

## SECTION X – SCIENCE, ENGINEERING, & TECHNOLOGY

### *General Information:*

- Entomology exhibits give 4-H'ers the opportunity to demonstrate their knowledge about insects and insect displays. This category has multiple projects that allows 4-H'ers to progress over numerous years.
- The Entomology project levels 1-3 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate level.
- Specimens in display collections should be mounted properly and labeled with location, date of collection, name of collector, and order name. Follow mounting and labeling instructions in the Nebraska 4-H Entomology Manual.
- Boxes are preferred to be 12" high x 18" wide, and landscape orientation, so they fit in display racks.
- Purchase of commercially made boxes is allowed. All specimens are to be pinned and labeled by the exhibitor. No purchased specimens allowed.
- No projects over 50 pounds allowed.
- Premier 4-H Science Award is available in this area.
- Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hentomology>.
- The insect of the year for the Special Entomology Project is the grasshopper.

### **Division 800 – Entomology**

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| sf Class 1 | <b>Entomology Display, First-Year Project</b> – Collection to consist of <u>25</u> or more different kinds (species) of insects representing at least <u>6</u> orders. Limit of <u>one</u> box.   |
| sf Class 2 | <b>Entomology Display, Second Year Project</b> – Collection to consist of a minimum of <u>50</u> kinds (species) of insects representing at least <u>8</u> orders. Replace damaged or poorly mounted specimens. At least <u>25</u> species must be from after July 1 of previous year. Limit <u>2</u> boxes.  |
| sf Class 3 | <b>Entomology Display, Third –Year or More Project</b> – Collection to consist of a minimum of <u>75</u> kinds (species) of insects representing at least <u>10</u> orders. Replace damaged or poorly mounted specimens. At least <u>25</u> species must be from after July 1 of previous year. Limit of <u>3</u> boxes.  |
| sf Class 4 | <b>Special Interest or Advanced Insect Display</b> – Educational display developed according to personal interests and/or advanced identification capability. This also is an opportunity to highlight favorite insects in a creative arrangement. Insects should conform to pinning and mounting standards as in Classes 1-3 and be protected in an insect box. Each specialty display should include names of the insects, interesting information about them, and why the display was made. Advanced identification collections should have insects grouped with labels that correspond with identification level (i.e. family, genus, species). A specialty collection may consist of insects by taxonomic group (e.g. butterflies, grasshoppers, dragon flies, scarab beetles) or by host, subject, or habitat (i.e. insect pests of corn aquatic insects, insect mimicry, insect galls, insects from goldenrod, insect pollinators, etc.) |

- sf Class 5 **Insect Habitats** – Habitats consist of any hand-crafted objects, made of natural or artificial materials, placed outdoors, which promote or conserve insects in the environment. Insects may include bee pollinators, butterflies, beneficial insects, etc. A one-page report describing activities must accompany the exhibit. Report should include placement, target insect, why materials were chosen, functional design, and indicators of success. See the following resources for reports:
- Nebraska Extension NebGuide: Creating a solitary Bee Hotel (G2256)
  - University of Minnesota: Wild Bees and Building Wild Bee Houses
  - National Wildlife Federation: How to Provide Water in Monarch Gardens
- sf Class 6 **Macrophotography** – Subjects should be insects, spiders, or other arthropods, or any nests, webs or constructions they make. All exhibits prints should be either 8" x 10" or 8 ½"x 11" and mounted on rigid, black 11" x 14" poster or mat board. Either orientation is acceptable. No frames or mat board framing are allowed. A caption of a few sentences should explain the subject, and be printed on white paper, and glued below the print on the poster board.
- sf Class 7 **Insect Poster/Display Exhibits** – Exhibits can be posters or three-dimensional displays, and artistic creativity is encouraged. Posters should be no larger than 22" x 28". They should be instructional and can be attractive and have pictures, drawings, charts, or graphs. Posters and displays may show any aspect of insect life, habitat, or related conservation or management. Examples include life history and other facts about an insect; insect anatomy; how to manage insects in a farm home, lawn, or garden setting; experiences rearing one kind of insect; survey of an important insect; insect behavior (ex. Nesting, finding food, mobility, defenses, etc.); habitats (i.e. forests, grasslands, wetlands, rivers, or lakes) and what insects are found there, etc. Three dimensional displays, such as dioramas, sculptures, models, or decorative boxes should have a page of explanatory information accompanying them and fit within a 22" x 28" area.
- sf Class 8 **Reports or Journals** – Reports or journals should be in a 3-ring binder. A report may be informational, that is, an original article about a favorite insect, a history of insect outbreaks, diseases caused by insects, insects as food, etc. Or, it may be a research report about an investigation or experiment done in a scientific manner. It then should have a basic introduction of the insect studied, methods used, observations, and results of the project. Tables, graphs and images are helpful to include. A journal is an observational study over a period of time with personal impressions. It may cover watching changes in kinds of butterflies over the summer, rearing a specific insect from egg to adult, managing a bee hive, observations of insects in a specific habitat, accounts of insect behavior in a forest or flower garden, etc.

## **Division 810 – Special Entomology Project**

<sup>sf</sup> Class 1	<b>Special Entomology Project Educational Exhibit</b> – based on what was learned from the project. Present information on a poster no larger than 22" x 28" either vertical or horizontal arrangement or in a clear plastic report cover. The 4-H member's name, age, full address, and county must be on the back of the poster or report cover. Reports may include life cycle, distribution of the insect, insect behavior (ex. nesting, finding food, mobility, defenses, etc.); habitats (e.g forests, grasslands, wetlands, rivers, or lakes). May include a certain species or broad overview of the family group of insects.
<sup>sf</sup> Class 2	<b>Special Entomology Project Display</b> – The current year's Special Entomology Project pinned species along with a one to two page report of what was learned from researching the insect type. Reports may include life cycle, distribution of the insect, insect behavior (es. nesting, finding food, mobility, defenses, etc.); habitats (e.g. forests, grasslands, wetlands, rivers, or lakes). May include a certain species or broad overview of the family or group of insects.

## **Dept. H – Veterinary Science**

The purpose of the Veterinary Science display is to inform the public about a common health problem of animals or veterinary science principle. Do not confuse veterinary science exhibit topics with animal husbandry, history or production topics.

### **Rules:**

- A Veterinary Science exhibit may consist of a poster, notebook or a display. The exhibit may represent material the exhibitors enrolled in Animal Disease or Animal Health.
- If photographs are to be part of the exhibit, remember that they will be viewed by the public. Make sure that the photographs are in good taste and will not be offensive to anyone. Graphic photographs of excessive bleeding, trauma or painful procedures are not appropriate. For exhibits related to veterinary surgical procedures, aseptic techniques need to be shown, for example, use of drapes, use of sterile procedures, wearing of gloves, and other appropriate veterinary medical practices.
- **First-Aid Kits:** Because of public safety concerns and risk of theft of first-aid kit contents (veterinary drugs/equipment) with perceived potential for drug abuse, animal first aid kits containing any drugs or medications will be immediately disqualified and not displayed. First Aid kits wishing to include medication information should instead utilize written descriptions, photographs, drawings, computer generated print-outs, or empty packaging of pharmaceuticals.
- **Veterinary Science Posters:** This exhibit presents the viewer with a design that is simple and direct, unlike a display that usually presents more information. A poster should not exceed 22" x 28" and may be either vertical or horizontal.
- **Veterinary Science Displays:** A display may include but is not limited to: a 3-dimensional exhibit, a scale model, the actual product (for example: skeleton; teeth; samples of leather, fur, or dried skin damaged by disease or parasites) or a notebook. A display is not a poster. A display may be mounted on poster board not to exceed 22" x 28" or on 1/4" plywood or equivalent that does not exceed 24" high or 32" wide or in a three ring binder or another bound notebook format.

- **Appropriate Veterinary Science Topics:**

- Maintaining health
- Specific disease information
- Photographic display of normal and abnormal characteristics of animals
- Animal health or safety
- Public health or safety
- Proper animal management to ensure food safety & quality
- Efficient and safe livestock working facilities
- Or a topic of the exhibitors choosing related to veterinary medicine or veterinary science

\*\*Remember, since these are science displays, all references and information needs to be properly cited. Proper sources include but are not limited to: Professional journals and publications, professional AVMA accredited websites, interviews with Veterinarians and excerpts from Veterinary Educational Literature. Plagiarism will result in a disqualification. Please study your topic and present the information to your audience in your own words.

**Division 840 – Veterinary Science**

<sup>sf</sup> Class 1	<b>Veterinary Science Large Animal Poster, Notebook, Kit, or Display</b>
<sup>sf</sup> Class 2	<b>Veterinary Science Small Animal/Pet Poster, Notebook, Kit or Display</b>
Class 3	<b>Other Veterinary Science Exhibit</b> – can be a notebook, multi-media presentation or video detailing your experience raising an animal.

**Dept. H – Aerospace/Rockets**

*General Information:*

- This category gives 4-H'ers a chance to display the rockets and drones they have created. Through participation in this category 4-H'ers will show judges what they learned about and how they adapted their exhibit throughout this project. Involvement in SET Aerospace gives participants a first-hand experience in modern technology.
- 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 the notebooks so owner of exhibit may be identified if the entry tag is separated from the exhibit.
- Rockets must be supported substantially to protect the rocket from breakage. Rockets are to be mounted on a base that has dimensions equal or less than 12" x 12" and the base should be  $\frac{3}{4}$ " thick. No metal bases. If the rocket fins extend beyond the edges of the required base (12" x 12"), then construct a base that is large enough to protect the fins. The base size is dictated by the size of the rocket fins.
- The rockets must be mounted vertically. Please do not attach sideboards or backdrops to the displays. In addition, a used engine or length of a dowel pin is to be glued and/or screwed into the board and extended up into the rockets engine mount to give added stability.
- Rockets must be equipped as prepared for launching, with wadding and parachute or other recovery system. Rockets entered with live engines, wrong base size or sideboards will be disqualified.

- A report, protected in a clear plastic cover, must include:
  - o Rocket specification (include original or photo of manufacture packaging stating rocket skill level)
  - o A flight record for each launching (weather, distance, flight height)
  - o Number of launchings
  - o Flight pictures
  - o Safety (How did you choose your launch site? Document safe launch, preparations, precautions)
  - o Objectives learned
  - o Conclusions
  
- The flight record should describe the engine used, what the rocket did in flight and recovery success. Points will not be deducted for launching, flight, or recovery failures described. This includes and damage that may show on the rocket. Complete factory assembled rockets will not be accepted.
- Judging is based upon display appearance, rocket appearance, workmanship, design or capabilities for flight, number of times launched, and report. Three launches are required to earn the maximum launch points given on the score sheets. For scoring, only actual launches count, misfires will not count towards one of the required three launches.
- For self-designed rockets only, please include digital recorded copy of one flight. In the documentation please include a description of stability testing before the rocket was flown.
- Youth enrolled in Aerospace 2, 3, or 4 may exhibit in any class within this division.
- For self-designed rockets only, please include digital recorded copy of one flight. In the documentation please include a description of stability testing.
- Skill level of project is not determined by number of years in project. Skill level is determined by the level listed on the manufacturing packaging. 4-H Rocket project levels are not intended to correspond to National Association of Rocketry model rocket difficulty ratings or levels.
- Posters can be any size up to 28" x 22" when ready for display. Example: tri-fold poster boards are not 28" by 22" when fully open for display.

High power rockets (HPR) is similar to model rocketry with differences that include the propulsion power and weight increase of the model. They use motors in ranges over "G" power and/or weigh more than laws and regulations allow for unrestricted model rockets. These rockets are NOT appropriate for 4-H projects and will be disqualified.

Youth enrolled in Aerospace 2, 3, or 4 may exhibit in any class within this division.

### **Division 850 – Aerospace (Rockets & Drones)**

<sup>sf</sup> Class 1	<b>Rocket</b> – Any Skill Level Rocket with wooden fins and cardboard body tubes painted by hand or air brush.
<sup>sf</sup> Class 2	<b>Aerospace Display</b> – Poster or display board that displays or exemplifies one of the principles learned in the Lift Off project. Examples include, display of rocket parts and purpose, explains the parts of a NASA rocket or shuttle, interview of someone in the aerospace field, or kite terminology. Include notebook containing terminology (definition), and what was learned. Display can be any size up to 28" by 22".
<sup>sf</sup> Class 3	<b>Rocket</b> – Any Skill Level Rocket with wooden fins and cardboard body tubes painted using commercial application, for example: commercial spray paint

## Self-Designed Rocket

<sup>Sf</sup> Class 4 **Rocket** – any self-designed rocket with wooden fins and cardboard body tubes.

## Drones

<sup>Sf</sup> Class 5 **Drone Poster** – Exhibit must be designed to educate yourself and other on one or more of the following topics: drone technologies, uses of drones, the different types of drones, types of training needed to operate drones, and the laws and regulations users must follow. Posters can be any size up to 28" x 22".

<sup>Sf</sup> Class 6 **Drone Video** – Exhibit must demonstrate how the drone interacts with the outside world. Examples include: field scouting, surveying damage from natural disasters, drones used in commercial applications and settings, and drones used for structural engineering. Video should not exceed 5 minutes. Videos should be submitted to the Extension Office by July 15<sup>th</sup>. Videos should also be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions.

## Dept. H – Computers

### General Information:

- This category gives 4-H'ers a chance to display their knowledge of computers. Through participating in this category 4-H'ers will develop presentations that show judges their knowledge in the different aspects of computer science. Involvement in SET Computers gives participants a first-hand experience in modern technology.
- The name of the county of each exhibitor should appear separately on the back of each board, poster, or article and on the front cover of the notebooks so the owner of the exhibit may be identified if the entry tag is separated from the 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, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: 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.
- Please refer to the General Rules for the policy regarding firearms, items with a blade, and other related items.
- Please refer to the general rules for the policy regarding use of copywritten images.
- Premier 4-H Science Award is available in this area.
- The Computer project levels 1-3 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate level.
- Team Entries: To qualify for entry at the Nebraska State Fair team materials in Class 7– 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 register. 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.

## **Division 860 – Computers**

### **Computer Mysteries Unit 1**

Class 14	<b>Computer Art Poster (Black &amp; White)</b> – Exhibit should be created on at least an 8.5"x11" page using a commercially available graphics software package and color printer/plotter. No theme required.
Class 15	<b>Computer Art Poster (Color)</b> – Exhibit should be created on at least 8.5"x11" page using a commercially available graphics software package and color printer/plotter. No theme required.
Class 16	<b>Computer Designed Greeting Cards</b> – Exhibit will consist of six (6) greeting cards each for a different occasion/holiday. Cards should be created on an 8.5"x11" page using commercially available graphics program and either single color or color printer/plotter. The cards should vary in folds and design. Tell which software program was used. Pre-fabricated cards from commercially available card programs will NOT be accepted. No theme required. Put cards in some type of protective cover.
Class 17	<b>4-H Promotional Flier</b> – Create on 8.5"x11" page using commercially available software. Flier can be color or black and white. Fliers can be a whole page or folded. Put in protective cover.
Class 18	<b>Utilizing the Internet</b> – Exhibit will be a notebook of web sites used to plan a real or fictitious vacation. Notebook will consist of at least (4) different web sites illustrating the following: 1) airfare and/or directions to drive to destination 2) hotels/motels in the area 3) things to do (i.e. baseball game, Disney World, amusement park) and 4) a maximum one-page text telling the steps taken to plan the vacation. List web sites for each site and tell how you may be able to use the web to plan or research other things in the future.

### **Computer Mysteries Unit 2**

<sup>sf</sup> Class 1	<b>Computer Application Notebook</b> – (SF277) -4-H exhibitor should use computer application to create a graphic notebook utilizing computer technology. 4-H'er may create any of the following: greeting card (5 different cards such as birthday, wedding, anniversary, sympathy get well or other); a business card (3 cards for 3 different individuals or businesses); menu (minimum of 2 pages including short description of foods and pricing); book layout (I-book); promotional flyer (3 flyers promoting 3 different events); newsletter (minimum of 2 pages), or other: examples such as precision farming or family business logo etc. This exhibit consists of a notebook (8.5x11 inches) which should include a: <ul style="list-style-type: none"><li>• Detailed report describing:<ul style="list-style-type: none"><li>○ The task to be completed,</li><li>○ The computer application software required to complete the task,</li><li>○ Specific features of the computer application software necessary for completing the task</li></ul></li><li>• Print out of your project. Project may be in color or black and white.</li></ul>
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<sup>sf</sup> Class 2 **Produce a Computer Slideshow Presentation – (SF276)** -Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. All slide shows for fair should be emailed to Melissa Mracek at [mmracek2@unl.edu](mailto:mmracek2@unl.edu) before July 15 or videos can be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions. A notebook with a printout of all the slides should be submitted. Slideshow should include a minimum of 10 slides and no more than 25. Incorporate appropriate slide layouts, graphics, animations and audio (music or voice and transition sounds do not count). Each slide should include notes for a presenter. All slideshows must be uploaded.

### Computer Mysteries Unit 3

<sup>sf</sup> Class 3 **Produce an Audio/Video Computer Presentation – (SF276)** - Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. All presentations should be emailed to Melissa Mracek at [mmracek2@unl.edu](mailto:mmracek2@unl.edu) before July 15, or videos can be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions. A notebook with a printout of all the slides should be submitted. The presentation should be at least 2 minutes in length and no more than 5 minutes in length, appropriate graphics, sound and either a video clip, animation or voice over and/or original video clip.

<sup>sf</sup> Class 5 **How to STEM (Science, Technology, Engineering and Math) Presentation – (SF276)** - Youth design a fully automated 2 - 5 minute 4-H “how to” video. Submissions should incorporate a picture or video of the 4-Her, as well as their name (first name only), age (as of January 1 of the current year), years in 4-H, and their personal interests or hobbies. Entries should be submitted to Melissa Mracek at [mmracek2@unl.edu](mailto:mmracek2@unl.edu) by July 15<sup>th</sup>, or videos can be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions.

<sup>sf</sup> Class 5 **Virtual Platform Presentation – (SF276)** – Youth design a fully automated education presentation (video, notebook, poster, etc.) Videos should be submitted to Melissa Mracek at [mmracek2@unl.edu](mailto:mmracek2@unl.edu) by July 15<sup>th</sup> or videos can be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for permissions.

<sup>sf</sup> Class 6 **Create a Web Site/Blog or App – (SF275)** - Design a simple Web site/ blog for providing information about a topic related to youth. Examples include, using either software programs such as an HTML editor like Microsoft’s FrontPage or Macromedia’s Dreamweaver, and image editor like IrfanView or GIMP OR online using a WIKI such as Google Sites. If the Web site, Blog, or App isn’t live include all files comprising the Web site, Blog or App should be submitted on a flash drive in a plastic case along with the explanation of why the site was created or may be shared through a hard copy share link or QR code for viewing. If developed using a WIKI or other online tool include a link to the website in the explanation of why the site was created. Entries should be submitted to Melissa Mracek at [mmracek2@unl.edu](mailto:mmracek2@unl.edu) by July 15<sup>th</sup>, or videos can be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions.



Sf Class 7 **3D Printing** – (SF1050) - 3D printing uses plastic or other materials to build a 3 dimensional (3D) object from a digital design (including 3D Pen Creation). Youth may use original designs or someone else's they have re-designed in a unique way. Exhibits will be judged based on motivation and/or problem identified. For example, 3D objects printed as part of the design process for robot or other engineering project. Must include design notebook that addresses the following questions:

- a. What was the motivation for your design or the problem you were solving with your design? ie. Is your item a functional or decorative piece?
- b. 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. 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.
- c. 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)?
- d. What materials were selected for your project?
- e. If your final design has any moving parts, define how you determined appropriate allowance in your design.
- f. Identify any changes that you would make to improve your design.

Sf 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:

- a. What motivated you to create this project
- b. Software and equipment used
- c. Directions on how to create the project
- d. Prototype of plans
- e. Cost of creating project
- f. Iterations or modifications made to original plans
- g. Changes you would make if you remade the project

## **Dept. H – Robotics**

### *General Information:*

This category involves the many different aspects of Robotics. Participants will learn more about how robots are designed and developed as well as the mechanical and electronic elements of robots. Involvements in SET Robotics gives participants a first-hand experience in modern technology.

- 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 the notebooks so the owner of the exhibit may be identified if the entry tag is separated from the exhibit.
- Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned). All reports should be computer generate and enclosed in a clear plastic cover. The reports should be attached securely to the display.

- Posters can be any size up to 28" x 22" when ready for display. Example: tri-fold poster boards are not 28" x 22" when fully open for display.
- Youth enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1,2, or 3), or Robotics Platforms may exhibit in any class within this division.
- Team Entries: To qualify for entry at the Nebraska State Fair team materials entered in robotics classes that are clearly the work of a team instead of an individual 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.
- Creating a video of your robot in action would be helpful for the judges but is not mandatory. Present as a CD Rom with your robot entry. Videos should be uploaded to a video streaming application and exhibitors should provide a hard copy QR code for viewing.

### **Division 861 – Robotics**

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| sf Class 1 | <b>Robotics Poster</b> – (SF236) - Create a poster (14" X 22") communicating a robotics theme such as "Robot or Not", "Pseudocode", "Real World Robots", "Careers in Robots" "Autonomous Robotics", "Precision Agriculture" or a robotic topic of interest to the 4-H'er.   |
| sf Class 2 | <b>Robotics Notebook</b> – (SF237) - Explore a robotics topic in-depth and present your findings in a notebook. Documentation should include any designs, research, notes, pseudocode, data tables or other evidence of the 4-H'ers learning experience. The notebook should contain at least three pages. Topics could include a programming challenge, a programming skill, calibration, sensor exploration, or any of the topics suggested in Class 1.   |
| sf Class 3 | <b>Robotics Video</b> – This class should be displayed in a notebook. The notebook should include a video clip on a CD/DVD that demonstrates the robot performing the programmed function. Include your pseudo code and screenshots of the actual code with a written description of the icon/command functions. Files must be saved in a PC compatible format with county name and the last name of participant before emailing to the Extension Office.   |
| sf Class 4 | <b>Robotics/Careers Interview</b> – (SF239) - Interview someone who is working in the field of robotics and research the career in robotics. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double spaced, 12 point font, and 1" margins. Multimedia reports should be between 3 to 5 minutes in length.  |
| sf Class 5 | <b>Robotics Sensor Notebook</b> – (SF241) - Write pseudo code which includes at least three sensor activity. Include the code written and explain the code function.  |
| sf Class 7 | <b>Kit Labeled Robot</b> (cannot be programmed) <b>and Notebook</b> – (SF243) - This class is intended for explorations of robotic components such as arms or vehicles OR educational kits marketed as robots that do not have the ability to be programmed to "sense, plan and act." The exhibit should include a notebook with the robot the youth has constructed. Included in the notebook should be 1) a description of what the robot does, 2) pictures of programs the robot can perform, 3) why they chose to build this particular form, and 4) how they problem solved any issues they might have had during building and programming. A picture story of assembly is recommended. If robot is more than 15 inches wide and 20 inches tall they may not be displayed in locked cases at State Fair. |

Sf Class 8 **3D Printed Robotics Parts** – (SF244) - This class is intended for youth to create parts through 3D printing that help create their robot or aid the robot in completing a coded function. Project should include notebook describing the process used to create the project, describe the success of your designed piece (did it work), intended use of the product and the modifications made to the item.

## **Dept. H – Electricity**

In this category 4-H'ers have the opportunity to create information exhibits about the different aspects of electricity. Through involvement in this category 4-H'ers 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 the notebooks so the owner of the exhibit 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 1/4" 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' by 8' sheet of plywood. Nothing should be mounted within 3/4" of the top or bottom of the board. (Example: Woodworking & Electricity).
  - o Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
  - o 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, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned). All reports should be computer generated and enclosed in a clear plastic over. The reports should be attached securely to the display.

## **Division 870 – Electricity**

### **Magic of Electricity Unit 1**

Class 11 **Demonstration Board** – Exhibit is to be prepared on a board that is 1/4" thick and 24" high x 32" wide. Exhibit may include a simple switch, simple fuse, and/or conductors/non-conductors. Be sure to include the appropriate labeling.

Class 12 **A Poster** – that describes and explains any one of these concepts related to electricity: electrical materials, appreciation of electricity, open and closed switches, and conductivity of materials. (change to: should exemplify one of the lessons learned in the Magic of Electricity project. Poster can be any size up to 28" x 22")

Class 13 **Design a Project** – that demonstrates the capacity for conductivity of materials.

### **Investigating Electricity Unit 2**

Class 14 **Build a Circuit Board** – Exhibit should be a series or parallel circuit.

Class 15 **Build a Burglar Alarm**

Class 16 **Build a Rocket Launcher**

- Class 17 **Telegraph Station** – exhibit must include one telegraph key and one telegraph sounder. The telegraph must be attached to a wooden base and wired to a battery to demonstrate its operation. Label the display and the major components.
- Class 18 **Electric Toy Motors** – working model of an electric motor. The motor is to be of the 4-H'ers designed should have the major parts labeled. A short, written description of how the motor works is to be included in a clear protective cover. No pre-manufactured electric motors will be accepted.
- Class 19 **Toy Electric Motor Converted to DC or AC Generator** – exhibit is to consist of a toy electric motor shown in Unit II, converted to use as a DC or AC generator. Generator should be exhibited on base including a battery and a light bulb or Galvanism to demonstrate its operation. Title the exhibit and label the major parts.
- Class 20 **A Poster** – describe and explain the purpose of the National Electrical Code.
- Class 21 **A Poster** – illustrate how an electrical usage meter or a main service panel for a building works.

### Wired for Power-Unit 3

- <sup>sf</sup> 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.
- <sup>sf</sup> 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.
- <sup>sf</sup> 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.
- <sup>sf</sup> Class 4 **Poster** – (SF227) - should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28" by 22".

### Entering Electronics-Unit 4

- <sup>sf</sup> 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.
- <sup>sf</sup> Class 6 **Electronic Display** – (SF229) - Show an application of one of the concepts learned in the Electronics project. Examples: components of an electronic device (refer to p. 35 of the Electronic manual).
- <sup>sf</sup> Class 7 **Electronic Project** – (SF230) - Exhibit an electronic item designed by the 4-H'er or from a manufactured kit that shows the electronic expertise of the 4-H'er. Examples include: a radio, a computer or a volt meter.
- <sup>sf</sup> Class 8 **Poster** – (SF231) - should exemplify one of the lessons learned in Unit 4. Posters can be any size up to 28" by 22".

## **Dept. H – GPS**

### **Division 880 – Geospatial**

#### *General Information:*

- Youth enrolled in Geospatial may exhibit in any class within this division.
- SET Geospatial is a diverse category that includes a variety of exhibits 4-H'ers can get involved in. Through participation in this category 4-H'ers will gain more knowledge about Nebraska's rich history and diverse geography.
- 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 the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
- Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: 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.
- Please refer to the General Rules for the policy regarding firearms, items with a blade, and other related items.
- Please refer to the General Rules for the policy regarding use of copywritten images.
- Premier 4-H Science Award is available in this area.

- |            |   |
|------------|---|
| sf Class 1 | <b>Poster-</b> (SF299) - (not to exceed 14" x 22") communicating a GPS theme such as How GPS or GIS works, Careers that use GPS or GIS, How to use GPS, What is GIS, GPS or GIS in Agriculture, Precision Agriculture, or a geospatial topic of interest.   |
| sf Class 2 | <b>4-H Favorite Places or Historical Site Poster</b> – (SF299) - The 4-H exhibitor identifies a favorite place or historical site (including grave sites) in Nebraska. Exhibit should include latitude and longitude, digital picture, and local area map. Poster size should not exceed 14" X 22".   |
| sf Class 3 | <b>GPS Notebook</b> – (SF300) - Keep a log of at least 5 places visited using a GPS enabled device. At least one site should be from a community other than where you live. For each site, record the latitude, longitude and elevation. Also include a description of the site, a paragraph explaining what was interesting about the site or finding it. Photos of each site and/or cache are optional but encouraged.  |
| sf Class 4 | <b>Geocache</b> – (SF301) - Assemble a themed geocache. Each geocache should be a water-tight container. It should include a logbook and pencil for finders to log their visits and may include small trinket, geo-coins, etc. for the finders to trade. Documentation should include a title, teaser description and the geographic coordinates of intended placement. Register the site at geocaching.com, include a print-out of its registry. The entry may include a photograph of the cache in its intended hiding place. |
| sf Class 5 | <b>Agriculture Precision Mapping</b> – (SF302) - 4-H'ers will assemble a notebook that will include a minimum of 2 digital copies of various data layers that can be used in precision agriculture to identify spatial patterns and/or correlations (printed copies of websites were applications can be purchases is acceptable). A report of how the analysis of the various data will be used to make management decisions.  |

- sf Class 6 **4-H History Map /Preserve 4-H History** – (SF303) - Nominate a Point of Interest for the 4-H History Map Project. Include copy of submitted form in folder or notebook. To nominate a site for the 4-H history map please go to <http://arcg.is/1bvGogV> . For more information about 4-H history go to [http://4hhistorypreservation.com/Hisotry\\_Map/](http://4hhistorypreservation.com/Hisotry_Map/) . For a step by step video on nominating a point, please go to this link: <http://tinyurl.com/nominate4h>. Write a brief description of historical significance of 4-H place or person. (a minimum of one paragraph)
- sf Class 7 **GIS Thematic Map** – (SF302) - Using any GIS software, create a thematic map. Thematic maps can utilize any subject of interest to the 4-Her. Example map would be Amelia Earhart's or Sir Francis Drake's voyage, population density maps, water usage "x11" maps, or 4-H projects in Nebraska. Create a GIS Map using data from books and/or internet. Use reliable data, (U.S. Center or U. S. Census Bureau etc.) Map any size from 8.5" x 11" up to 36" X 24", which should include Title, Base map, Neat Line, North Arrow, and Legend. Identify the source of your information on the back of the map.
- Sf Class 8 **Virtual Geocache** – (SF300) – Keep a log of at least 5 places visited using a virtual geocache platform. At least one site should be from a community other than where you live. For each site, record the latitude, longitude and elevation. Also include a description of the site, a paragraph explaining what was interesting about the site or finding it. Photos of each site and/or cache are optional but highly encouraged.

## **Dept. H – Small Engines**

### **Division 890 – Small Engines**

#### **Crank It Up Unit 1 (No State Fair)**

- Class 1 **Poster** – of external parts of engines.
- Class 2 **Poster** – of tools for maintaining and repairing small engines.
- Class 3 **Poster** – describing a cooling system.
- Class 4 **Poster** – of Safety Rules for small engines.

#### **Warm It Up Unit 2 (No State Fair)**

- Class 5 **Small Engine Display/Item** – Show an application of one of the concepts learned in the Warm It Up project. Examples include: comparison of engine oil types, transmissions, or safety related to engines. Exhibit could be a poster, display, or an actual item.
- Class 6 **Complete Small Engines** – are to have been reconditioned, repaired or overhauled during a 4-H Small Engine project. A report-listing source of engine, use of engine, repair parts list and cost is to be included in a notebook. Gas tanks are to be EMPTY when entered at the fair. Engines will be fueled and started as part of the judging criteria.  
All engines with cast iron flywheels should be mounted on a solid wood base. These engines will run smoothly without attachments on the PTO shaft. Complete lawn mower exhibits are recommended where the engine is equipped with an aluminum flywheel because the blade is important to the smooth operation of the engine. Engines must be equipped with a throttle control.
- Class 7 **Small Engine Display** – show parts or systems of a small engine, cutaways of engine or systems, worn or broken parts, step by step procedure of how to perform repairs or maintenance, etc. Use needed labeling, short written description or explanations, drawings, etc., to explain what you are showing. Mount on 1/4" thick board, 24" x 32" wide.

### **Tune It Up Unit 3 (No State Fair)**

Class 8	<b>Complete Small Engines</b> – that have been reconditioned, repaired or overhauled in 4-H Small Engine project. A report-listing source of engine, use of engine, repair parts list and cost is to be included and protected in a notebook type of cover. Gas tanks are to be EMPTY when entered at the fair. Engines may be fueled and started as part of the judging criteria. All engines should be mounted on a base at least $\frac{3}{4}$ " plywood. Complete lawn mower exhibits are recommended where the engine is equipped with an <u>aluminum</u> flywheel because the blade is important to the smooth operation of the engine. Engines must be equipped with a throttle control.
Class 9	<b>Engine Display/Item-</b> Display/Item should exemplify one of the lessons learned in the Tune It Up Project. Examples include: diagnostic tools, fuel systems, ignition systems. If a complete engine is exhibited it will not be started. Must include a report detailing: the process of building/rebuilding engine and how/where engine will be utilized (i.e. lawn mower, weed eater, snow blower, etc.)

### **Division 891 – Restored Vehicle**

#### *General Information:*

- Not State Fair Eligible
- Include an item description on your Fair Entry Form.
- Large vehicles will be displayed outside.

Class 1	<b>Restored Vehicle</b> – scoring: 30pts-General Appearance, 25pts-Written Report, 25pts-Operation, 20pts-Innovation in restoring. A notebook should include: <ol style="list-style-type: none"><li>1. Vehicle background and source</li><li>2. Repairs and parts needed</li><li>3. Expenses</li><li>4. Time involved</li><li>5. Descriptions of special processes used</li><li>6. Photographs of the item at different stages and youth in action.</li></ol>
Class 2	<b>Restoration Display</b> – detailing a specific process used to restore a vehicle. Examples: painting process, fiberglass repair, window replacement, etc.
Class 3	<b>Bicycle Demonstration Display</b> – to be exhibited by an individual. Exhibit may include: parts of a bicycle system, worn or broken parts, and a step by step procedure of how some repair or service is performed. A notebook describing what was done and what was learned including photographs should be included. Actual parts or cut-a ways of parts are recommended. The exhibit is to be prepared on a 24" high x 32" wide x $\frac{1}{4}$ " thick board.
Class 4	<b>Tractor Demonstration Display</b> – to be exhibited by an individual only. Exhibit should show some part or system of a tractor. Include a brief description of how the part or system functions. Prepare the display on a 24" high x 32" wide x $\frac{1}{4}$ " thick board.

## **Dept. H – 4 Wheelin’**

### **Division 895 – 4 Wheelin’ (No State Fair)**

Class 1	<b>Poster</b> –Poster to show something learned about physics or safety from the 4 Wheelin’ activities.
Class 2	<b>Toolbox</b> – put together using guidelines from the 4 Wheelin’ manual. Include a description of the kit’s purpose and a list of individual contents.
Class 3	<b>4 Wheelin’ Vehicle</b> – The vehicle needs to be mounted on a base that is equal to or less than 12” by 12” and the base should be $\frac{3}{4}$ ” thick. Please make your vehicle stable. Please do not attach sideboards or backdrops to the display. A report, protected with a clear, plastic cover, needs to be included with the following information: 1) vehicle specification, 2) results of driving, pulling and climbing tests, 3) track diagram, 4) pictures.
Class 4	<b>Track or Course Design Drawing</b> – Scale drawing to actual track or course design. Indicate the direction the course is used with arrows. Display on a 14” x 22” poster.

## **Dept. H – SET Physics/Power of Wind**

### **Division 900 – SET Physics/Power of Wind**

#### *General Information:*

- This category provides 4-H’ers a way to present their ideas about renewable energy resources. Through participation in this category 4-H’ers 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 the notebooks so owner of the exhibit may be identified if the entry tag is separated.
- Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: 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” x 22” when ready for display. Example: tri-fold poster boards are not 28” x 22” when fully open for display.
- Premier 4-H Science Award is available in this area.

#### Renewable Energy Resources:

- United States Department of Energy: <https://www.energy.gov/clean-energy>
- U.S. Energy Information Administration: <https://www.eia.gov/energyexplained/renewable-sources/>
- Natural Resources Defense Council: <https://www.nrdc.org/stories/renewable-energy-clean-facts>

sf Class 1	<b>Create &amp; Compare Energy Resources Poster</b> – (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”.
sf Class 2	<b>Experiment Notebook</b> – (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.



- sf Class 3 **Solar as Energy Display/Poster** – (SF308) - Item should be the original design of the 4-H'er. 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 evens, solar panels, etc.
- sf Class 4 **Water as Energy Display/Poster** – (SF308) - Item should be the original design of the 4-H'er. Include the item, or a picture of the 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.
- sf Class 5 **Wind as Energy Display/Poster** – (SF308) - Item should be the original design of the 4-H'er. 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.
- sf Class 6 **Other Nebraska Alternative Energy**– (SF306) - Notebook should explore Nebraska an 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.

## **Dept. H – Woodworking**

### *General Information:*

- In this category 4-H'ers have the opportunity to create exhibits about varying levels of woodworking. In addition, participants can also create informational exhibits about their woodworking projects. Through involvement in this category 4-H'ers will be better educated about the topic and better their woodworking skills.
- 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 the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
- Requirements: All articles exhibited must include a plan (with drawings or sketch or blueprints) stating dimensions and other critical instructions a builder would need to know how to build the project. Plans may include narrative instructions in addition to the dimension drawings and include any alternations to the original plan. Part of the score depends on how well the project matches the plans. If the plans are modified, the changes from the original need to be noted on the plans. All plans used for making the article must be securely attached and protected by a clear plastic cover.
- If the project (i.e picnic tables, wishing wells, swings, chairs, bridges, doghouses, etc.) is designed to be used outside, it will be displayed outside.
- All outside projects MUST have supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.
- Premier 4-H Science Award is available in this area.

## **Division 911 – Woodworking**

### **MEASURING UP –UNIT 1 (No State Fair)**

- |          |  |
|----------|--|
| Class 9  | <b>Build a Flower Box</b> – include your plan    |
| Class 10 | <b>Build a Letter Holder</b> – include your plan |
| Class 11 | <b>Build a Picture Frame</b> – include your plan |

## MAKING THE CUT –UNIT 2 (No State Fair)

- |          |   |
|----------|---|
| Class 12 | <b>Display of Wood Samples</b> – display at least 6 different wood samples, attach securely to a 1/4" or 3/8" board, label each sample with tree species and type of wood (hard or soft). |
| Class 13 | <b>Woodworking Tools Poster</b> – Create a poster showing at least 6 tools used in woodworking. Label each tools with its name and general use.   |
| Class 14 | <b>Build a Napkin Holder</b> – include your plan  |
| Class 15 | <b>Build a Birdhouse</b> – include your plan  |
| Class 16 | <b>Build a Foot Stool</b> – include your plan   |
| Class 17 | <b>Build a Tool Box or a Sawhorse</b> – include your plan   |
| Class 18 | <b>Build an Article</b> – using at least 2 different <u>hand</u> tools, include your plan and what tools you used.  |

## NAILING IT TOGETHER-UNIT 3

- |                       |  |
|-----------------------|--|
| <sup>sf</sup> Class 1 | <b>Woodworking Article</b> – (SF91) - Item should be made using skills either joints, hinges, dowels, or a dado joining, learned in the Nailing it Together manual. Item is required to be appropriately finished. Examples include: bookcase, coffee table or end table.  |
| <sup>sf</sup> Class 3 | <b>Recycled Woodworking Display</b> – (SF95) - Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from pg. 2 of the Unit 3 manual. Exhibit must include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan.<br><br>Engineering Design Process<br><ol style="list-style-type: none"><li>1. State the problem (Why did you need this item?)</li><li>2. Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)</li><li>3. Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)</li><li>4. Build the item (What was your woodworking plan, and what processes did you use to build your item?)</li><li>5. Reason for article finish (What type of finish, how did you finish or why you choose this finish?)</li><li>6. Evaluate (How does your item solve the original need?)</li><li>7. Present results (How would you do this better next time?)</li></ol> |
| <sup>Sf</sup> Class 4 | <b>Composite Wood Project</b> – (SF96) - 60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish because project may be displayed outside.   |
| <sup>Sf</sup> Class 5 | <b>Outdoor Wood Project made with Treated Wood</b> – (SF97) - Treated wood projects DO NOT have to have a finished coating. All plans and plan alternations must be attached to the article. Project plans with a cover. If project is designed to be outside. Examples include: picnic tables, planters, outdoor furniture, etc.  |

## FINISHING UP-UNIT 4

- <sup>sf</sup> Class 6 **Woodworking Article** – (SF 91) - Item made using skills learned in the Finishing it Up Project. Examples include: dovetailing, making a pen using lathe, overlays, using a router, etc. Item is required to be appropriately finished.
- <sup>sf</sup> Class 8 **Recycled Woodworking Display** – (SF91) - Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from pg. 2 of the Unit 4 manual. Exhibit must include the woodworking plan and a minimum one page report of how the design and engineering process was used to develop the woodworking plan.
1. State the problem (Why did you need this item?)
  2. Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
  3. Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)
  4. Reason for article finish (What type of finish, how did you finish or why you choose this finish?)
  5. Build the item (What was your woodworking plan, and what processes did you use to build your item?)
  6. Evaluate (How does your item solve the original need?)
  7. Present results (How would you do this better next time?)

## Dept. H – Welding

### *General Information:*

This category helps 4-H'ers learn the basics of welding. In addition, 4-H'ers get the opportunity to present their knowledge on the topic and display what they have made. Involvement in SET Welding gives participants a first-hand experience in a skill that can be used for a lifetime.

- 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 the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
- All welds exhibited in class 1 or 2 must be mounted on a 12" x 15" display board of thickness not to exceed 3/8". Attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary. Each weld should be labeled with information stated 1) type of welding process (stick, MIG, TIG, Oxy-Acetylene, etc.) 2) kind of weld, 3) welder setting, 4) electrode/wire/rod size, and 5) electrode/wire/rod ID numbers. Attach a wire to display board so it can be hung like a picture frame. No picture frame hangers accepted.
- 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.
- Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: 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.
- If no plans are included with welding art, welding article, welding furniture or composite weld project item will be disqualified.
- All outside projects MUST have supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.
- Premier 4-H Science Award is available in this area.

## ARCS & SPARKS

- All welds exhibited in class 1 or 2 must be mounted on a 12" high x 15" long display board of thickness not to exceed  $\frac{3}{8}$ ". Attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary.

### 4-H Welding Project Tips and Suggestions:

#### Class 1

1. All welds should be made with the same electrode/wire/rod size and number.
2. Welds should be made only on one side of metal so penetration can be judged.
3. Welds should be cleaned with chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.
4. It is suggested that all welds be of the same size and thickness of metal. These pieces, referred to as coupons, should be 1.5 to 2" wide and 3.5 to 4" long. A good way to get this size is to buy new cold rolled strap iron and cut to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too cold at the bead start, just about right in the middle, and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full length bead.
5. Stick welding - Suggested coupon thickness-  $\frac{1}{4}$ " if using  $\frac{1}{8}$ " rod, Suggested rod-AC and DC straight or reverse polarity- first E-7014, second E-6013
6. MIG welding - Suggested coupon thickness-  $\frac{1}{4}$ " if using .035 wire and  $\frac{1}{8}$ " if using .023 wire
7. Oxy-Acetylene - Suggested coupon thickness-  $\frac{1}{8}$ ". Suggested rod-  $\frac{1}{8}$ " mild steel rod.

#### Class 2

1. It is suggested that all welds be on same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4" x 4" or on individual coupons that are about 2" x 4" and  $\frac{1}{4}$ " thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is, first E-6013, second E-7014 and E-6010 for DC reverse polarity only.
2. Welds should be cleaned with a chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.

#### Class 3 & 4

1. All welds should be cleaned and protected from rust with paint or light oil. Plans are to be complete enough that if they were given to a welding shop, the item could be made without further instructions. Bill of materials should include a cost for all items including steel, electrodes, paint, wheels, etc.

### **Division 920 – Welding**

sf Class 1	<b>Welding Joints</b> – (SF281) - a display of one butt, one lap and one fillet weld.
sf Class 2	<b>Position Welds</b> – (SF281) - a display showing three beads welded in the vertical down, horizontal and overhead positions.
Sf Class 3	<b>Welding Art</b> – (SF283) – any art created using tack welds to hold the metal pieces together (examples include horseshow projects). Type of welder, welder settings, all plans, plan alternations, and a bill for materials must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.

- sf Class 4 **Welding Article** – (SF281) - any shop article where welding is used construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alternations, and a bill for materials must be attached to the article. Protect plans with a cover. If the project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.
- sf Class 5 **Welding Furniture** – (SF282) - any furniture with 75% welding is used in construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.
- sf Class 6 **Plasma Cutter/Welder Design** – (SF279) - Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4-H'ers will create a notebook describing the design process to create the "artwork" to butt cut into the metal.
- In the notebook include:
1. A photo (front and back) of the finished project.
  2. Instructions on how the design was created (include software used), this allows for replication of the project.
  3. Lessons learned or improvements to the project.
  4. Steps to finish the project.
- sf Class 7 **Composite Weld Project** – (SF280) - 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

## **Dept. H – Rope**

### *General Information:*

- Each rope exhibit must be mounted on a board  $\frac{3}{8}$ " thick x 24" high x 32" wide.
- For items on demo-boards use instructions found in the 4-H Rope Manual, EC70179.
- Mount the knots in the same position as shown in the 4-H Rope Manual.
- Either manila or synthetic rope may be used.
- When halters are exhibited, the tie rope, plus a required second piece of rope must show any three of the following items:
  - o End whipping
  - o Eye splice
  - o Crown splice
  - o Rosebud knot
  - o Matthew Walker knot
  - o Diamond knot

**Division 990 – Rope (Not State Fair Eligible)**

Class 1	<b>Rope Display</b> – at least 10 and not more than 12 knots, hitches and splices (include two splices) made of $\frac{3}{8}$ " rope.
Class 2	<b>Single Loop or Double Loop Halter</b> – cattle and horse use $\frac{5}{8}$ " or $\frac{3}{4}$ " rope. See above requirements for halter exhibits.
Class 3	<b>Single Loop or Double Loop Halter</b> – sheep and goats use $\frac{3}{8}$ " rope. See above requirements for halter exhibits.
Class 4	<b>Braided Reins, Bridles, Halters, etc.</b>

**Dept. H – Leather**

*General Information:*

- Leather garments (chaps/chinks/vest) can be entered under Clothing – STEAM 3 Class 11 Fashion Show – STEAM 3 Class 40.
- Not State Eligible

**Division 991 – Leather**

Class 1	<b>Tooled</b>
Class 2	<b>Stamped</b>
Class 3	<b>Non-Tooled</b>
Class 4	<b>Tooled &amp; Stamped</b>
Class 5	<b>Other</b>