

website, blog, or app for providing information about a topic related to youth. Include an explanation of why the entry was created. Any current website, blog, or app development platform is accepted such as Google Sites, iBuildApp, Wix, etc. If the website, blog, or app isn't live, include all files on a flash drive in a plastic case. Exhibitors must provide a hard copy QR code for viewing. It is recommended to test codes or links on several devices to check for appropriate permissions for public viewing.

Class 7

**3D Printing [SF1050]:** 3D printing uses plastic or other materials to build a three-dimensional (3D) object from a digital design (including 3D Pen Creation). Youth may use original designs or someone else's they have redesigned in a unique way. Exhibits will be judged based on the motivation and/or problem identified. For example, 3D objects printed as part of the design process for a robot or other engineering project. Must include design notebook that addresses the following questions:

1. What was the motivation for your design or the problem you were solving with your design? i.e. Is your item a functional or decorative piece?
2. Please include a picture of original design, citation of designer/website OR if design is completely original (you created it using CAD software), then state that it's original. If item was not completely original, indicate what you did to the original design to modify it to better meet the design problem stated in #1 above. If its design was modified multiple times, please indicate what change was made with each modification, and what prompted the need for the change. (i.e. I printed it and the design was too fragile, so I resliced the print to make thicker external walls, or to have a denser infill.)
3. Define your process for designing/printing. What software and/or hardware was used (indicate type of 3D printer or if item was created with 3D pen)?
4. What materials were selected for your project?
5. If your final design has any moving parts, define how you determined appropriate allowance in your design.
6. Identify any changes that you would make to improve your design.

Class 8

**Maker Space/Digital Fabrication [SF1051]:** This project is a computer-generated project created using a laser cutter, vinyl cutter, heat press or CNC router. Vector or 3D based software such as Corel Draw or Fusion 360 would be an example of an appropriate software used to create your finished project. Project should include a notebook with the following:

1. What motivated you to create this project
2. Software and equipment used
3. Directions on how to create the project
4. Prototype of plans
5. Cost of creating project
6. Alterations or modifications made to original plans
7. Changes you would make if you remade the project

**Team Entry Option:** To qualify for entry at the Nebraska State Fair team, materials entered in Class 8 – Maker Space/Digital Fabrication must clearly be the work of a team instead of an individual, and must have at least 50% of all team members enrolled in 4-H. Additionally, all enrolled 4-H members on the team should complete and attach an entry tag to the materials. A supplemental page documenting the individual contributions to the project should be included. The entry will be judged as a team, with all team members receiving the same ribbon placing.

# ELECTRICITY

## ELECTRICITY GUIDELINES

- In this category 4-H Members have the opportunity to create informational exhibits about the different aspects of electricity.

Through involvement in this category 4-H Members will be better educated about electricity and be able to present their knowledge to others.

- The name and county of each exhibitor should appear separately on the back of each board, poster, or article and on the front cover of notebooks so the exhibitor may be identified if the entry tag is separated from the exhibit.
- Several classes require a display board which should be a height of 24" and not to exceed ¼" thickness. A height of 24 7/8" is acceptable to allow for the saw kerf (width) if two 24" boards are cut from one end of a 4-foot by 8-foot sheet of plywood. Nothing should be mounted within ¾" of the top or bottom of the board. (Example: Woodworking & Electricity).
  - Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
  - Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
  - Demonstration boards should include an overall title for the display, plus other necessary labeling.
  - Reports should be written using the scientific method whenever possible (Background; Question or Hypothesis; What you planned to do and What you did; Method Used and Observations; Results and What you learned). All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
- Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4helectricity>
- Educational resources can be found at: [https://4hcurriculum.unl.edu/index.php/main/program\\_project/126](https://4hcurriculum.unl.edu/index.php/main/program_project/126)

## DEPT. H / DIV. 870

### ELECTRICITY

#### GENERAL INFORMATION [Scoresheets SF224-231]:

- Explore electrical insulation; Learn about the effects of magnetism; Build an electromagnet or electric motor; Decode circuit diagrams; Build circuits and test voltages; Build a rocket launcher or a burglar alarm; Measure electrical usage; Replace electrical switches; Evaluate light bulbs and test for electrical power; Explore LED's and SCR's, transistors, and the construction of an SCR intruder alarm; Learn the basics of solid-state electronics; Build a blinking flasher and an amplifier.

### MAGIC OF ELECTRICITY: UNIT 1

[Scoresheet SF230]:

#### (NOT Eligible for State Fair)

- Class 901 **Bright Lights:** Create your own flashlight using items found around your house. Flashlights should be made out of items that could be recycled or reused.
- Class 902 **Control the Flow:** Make a switch or circuit that can open and close. Items used could include, but are not limited to the following: D cell battery, battery holder, insulated wire, 2- or 2.5-volt light bulb, bulb holder, paper clip, cardboard, brass paper fasteners.
- Class 903 **Fork in the Road:** Construct one parallel and one series circuit. Items used could include, but are not limited to the following: D cell battery, battery holder, insulated wire, 2- or 2.5-volt light bulb, bulb holder, paper clip, cardboard, brass paper fasteners.
- Class 904 **Other Electric or Electronic Exhibit, Poster, or Display:** Exhibits that are made from household, reusable, or recyclable items. Projects could include, but are not limited to the following: nonwooden quiz box, non-wooden steady hand tester, a battery-operated simple circuit, homemade battery powered electric motor, insulator vs conductor, etc.

### INVESTIGATING ELECTRICITY: UNIT 2

[Scoresheet SF230]:

## **(NOT Eligible for State Fair)**

- Class 905 Switching Circuit: Build a three-way switch. Items used could include, but are not limited to the following: D cell batteries, battery holders, light bulb, bulb holder, cardboard, brass paper fasteners, wire. Write a short essay or create a poster that illustrates how three-way switches function.
- Class 906 Rocket Launcher: Construct a rocket launcher. Items used could include, but are not limited to the following: plastic pencil box, single pole switch, single throw switch, normally-open push button switch, wire, alligator clips, metal rod, rosin core solder, rocket engine igniters. You must successfully build a rocket launcher and light two rocket igniters with your launcher. You DO NOT have to actually fire a rocket off of the launcher. Create a poster or display using photographs to show the "step by step process" used to build the launcher.
- Class 907 Stop the Crime: Build an alarm. Items used could include, but are not limited to the following: On-off push button switch, mercury switch, buzzer-vibrating or piezoelectric, battery, rosin core solder, wire, a plastic box with a lid to mount alarm circuit. Create a poster or display using photographs to show the "step by step process" you used to build your alarm.

## **WIRED FOR POWER: UNIT 3**

[Scoresheets SF224-227]:

- Class 1 Electrical Tool/Supply Kit [SF224]: Create an electrical supply kit to be used for basic electrical repair around the house. Include a brief description of each item and its use. Container should be appropriate to hold items.
- Class 2 Lighting Comparison [SF225]: Display studying the efficiency of various lighting (incandescent, fluorescent, halogen, Light Emitting Diodes, etc.). Exhibit could be a poster, display, or an actual item.
- Class 3 Electrical Display/Item [SF226]: Show an application of one of the concepts learned in the Wired for Power project. Examples include: re-wiring or building a lamp, re-wiring or making a heavy-duty extension cord or developing an electrical diagram of a house. Exhibit could be a poster, display, or an actual item.
- Class 4 Poster [SF227]: Poster should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 22" x 28".

## **ELECTRONICS: UNIT 4**

[Scoresheets SF228-231]:

- Class 5 Electrical/Electronic Part Identification [SF228]: Display different parts used for electrical/electronic work. Exhibit should show the part (either picture or actual item) and give a brief description, including symbol of each part and its function. Display should include a minimum of 10 different parts.
- Class 6 Electronic Display [SF229]: Show an application of one of the concepts learned in the Entering Electronics project. Example includes: components of an electronic device (refer to p. 35 of the Entering Electronics manual).
- Class 7 Electronic Project [SF230]: Exhibit an electronic item designed by the 4-H Member or from a manufactured kit that shows the electronic expertise of the 4-H Member. Examples include: a radio, a computer, or a volt meter.
- Class 8 Poster [SF231]: Poster should exemplify one of the lessons learned in the Entering Electronics project. Posters can be any size up to 22" x 28".

about wind and its uses; Design, create, build and test a wind-powered device; Explore wind as a potential energy source in the community.

- This category provides 4-H Members a way to present their ideas about renewable energy resources. Through participation in this category 4-H Members will learn more about physics, friction, energy, and elasticity. In addition, participants will make a display to go along with their findings.
- The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of notebooks so exhibitor may be identified if the entry tag is separated from the exhibit.
- Reports should be written using the scientific method whenever possible (Background; Question or Hypothesis; What you plan to do and What you did; Method Used and Observations; Results and What you learned). All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
- Posters can be any size up to 28" by 22" when ready for display. Example: Tri-fold poster boards should not exceed 28" by 22" when fully open for display.
- Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hphysics-powerofwind>
- Educational resources can be found at:  
<https://www.energy.gov/clean-energy>  
<https://www.eia.gov/energyexplained/renewable-sources/>  
<https://www.nrdc.org/stories/renewable-energy-clean-facts>  
[https://4hcurriculum.unl.edu/index.php/main/program\\_project/133](https://4hcurriculum.unl.edu/index.php/main/program_project/133)

## **DEPT. H / DIV. 900**

### **ENERGY**

[Scoresheets SF305-308]

- Class 1 Create and Compare Energy Resources Poster [SF307]: Poster should explore 2 alternative/renewable energy resources. Compare and contrast the 2 resources including two of the following information: amount of energy created, costs of production, usability of the energy, pros/cons of environmental impacts, etc. Posters can be any size up to 28" by 22."
- Class 2 Experiment Notebook [SF305]: Notebook will explore the scientific method involving alternative/renewable energy sources. Information required: 1.) Hypothesis 2.) Research 3.) Experiment 4.) Measure 5.) Report or Redefine Hypothesis.
- Class 3 Solar as Energy Display/Poster [SF308]: Item should be the original design of the 4-H Member. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of the sun. Examples include solar ovens, solar panels, etc.
- Class 4 Water as Energy Display/Poster [SF308]: Item should be the original design of the 4-H Member. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of water.
- Class 5 Wind as Energy Display/Poster [SF308]: Item should be the original design of the 4-H Member. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of wind.
- Class 6 Other Nebraska Alternative Energy [SF306]: Notebook should explore Nebraskan alternative energy source besides wind, water, and solar power. Include information on type of power chosen, infrastructure for distribution, what resources are needed to create this alternative resource, cost of production, and potential uses of bio-products. Examples include geothermal, biomass, ethanol, bio-diesel, methane reactors, etc.

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# **ENERGY**

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## **ENERGY GUIDELINES**

- Learn basic principles of physics, such as friction, energy, elasticity; Do experiments with a radio-controlled pickup; Learn