
   - ☒ Student Checklist (1A)
   - ☒ Research Plan/Project Summary
   - ☒ Approval Form (1B)
   - ☐ Regulated Research Institutional/Industrial Setting Form (1C) (when applicable; after completed experiment)
   - ☐ Continuation/Research Progression Form (7) (when applicable)

Additional forms required if the project includes the use of one or more of the following (check all that apply):

☐ **Humans,** including student designed inventions/prototypes. (Requires prior approval by an Institutional Review Board (IRB); see full text of the rules.)
- ☐ Human Participants Form (4) or appropriate Institutional IRB documentation
- ☐ Sample of Informed Consent Form (when applicable and/or required by the IRB)
- ☐ Qualified Scientist Form (2) (when applicable and/or required by the IRB)

☐ **Vertebrate Animals** (Requires prior approval, see full text of the rules.)
- ☐ Vertebrate Animal Form (5A) - for projects conducted in a school/home/field research site (SRC prior approval required.)
- ☐ Vertebrate Animal Form (5B) - for projects conducted at a Regulated Research Institution. (Institutional Animal Care and Use Committee (IACUC) approval required prior experimentation.)
- ☐ Qualified Scientist Form (2) (Required for all vertebrate animal projects at a regulated research site or when applicable)

☐ **Potentially Hazardous Biological Agents** (Requires prior approval by SRC, IACUC or IBC, see full text of the rules.)
- ☐ Potentially Hazardous Biological Agents Risk Assessment Form (6A)
- ☐ Human and Vertebrate Animal Tissue Form (6B) - to be completed in addition to Form 6A when project involves the use of fresh or frozen tissue, primary cell cultures, blood, blood products and body fluids.
- ☐ Qualified Scientist Form (2) (when applicable)
- ☐ The following are exempt from prior review but require a Risk Assessment Form 3: projects involving protists, archae and similar microorganisms, for projects using manure for composting, fuel production or other non-culturing experiments, projects using color change coliform water test kits, microbial fuel cells, and projects involving decomposing vertebrate organisms.

☐ **Hazardous Chemicals, Activities and Devices** (No SRC prior approval required, see full text of the rules.)
- ☐ Risk Assessment Form (3)
- ☐ Qualified Scientist Form (2) (required for projects involving DEA-controlled substances or when applicable)

Adult Sponsor's Printed Name	Signature	Date of Review (mm/dd/yy)
		10/24/2011

Phone	Email

Qualified Scientist Form (2)

May be required for research involving human participants, vertebrate animals, potentially hazardous biological agents, and hazardous substances and devices. Must be completed and signed before the start of student experimentation.

Student's Name(s): Jane Doe

Title of Project: The Art and Science of Dyeing Eggs

To be completed by the Qualified Scientist:

Scientist Name: Dr. Deer

Educational Background: Geology

Degree(s): Ph.D.

Experience/Training as relates to the student's area of research:

Jane will receive training to use a FEI Scanning Electron Microscope and analyze images and data.

Position: Assistant Professor and Director of SEM Lab

Institution: _____

Address: _____

Email/Phone: _____

1) Have you reviewed the Intel ISEF rules relevant to this project? ☑ Yes ☐ No

2. Will any of the following be used?
   a. Human participants ☐ Yes ☑ No
   b. Vertebrate animals ☐ Yes ☑ No
   c. Potentially hazardous biological agents (microorganisms, rDNA and tissues, including blood and blood products) ☐ Yes ☑ No
   d. Hazardous substances and devices ☐ Yes ☑ No

3. Will this study be a sub-set of a larger study? ☐ Yes ☑ No

4. Will you directly supervise the student? ☑ Yes ☐ No
   a. If no, who will directly supervise and serve as the Designated Supervisor? _____
   b. Experience/Training of the Designated Supervisor:

To be completed by the Qualified Scientist:

I certify that I have reviewed and approved the Research Plan/Project Summary prior to the start of the experimentation. If the student or Designated Supervisor is not trained in the necessary procedures, I will ensure her/his training. I will provide advice and supervision during the research. I have a working knowledge of the techniques to be used by the student in the Research Plan/Project Summary. I understand that a Designated Supervisor is required when the student is not conducting experimentation under my direct supervision.

Qualified Scientist's Printed Name

Signature

Date of Approval (mm/dd/yy)

To be completed by the Designated Supervisor when the Qualified Scientist cannot directly supervise.

I certify that I have reviewed the Research Plan/Project Summary and have been trained in the techniques to be used by this student, and I will provide direct supervision.

Designated Supervisor's Printed Name

Signature

Date of Approval (mm/dd/yy)

Phone

Email

Risk Assessment Form (3)

Must be completed before experimentation.

Student's Name(s) Jane Doe

Title of Project The Art and Science of Dyeing Eggs

To be completed by the Student Researcher(s) in collaboration with Designated Supervisor/Qualified Scientist: (All questions must be answered; additional page(s) may be attached.)

1. List all hazardous chemicals, activities, or devices that will be used; identify microorganisms exempt from pre-approval (see Potentially Hazardous Biological Agent rules).

   Bio-char, Copper and Iron salts, FTIR, colorimeter, Scanning Electron Microscopes

2. Identify and assess the risks involved in this project.

   Bio-char will be made using an open flame and is a fire hazard. Waste water solutions will be made using Copper and Iron salts which are skin/eye irritants. Analysis of bio-char and wastewater will be carried out using a colorimeter, FTIR spectrometer and Scanning Electron Microscopes that are expensive and have specialized parts and requires training before use.

3. Describe the safety precautions and procedures that will be used to reduce the risks.

   An open cemented area will be chosen to produce the bio-char under supervision of an adult. A fire extinguisher will be kept handy for an accidental fire.
   Safety goggles will be used during experimentation to prevent direct contact of chemicals with eyes.
   Experiments will be carried after receiving training from professors at the University of _____ who use these instruments regularly in their own research and will be supervised during use.

4. Describe the disposal procedures that will be used (when applicable).

   All used chemicals will be disposed in labeled waste containers for proper disposal by the Chemistry Department at the University of _____.

5. List the source(s) of safety information.

   Material safety data sheets (MSDS) found at www.sciencelab.com
   Operating instructions found in the instrument's operating manuals.

To be completed and signed by the Designated Supervisor (or Qualified Scientist, when applicable):
I agree with the risk assessment and safety precautions and procedures described above. I certify that I have reviewed the Research Plan/Project Summary and will provide direct supervision.

Designated Supervisor's Printed Name _____ Signature _____ Date of Review (mm/dd/yy) _____

Position & Institution _____ Phone or email contact information _____

Experience/Training as relates to the student's area of research _____

Official 2019 GSEF Abstract Form

This form is the *preferred* Official Abstract Form for the 2019 Georgia Science & Engineering Fair; however, the "OFFICIAL ABSTRACT and CERTIFICATION" form obtainable from the ISEF website (https://student.societyforscience.org/intel-isef-forms) will also be accepted at GSEF as meeting the Official Abstract Form requirement, as long as the form is properly completed (but does not have to be embossed).

The Art and Science of Dyeing Eggs

Jane Doe

Chapel Hill Middle School, Douglasville, GA 30135

Dyeing eggs is both an art as well as science. Using simple and safe household materials, brilliant colors and exciting designs can be created. The color results due to formation of a salt bridge from electrostatic interactions between positive charges on the egg and negative charges on the dye.
In this project, the chemical environment of the dye solution (independent variable) was altered to see its effect on the color intensity of the egg (dependent variable). Using a red dye, the egg was colored different shades of pink under neutral conditions due to color mixing of the red dye with white calcium carbonate in the egg shell. Increasing the concentration of the dye solution, temperature and the time of dyeing all increased the color intensity. In an acidic environment, the calcium carbonate in the egg shell chemically reacted with the acid and produced carbon dioxide gas exposing positive charges in the egg's cuticle to interact with the negative charges in the dye. No color mixing was possible in the absence of the white calcium carbonate and the color of the dyed egg was bright red instead of pink. When ionic solids were added to the dye solution, the color intensity decreased because these additional ions distracted the charges on the egg and dye from forming salt bridges, resulting in a fainter color of the dyed eggs.

CATEGORY
Pick one only — mark box at right

- ☐ Animal Sciences
- ☐ Behavioral & Social Sciences
- ☐ Biochemistry
- ☐ Biomedical & Health Sciences
- ☐ Biomedical Engineering
- ☐ Cellular & Molecular Biology
- ☐ Chemistry
- ☐ Computational Biology & Bioinformatics
- ☐ Earth & Environmental Sciences
- ☐ Embedded Systems
- ☐ Energy: Chemical
- ☐ Energy: Physical
- ☐ Engineering Mechanics
- ☐ Environmental Engineering
- ☐ Materials Science
- ☐ Mathematics
- ☐ Microbiology
- ☐ Physics & Astronomy
- ☐ Plant Sciences
- ☐ Robotics & Intelligent Machines
- ☐ Systems Software
- ☐ Translational Medical Sciences

1. As part of this research project, the student directly handled, manipulated, or interacted with (check ALL that apply):
   ☐ human participants ☐ potentially hazardous biological agents
   ☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue

2. I/we worked or used equipment in a regulated research institution or industrial setting: ☐ Yes ☐ No

3. This project is a continuation of previous research. ☐ Yes ☐ No

4. My display board includes non-published photographs/ visual depictions of humans (other than myself): ☐ Yes ☐ No

5. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only. ☐ Yes ☐ No

6. I/we hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work. ☐ Yes ☐ No

GSEF GEORGIA SCIENCE & ENGINEERING FAIR 2019

A Spectroscopic and Microscopic Analysis of the Adsorption capacity of Bio-Char

Jane Doe

11th grade

Douglas County High School

Purpose/Research Question

The purpose of the project is to synthesize and evaluate various types of bio-char to determine their adsorption efficiency using visual, spectroscopic and microscopic analysis.

The research question for this project is "Which type of bio-char is the most efficient adsorbent for removing pollutants from waste water?"

Hypothesis

If the chemical environment (independent variable) of the bio-char and wastewater solution favors formation of a chelated complex, **then** it will result in the most efficient bio-adsorption (dependent variable).

Procedures, Calculations and Data Analysis

A) Preparation of aqueous waste solutions.

a. Weigh 1 g of $CuSO_4$ using a digital balance.

b. Transfer the weighed $CuSO_4$ into a 1 L volumetric flask and add water to fill to the 1 L mark.

c. Use a magnetic stir bar and stir plate to completely dissolve the salt in water.

d. Measure pH and temperature of the resulting solution.

B) Bio-adsorbent study with various nut shells

a. Measure 100 mL of the $CuSO_4$ solution using a 100 mL graduated cylinder.
b. Weigh measured amount of selected nut (raw peanut, roasted peanut, pistachio, pecan, chestnut). (Figure 9)
c. Transfer weighed amount of nut and measured volume of $CuSO_4$ solution into a 250 mL beaker.
d. Cover the beaker with a plastic sandwich bag.
e. Use a plastic pipet to collect liquid samples for spectrometric analysis and tweezers to collect nut shells for microscopic analysis.

C) Colorimetric study of solution to evaluate various bio-char as bio-adsorbent.

a. Connect Vernier colorimeter to Lab Quest data acquisition unit, turn on the power and warm-up instrument for 5 minutes.
b. Fill the cuvette ¾ with distilled water and calibrate to read 0.00 for blank at the maximum wavelength (λ_{max}).
c. Fill the cuvette ¾ with the sample solution and place in the colorimeter to read absorbance of the solution.

D) Scanning electron microscopy (SEM) of various bio-char as bio-adsorbent

a. Clean a Aluminum stub with alcohol and apply a double sided carbon tape.
b. Place the bio-char on the carbon taped aluminum stub and carefully insert prepared sample in the holder of a FEI Quanta 200 SEM with backscatter electron imaging capability.

c. Set working distance (WD) to 10 mm, voltage (HV) to 20 kV and magnification to 30X.
d. Acquire image of the samples using a Bruker energy dispersing spectrometer.
e. Use the Espirit software to analyze spectra to identify identity and location of elemental composition.

Calculations

% change in absorbance = {(Day 7 absorbance – Day 1 absorbance)/Day 1 absorbance}*100

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http://www.masterorganicchemistry.com/2010/10/06/functional-groups-organic-chemistry/

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http://www.vernier.com/products/sensors/spectrometers/visible-range/v-spec/

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http://www.aboutpeanuts.com/

http://extension.uga.edu/agriculture/crops/peanuts/

Completing the Abstract:

Abstracts are limited to a maximum of 250 words and must fit within the predefined area. Please be sure to consult the information from your local or regional fair for the proper formatting of the header information as fairs differ in what is required (or not allowed).

The abstract **should include the following:**

A) Purpose of the experiment
B) Procedure
C) Data
D) Conclusions

It may also include any possible research applications. Only minimal reference to previous work may be included. An abstract **must not include the following:**

A) Acknowledgements (including naming the research institution and/or mentor with which you were working), or self-promotions and external endorsements
B) Work or procedures done by the mentor

Tips for Writing an Abstract:

A project abstract is a brief paragraph or two (limited to 250 words or 1,800 characters) highlighting and/or summarizing the major points or most important ideas about your project. An abstract allows judges to quickly determine the nature and scope of a project.

- Emphasize these aspects: purpose (hypothesis), methods (procedures used), data summary or analysis, and conclusions.
- Focus only on the current year's research.
- Omit details and discussions.
- Use the past tense when describing what was done. However, where appropriate use active verbs rather than passive verbs.
- Use short sentences. Don't abbreviate by limiting articles or other small words in order to save space.
- Avoid jargon and use appropriate scientific language.
- Use concise syntax, correct spelling, grammar, and punctuation.

Avoid a Rewrite:

- Focus on what you did, not on the work of your mentor or of the laboratory in which you did your work.
- Do NOT include acknowledgements, self-promotion, or external endorsements. Don't name the research institution and/or mentor with which you were working, and avoid mentioning awards or honors (including achieving a patent) in the body of the abstract.
- Be sure to emphasize the current years' research. A continuation project should only make a brief mention of previous years' research (no more than a sentence or two).