Philip Michael Pennington

Science Fair

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**School Science Fair**

4th – 8th Grade February 9th, 2023

**Prince William Manassas Regional Science and Engineering Fair(PWMRSEF) (at KLC)**

Phase I: Virtual Judging- Mar 8th – Mar 15th, 2023

Phase II: In-person Judging (6 finalists per category) and Award Ceremony- Mar. 18th, 2022

**Please submit page 12 of this document to Mr. Johnson by Nov. 22nd**

**Protocol Forms can be submitted as necessary, but as soon as possible.**

**Categories and Topic Descriptions**

*T****eam*** *projects (consisting of no more than three students) are allowed****.*** Only projects from grades 6-8 are eligible for advancing to the PWMRSEF.

|  |  |
| --- | --- |
| **Category**  | **Project Focus**  |
| **Animal Sciences (AS)**  | genetics, physiology, pathology, and systematics |
| **Behavioral and Social Sciences (BE)**  | human clinical and developmental psychology, cognitive physiological psychology, and sociology |
| **Biochemistry (BI)**  | chemical processes within and relating to living organisms |
| **Chemistry (CH)**  | analytical chemistry; inorganic chemistry; organic chemistry; and physical chemistry  |
| **Computational Biology and Bioinformatics (CB)** | Computational biomodelling, epidemiology, evolutionary biology, neuroscience, pharmacology, and genetics |
| **Computer Science (CS)**  | algorithms and data bases; artificial intelligence; networking and communications; graphics, simulations/virtual reality; computer and operating systems; computational science; and software engineering  |
| **Earth & Planetary Sciences (EP)**  | Climatology; weather; geochemistry; mineralogy; paleontology; geophysics; and tectonics  |
| **Engineering (EN)** | Civil, constructional, chemical, industrial, electrical, computer, and mechanical engineering, materials science, bioengineering, and robotics |
| **Environmental Sciences (EV)**  | air, soil, and water pollution/quality, bioremediation, environmental engineering, land resource management, recycling, and waste management |
| **Materials Science (MS)** | Product testing, product development (biomaterials, ceramic and glasses, composite materials, computational and theory, electronic, optical, and magnetic materials, nanomaterials, polymers |
| **Mathematical Sciences (MA)**  | probability and statistics, and applied mathematics |
| **Medicine & Health Sciences (MH)**  | disease diagnosis and treatment; epidemiology; human genetics; and pathophysiology  |
| **Microbiology (MI)**  | bacteriology; virology; microbial genetics; antibiotics, and antimicrobials  |
| **Physics (PH)**  | Newtonian physics, instrumentation and electronics, nuclear and particle physics, optics/lasers, and theoretical physics |
| **Plant Sciences (PS)**  | Agriculture; agronomy; horticulture; forestry; plant taxonomy and evolution; plant physiology; plant pathology; and plant genetics  |
| **Robotics and Intelligent Machines (RI)** | Biomechanics, cognitive systems, control theory, machine learning, and robot kinematics |

Additional information regarding team projects can be found in the *https://student.societyforscience.org/international-rules-pre-college-science-research*. The goal of the regional fair is to allow students to exhibit projects that are similar in research focus in each category. Consistent identification of category place across individual schools is extremely important. Please call us at 703.791.7240 if you have questions regarding the focus of specific project research. *Regional Science Fair reserves the right to re-assign projects to ensure consistent and fair placement for competition*

**Project Components**

The Pennington Traditional School Science Fair is offered as an optional but rewarding experience to challenge yourself to research and present a topic to your community.

Students may work in groups of 1, 2, or 3, and may be from different grade levels unless you are wishing to advance to the PWMRSEF, then all group members must be in grades 6 – 8.

All students (4th – 8th) have the option to produce a traditional tri-fold science fair project. However, students in grades 6-8 wishing to qualify to compete in the regional science fair at the Kelly Leadership Center must produce a PowerPoint and have a video ready for the regional fair submission. The video will not be used for the Pennington fair.

* PowerPoint presentation must be no more than 10 slides.
* A video presentation of the ppt slides no more than 7 minutes.

Tutorials are provided to all students on the [PWMRSEF public website](https://flipgrid.com/d6d6b8c0). These include:

* How to create an effective PPT presentation
* How to create an effective video presentation
* How to create a presentation using Flipgrid
* How to post your presentation on YouTube
* How to upload your project presentation into the *RocketJudge* platform

***Note: Students should not identify, or show, their school, teacher, or own first/last names, and faces on the video, ppt, or tri-fold to ensure anonymous judging of the projects.***

**Prince William – Manassas Regional Science and Engineering Fair**

***JUDGING CRITERIA (6-8)***

|  |  |  |
| --- | --- | --- |
| **Criterion** | **Description** | **Points** |
| Title | A sentence that relates the independent and dependent variables | 0-5 |
| Experimental Design | The experimental process: Question (5pts) Literature Review**\*\*** (5pts) Hypothesis(5pts) Independent Variable (I.V.) (5pts) Dependent Variable (D.V.) (5 pts) Constants (5 pts) Control (5pts) | 0-35 |
| Materials & Procedures | List of materials used (5pts)Explain procedures (5pts) | 0-10 |
| Results\*: Data Table, Graph. Written Explanation | Data Table (5pts)Graph (5pts)Written Explanation (5pts) | 0-15 |
| Conclusion | R=Recall (2pts)E=Explain (2pts)R=Results (2pts)U=Uncertainty (2pts)N-New (2pts) | 0-10 |
| Creativity\* | Innovation and quality of Ideas | 0-15 |
| Presentation | Understanding basic relevant science, interpretation and limitations of results  | 0-10 |
|  | **Total** | **100** |

***\*Considerable emphasis is placed on these two criteria at this level***

***\*\**** Describe the background research, rationale, and purpose for the investigation. Use three questions to guide your writing of the introduction.

* What is the science behind your project? (Research)
* Why did you conduct the experiment? (Rational)
* What did you hope to learn? (Purpose)

**Rules for Conducting Experimentation**

**The PWMRSEF is an affiliate of the Intel ISEF. Policies and forms are vertically aligned to ensure compliance and consistency for all projects at all levels. Projects that do not adhere to the safety/sanitation guidelines might be disqualified.**

1. **Experimentation with microorganisms**

Microorganisms include, but are limited to, bacteria, fungi (including molds), yeasts, and viruses.

Middle (Grades 6-8) Division participants are allowed to collect microorganisms of unknown origin from the environment (e.g. swabbing common surfaces, skin, soil). Cultures can be collected at home if they are immediately sealed and transported to an approved experimentation location.

**Students are prohibited from cultivating microorganisms at home.**

Note: These rules do not apply to projects involving composting or decomposition of foods if projects are terminated at the first sign of microbial growth.

Experiments that involve cultures of known BioSafety Level 1 microorganism (BSL-1) or of unknown origin from swabbing must be:

* Cultured in plates that are sealed with paraffin or placed in heavy-duty sealed plastic bags;
* Disposed under the supervision of the designated supervisor while wearing a lab coat and disposable gloves and using any of the following aseptic techniques: autoclaving at 121°C for 20 minutes, soaking in 10% bleach solution for 10 minutes, or incinerating.
1. **Human (Research) Participants and Vertebrate Animals**

***Vertebrate Animals***

Students must obtain **prior approval** for any project proposal involving vertebrate animals (fish, amphibians, reptiles, birds, and mammals) or humans. Students must complete the “Student Protocol for Research Involving Vertebrate Animals” or the “Student Protocol for Research Involving Human Participants” form and return it to the teacher for approval before any experimentation takes place. It is unethical to falsify any information on the forms.

Alternatives to the use of vertebrate animals for research should be explored. Alternatives include the “3 R’s”: **R**eplace vertebrate animals with invertebrates, lower life forms, tissue/cell cultures or computer simulations; **R**educe the number of animals without compromising statistical validity; and **R**efine the experimental design to lessen the pain or distress of the animal.

Projects involving vertebrate animals must only be observational in nature and must not interfere with the normal life processes of the organism. There may not be handling of the vertebrate animal in any way that interferes with its life processes. It is recommended that a veterinarian is consulted in experiments that involve supplemental nutrition and/or activities that would not be ordinarily encountered in the animal’s daily life. The following studies on vertebrate animals are **prohibited**:

* No vertebrate organism may be subjected in any way to stress (nutritional deficiency, oxygen deprivation, etc.) Behavioral studies involving mazes or other artificial structures are permitted if the effects of the structure are not stressful to the animal.
* Studies involving pain
* Live predator/prey experiments (simulations are allowed)

***Human Participants***

Informed consent (permission slips) is necessary for some research with humans. Obtaining consent involves informing potential participants (and where applicable, to the parents or guardians of minors) of the potential risks and benefits of the study and allows the subject to make an educated decision to participate or to decline. Obtaining documentation of informed consent in the form of a permission slip completed by the parents/students is NOT necessary in the following cases:

* Research as a part of normal educational practices
* Research on induvial or group behavior or characteristics of individuals where the research does not manipulate the subject’s behavior in a harmful way
* Surveys and questionnaires determined by the teacher and/or administration to involve perception, cognition, or game theory and do not involve gathering personal data
* Studies involving physical activity where no more than minimal risk exists and where the probability and magnitude of discomfort anticipated in the research are not greater than those ordinarily encountered in daily life.
1. **Biological Agents**

Due to the safety risks associated with handling potentially hazardous biological agents, proposals for projects that involve human or vertebrate tissue/fluids MUST be reviewed and approved by your teacher.

Middle (Grades 6-8 Division: Students ARE allowed to conduct experiments with human or vertebrate tissues that are: 1) meat or meat by-products from a store or restaurant treated to inhibit bacterial growth, naturally shed or cut hair, fossilized tissues, and sterilized teeth; 2) student’s own bodily tissues, as long as the experimental proposal is pre-approved by your teacher and tissues are treated as BSL-1 biohazard; and 3) tissues from a biological supply house/catalog, hospital, or certified doctor/laboratory as long as the proposal is pre-approved by your teacher and the tissues are treated BSL-2 biohazard.

**Teacher approval of biological agents will include submission of proposal and approval by the PWMRSF review board via Julia Renberg at** **renbergj@pwcs.edu****.**

**Prohibited in Experimentation**

Chemicals listed as “prohibited” in the *2021-22 PWCS Science Education Safety Plan.* Contact your teacher if you have questions or concerns about permitted chemicals.

All DEA controlled substances, prescription drugs, consumable alcohol, and tobacco.

Firearms, pneumatic guns, and other weapons and ammunition as defined by the PWCS Code of Behavior

The following potentially hazardous biological agents are NOT allowed:

* Blood, skin cells, urine, saliva, tears, sweat, or other body fluid or tissue NOT from the student themself.
* Biological agents that pose risk of infection or to the environment, including those that cause tuberculosis, pneumonia, food poisoning, and staph infection (MRSA).

Ionizing radiation has enough energy to remove tightly bound electrons from atoms, thus creating ions. Examples include high frequency UV, X-Rays, and gamma rays.

**Allowed in Experimentation**

The following low-risk biological agents are allowed but must remain in a sealed environment:

* Baker’s yeast and Brewer’s yeast
* Nitrogen-fixing bacteria, oil-eating bacteria, and *Bacillus thuringiensis* (a common bacterium that lives in soil and are harmful to insects), slime mold, and algae-eating bacteria, and *Lactobacillus* (bacteria found in yogurt and other dairy products).
* Mold grown on food items
* Meat or meat by-products from food stores, restaurants, or packing houses
* Hair and sterilized teeth
* Specimens fixed on commercially prepared slides
* Blood, skin cells, urine, saliva, tears, sweat or other body fluid or tissue from the student themselves (BSL-1 biohazard), if the proposal is pre-approved by the teacher.

Non-ionizing radiation normally encountered in everyday life is allowed. Class I lasers of low power or higher power embedded lasers found in in laser printers and other office machines, and Class II lasers that emit radiation in the visible light spectrum are allowed.

Heat and open flames during the experimentation are allowed, but only under direct adult supervision.

*When in doubt, contact your teacher who can consult with the science department as needed.*

**Student Protocol for Research Involving Human Participants**

**Please print legibly or type**.

Participant’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Grade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project Category: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explain why human participants are proposed or necessary for this research.

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1. Describe if there any potential risk (physical, psychological, or legal) involved.

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1. How will your participants be informed of procedures involved in the investigation?

**Informed consent is mandatory.**

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1. What is the potential benefit or practical application of this research?

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**Teacher Validation of Approval PRIOR to Research**

My review of this project plan indicates that there are no risks for this student researcher or for the humans involved in this investigation.

Teacher/Supervisor Name (Please Print)

Teacher/Supervisor (Signature)

School Administrator’s Initials: \_\_\_\_\_\_\_\_

**Student Protocol for Research Involving Vertebrate Animals**

**Please print legibly or type**.

Participant’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Grade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project Category: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explain why vertebrate animals are proposed or necessary for this research.

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1. Describe if there any potential risk (physical, psychological, or legal) involved.

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1. Describe animal care procedures to be used during experimentation.

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1. If an animal is acquired for this project, what is the source and what is your plan for the animal after the project is completed?

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1. What is the potential benefit or practical application of this research?

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**Teacher Validation of Approval PRIOR to Research**

My review of this project plan indicates that there are no risks for this student researcher or for the vertebrate animals involved in this investigation.

Teacher/Supervisor Name (Please Print)

Teacher/Supervisor (Signature)

School Administrator’s Initials: \_\_\_\_\_\_\_\_

**Student Protocol for Research Involving**

**Potentially Hazardous Chemical Substances, Activities, or Devices**

Certain Hazardous Biological and Chemical Materials are prohibited/restricted at PWCS.

Prior to filling in this form, please check for details with your Science Fair Coordinator.

**Please print legibly or type**.

Participant’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Grade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project Category: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Provide a list of chemicals/activities/devices and explain why they are proposed for this research.

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1. Describe potential risks and protective measures to be followed.

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1. Are any of them prohibited at Prince William County Public Schools per the 2018-19 PWCS *Student Code of Conduct*? (If yes, list the names and amounts to be used).

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1. What is the potential benefit or practical application of this research?

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**Teacher Validation of Approval PRIOR to Research**

 **Student Protocol for Research Involving Biological Materials**

My review of this plan indicates that:

1. No substances from the PWCS 2018-19 *Science Safety Plan* “Prohibited Substances List” will be used; and
2. There are no risks involved or that *the potential risks are properly recognized and will be minimized to an acceptable level through the use of administrative controls and/or personal protection equipment.*

Teacher/Supervisor Name (Please Print)

Teacher/Supervisor (Signature)

School Administrator’s Initials: \_\_\_\_\_\_\_\_

PWMRSF Science Review Committee Approval

**(Micro Specimens and Biological Tissues)**

Certain Hazardous Biological and Chemical Materials are prohibited/restricted at PWCS.

Prior to filling in this form, please check for details with your Science Fair Coordinator.

**Please print legibly or type**.

Participant’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Grade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Project Category: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Specify microorganisms (yeast, mold, or probiotic bacterial cultures) or biological tissues (urine, blood, muscle, bone, etc.) that you plan to use and explain why they are proposed for this work.

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1. Describe potential risks involved and personal protective measures to be followed.

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1. What is the source of your biological tissues or microorganisms?

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1. Describe disposal procedures.

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1. What is the potential benefit or practical application of this research?

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**Teacher Validation of Approval PRIOR to research**

My review of this plan indicates that the student understands proper techniques for handling and that there are no risks for the students while working with identified biological agents.

Teacher/Supervisor Name (Please Print)

Teacher/Supervisor (Signature)

School Administrator’s Initials: \_\_\_\_\_\_\_\_

PWMRSF Science Review Committee Approval

**Science Fair Proposal Form**  **Due Date 11/22/22**

# Names of Group Members and Grade

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **Question/Problem being explored:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**The *category* is:(Circle) –**

|  |  |  |  |
| --- | --- | --- | --- |
| AS Animal Science | BE Behavioral/Social Science | BI Biochemistry | CH Chemistry |
| CB Computational Biology & Bioinformatics | CS Computer Science | EP Earth & Planetary Science | EN Engineering |
| EV Environmental Science | MS Materials Science | MA Mathematics | MH Medicine & Health |
| MI Microbiology | PH Physics | PS Plant Science | RI Robotics & Intelligent Machines |

*You cannot change your project option selected after the proposal form is turned in unless approved by your teacher.*

I understand that this is a long-term project.

*I have reviewed the science fair procedures packet and agree to assist and encourage my child to meet all deadlines.  I will also foster a sense of responsibility for my child’s academic achievement.*

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***Parent Signature                   Date***

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***Student Signature                   Date***