

# SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH (STEM)

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**Superintendent: Samantha Basile**

## 1. Science Experiments and Exhibits

This division allows participants a chance to learn about and experience science concepts in an area of agriculture, human ecology, or life sciences that the participant really enjoys.

### STEM Rules

- Entries must have been created in the current year and since the 2022 Erie County Fair.
- Premiums and ribbons for group projects will go to the club or 4-H after school group. The group/club leader will complete the entry form, not the individual members.
- Any project and its corresponding pieces/equipment/posters must be entered together in one of the following classes.

### Awards:

**Blue - \$3.50   Red - \$2.50   White - \$1.50**

### Class #

**1A. Experiments** – For an experiment, a project must include a poster made of heavy poster paper no smaller than 14 inches by 22 inches OR a formal typed report including the below information.

- Introduction- Describe what led you to completing this experiment. Was it to answer a problem you had or to test the effects of outside influences?
- Hypothesis- Describe your hypothesis, your prediction for what will happen during the experiment.
- Procedure- Describe the steps you took in order to complete the experiment. Be as detailed as possible.
- Observations and Results- Describe what you observed throughout the experiment. Some ways to organize this information is in an organized chart or table. If you observed the physical change of something, you can take photographs throughout the experiment. There should still be a written summary of this information.
- Conclusion- Based off what was observed during your experiment, was your hypothesis correct or incorrect. State what about your observations confirms or denies your hypothesis.
- Creativity is encouraged.

**1B. Public Service Projects** – These exhibits can be of any public service or public education activity you took part in that had a scientific component to it. Watershed rehabilitation, recycling programs and educational models are just a few of the possibilities here. In any case, the project exhibit poster must include the following information on a poster made of heavy poster paper no smaller than 14 inches by 22 inches.

- Be clearly labeled with a title and description of the project.
- Explain how it relates to service and why are you interest in the project.
- A summary or description of what was completed throughout the service project.
- Any photographs or other articles from the project.
- Creativity is encouraged.

**1C. Descriptive Science** - These science projects, which are not experiments and are not applied service projects, but do consist of systematic observations and tell us about the natural world. Your exhibit should include the following information either on a poster made of heavy poster paper no smaller than 14 inches by 22 inches OR a formal typed report including the below information.

- There could be summaries of the observations in behavior, growth or other changes.
  - This could be for projects such as observing how the local bird population changes with the seasons, where flies like to breed in the barn, or how many bites of food different animals eat per minute, etc.
- There could be collections and classifications of materials which display physics or biological articles.
- Creativity is encouraged.

**Related Geospatial Science Project** – 4-H exhibits that show skill and knowledge learned through 4-H GPS and GIS projects.

**2A. 4-H GIS Maps** – Maps made using ESRI (Environmental Systems Research Institute, Inc.), Arc GIS software or other mapping software. Criteria and guidelines for community mapping projects **can be found by contacting the 4-H office.**

**2B. GIS or GPS project or activity** – Undertaken by individual or group. Exhibit may be in the form of a project record book, photo documentation, video, CD, DVD, etc. Exhibit must include the following.

- The purpose of the project activity.
- The outcome of the project activity.
- Creativity is encouraged.

**2C. Story or Outline of a 4-H GIS or GPS Project-** This project can be made of heavy poster board paper no smaller than 14 inches by 22 inches OR a formal typed report including the below information.

- The purpose of the project.
- The summary or results from the activity.
- Photographs or other articles from the activity.
- Creativity is encouraged.

**2D. Community Service/Youth Community Action Mapping Project** – A mapping GPS project built around a specific community issue or project. This project can be made of heavy poster paper not smaller than 14 inches by 22 inches OR a formal typed report including the below information.

- The purpose of the project.
- The procedure taken in order to complete the project.
- Your observations and summary of what was observed. This can include photographs of information organized in a chart.
- The summary of your results for the project.
- Creativity is encouraged.

**2E. Educational Poster Exhibit** displaying 4-H GPS or GIS activities. This should include a summary on the activity and photographs or other articles from the activity.

### 3. Educational Displays

A series of posters (at least 14" x 22") and/or a 3-dimensional exhibit related to an engineering science project.

- Display should be self-explanatory through use of sign or labels and limited to approximately card table size.
- Topics may include such things as engine parts or bicycle parts display boards, electric circuit boards, and electric quiz games, safety rules for bicycling or working in a wood shop or with electricity.
- Entry will be evaluated on the purpose or principle idea, effectiveness in illustrating one idea, appearance, arrangement and description of the display.
- Exhibit must be self-explanatory.
- Creativity is encouraged.

### 4. Related Science Projects

Any article made as part of a directly related engineering science project that is not included in the Electrical section or the Wood Science section or in classes 1-3 above. Kits are not acceptable for youth 14 years or over. An article might be metalworking, cardboard carpentry, and safety items.

### 5. Horticulture Experiments including Soil Science

The intent of this division is to generate an interest among young people in a science-based approach to horticulture. **Guidelines and suggestions for the exhibitor working with plants:**

Both how you plan your experiment and the final description for your display should include the following sections:

- **Background.** Describe why you did this experiment and why it is important to you and other people.
- **The Question** (or hypothesis). What specific question does your experiment try to answer? For example: "Does watering geraniums with coffee increase their growth?"
- **Methods.** Outline how you did the experiment. Be sure to include:
  - a) Treatments – Describe specifically what you are comparing as treatments. Remember that you should have a check treatment (what is usually done) and the 'test' treatment. From the above question: Check = watering with water, and treatment = watering with coffee.
  - b) Measurements – Describe what you are measuring (weight, height, etc.) and why. Include observations of the plants over the course of the experiment.
- **Results.**
  - a) What did your measurements tell you about the treatment compared to the check? Was there a difference and if so, why do you think so? Use tables, graphs or pictures to share what you learned.
  - b) What other things did you notice in your observations?
- **Conclusions.** What did you learn? What is important about your results to other people? What would you suggest to someone else, based on what you learned?

**THE DISPLAY** should be interesting, attractive and neat, so that people will want to stop and learn about what you did. It should:

- Include actual examples of treated and untreated plants, if possible, otherwise use drawings or photographs.
- On sheets of paper, describe your study using the above 5 sections.
- Use big print so that it is easy to read from 3 feet away.
- Glue these sheets, along with any photos or graphs to heavy poster paper (14" x 22" minimum) for display.

**6. 3D PRINTING:** 3D printing uses plastic or other materials to build a 3-dimensional object from a digital design. Youth may use original designs or someone else's they have re-designed in a unique way. Youth must bring their finished printed object (we cannot print objects at Fair). Exhibits will be judged based on the complexity of the design and shape. Must include the following:

- a. Software used to create 3D design.
- b. Design or, if using a re-design, the original design and the youth's design with changes.
- c. Orientation that the object was printed.

**6A. 3D Unique Object-** 3D objects printed for their own sake. This may be an art design, tool or other object. The following must be included on a small poster OR written report.

- Software used to create 3D design.
- Design or if using a re-design, the original design and the youth's design with changes. These may be photographs of their design off the program.
- Orientation that the object was printed.

**6B. 3D Prototypes-** 3D objects printed as part of the design process for robot or other engineering project. The following must be included on a small poster OR written report.

- Must include statement of what design question the prototype was supposed to answer and what was learned from the prototype.
- Software used to create 3D design.
- Design or if using a re-design, the original design and the youth's design with changes. These may be photographs of their design off the program.
- Orientation that the object was printed.

**7. SIMPLE MACHINE CREATION-** This category allows for the creation of a scientific project based off the different types of simple machines. Simple machines include levers, wheel and axel, inclined plane, wedge, pulley or screw. The below information must be included on a poster no smaller than 14 inches by 22 inches OR a written report.

- The purpose of the project and what it is to accomplish.
- Where the simple machine(s) are located in the project and explaining their purpose.
- The ability of your project to complete its purpose.
- Creativity is encouraged.

**8. VOCATIONAL EDUCATION:** Exhibit constructed from Cold Metal, Sheet Metal, Welding, or CNC Design.

- A. Small Projects: Finished project valued at up to \$50 (ex. Planter boxes, garden art, decorative art work, signs, hangers, bottle racks)
- B. Medium Projects: Finished project valued at \$51-\$200 (ex. Planter boxes, fire pit, decorative art, benches, truck/vehicle accessories, BBQ)
- C. Large Projects: Finished project valued at \$201 or more.
  - 1. General Farm Equipment
  - 2. Shop Equipment
  - 3. Other

**9. ENGINE:** Please attach a 3"x5" card detailing the steps that were done in restoring engine.

- A. Small Engine
- B. Tractor
- C. Other

**10. INTERLOCKING BUILDING TOYS (Lego's, K'NEX, etc.):** All entries must be an original design or adaptation. Kits are allowed if 1,000 or more pieces. Must be firmly mounted (wood, plastic, metal base, NO cardboard). Must be able to be carried by one person, no backdrops allowed. Below are the categories that the design must fit.

- Structure
- Animal
- Vehicle
- Mechanical (motorized, must move)
- Other

**10A. Small-** under 200 pieces (max 10"x1 10" x 24" H) Base max of 12x12

**10B. Large-** 201 pieces and up (max 15" x 33" x 36" H) Base max of 32" x 32"

**10C. Kit-** Base max of 32" x 32" Remember: Kits must be 1,000 pieces or more.

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**NOTE:** Special Requirement for 4-H exhibitor who will not be talking with the Fair Evaluator

For any 4-H member who is unable to bring his/her exhibits/entries to the 4-H Youth Development Building on Saturday, August 5, 2023, to speak personally with the evaluator, the following Exhibitor Information Statement is required to be completed for each exhibit/entry. The evaluator will be requiring this in order to accept the exhibit/entry. (Cloverbuds should complete this information to the best of their abilities; regular 4-H'ers (ages 8-18 as of January 1<sup>st</sup>) should complete these statements fully in their own handwriting if possible. Age and experience will be taken into consideration.)

1. What is the Kind \_\_\_\_\_ and Variety \_\_\_\_\_ of your exhibit (relates to vegetables, flowers, etc.)
2. Describe what you did to complete this project. Provide a list of materials, products and/or equipment used and why they were selected. Briefly explain your methods of construction process and your source of ideas. (3-5 sentences are sufficient)
3. In approximately 3 – 5 sentences, describe your feelings about this project: what you learned, what challenged you, and /or how you would improve your exhibit in the future.
4. Additional information requested in the Section for this class (Be sure to read complete guidelines in the section)
5. Additional information or special needs to be noted by the evaluator.