

Science, Engineering & Technology

GENERAL INFORMATION

- A. 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.
- B. Several classes require a display board which should be a height of 24 inches and not to exceed 1/4" in thickness. A height of 24 7/8" is acceptable to allow for the saw kerf (width) if two 24 inch boards are cut from one end of a 4' X 8' sheet of plywood. Nothing should be mounted within 3/4" of the top or bottom of the board. (Example: Woodworking & Electricity.)
- C. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
- D. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
- E. Demonstration boards should include an overall title for the display, plus other necessary labeling.
- F. All 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.

Division 800 - Entomology -GENERAL INFORMATION -Specimens should be mounted properly and labeled with location and 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 not more than 12" high X 18" wide, so they fit in display racks. Purchase of commercially made boxes is allowed. All specimens must be from collector. Recourses can be found at: <https://go.unl.edu/ne4hentomology>

CLASS

- H800001 - Entomology Display** -First-Year Project - Collection to consist of 25 or more different kinds (species) of insects representing at least 6 orders. Limit of one box.
- H800002 - Entomology Display** - Second-Year Project - Collection to consist of a minimum of 50 kinds (species) of insects representing at least 8 orders. Replace damaged or poorly mounted specimens. At least 25 species must be present from after July 1 of the previous year. Limit 2 boxes.
- H800003 - Entomology Display** - Third-Year or More Project - Collection to consist of a minimum of 75 kinds (species) of insects representing at least 10 orders. Replace damaged or poorly mounted specimens. At least 25 species must be present from after July 1 of previous year. Limit of 3 boxes.
- H800004 - Special Interest or Advanced Insect Display** - Educational display developed according to personal interest 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 (e.g. family, genus, species). A specialty collection may consist of insects by taxonomic group (e.g. butterflies, grasshoppers, dragonflies, scarab beetles) or by host, subject or habitat (e.g. insect pest of corn, aquatic insects, insect mimicry, insect galls, insects from goldenrod, insect pollinators, etc.)
- H800005 - 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.
- H800006 - Macrophotography** - Subjects should be insects, spiders or other arthropods, or any nests, webs or constructions they make. All exhibit prints should be either 8" x 10" or 8 1/2" X 11" and

mounted on rigid, black 11" X 14" poster or matt board. Either orientation is acceptable. No frames or mat board framing is allowed. A caption of a few sentences should explain the subject, and be printed on white paper, and be glued below the print on the poster board.

H800007 – 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 (e.g. forests, grasslands, wetlands, rivers, or lakes) and what insects are found there, etc. Three-dimensional displays, such as a dioramas, sculptures, models, or decorative boxes should have a page of explanatory information accompanying them and fit within a 22" x 28" area.

H800008 – 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 beehive, observations of insects in a specific habitat, accounts of insect behavior in a forest or flower garden, etc.

Division 840 – Veterinary Science - The purpose of a Veterinary Science exhibit is to inform the public about a common health problem of animals or a veterinary science principle. Do not confuse veterinary science exhibit topics with animal husbandry, history, or production topics.

- **A Veterinary Science exhibit may consist of a poster, notebook, or a display** - The exhibit may represent material from 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.
All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.
- **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 printouts, 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. Resources: <https://go.unl.edu/ne4hvetscience> .

CLASS

H840001 - 4-H Veterinary Science Large Animal Poster, Notebook or Display

H840002 - 4-H Veterinary Science Small Animal/Pet Poster, Notebook or Display

SET – Science, Engineering and Technology –

General Information for all S.E.T. area.

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2. 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' x 8' sheet of plywood. Nothing should be mounted within ¾" of the top or bottom of the board. (Example: Woodworking & Electricity).
3. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
4. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
5. Demonstration boards should include an overall title for the display, plus other necessary labeling.
6. 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.

Division 850 – SET- Aerospace – Rockets/Drones

- 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 ¾" 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 display. In addition, a used engine or length of 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.
 1. Rocket specification (include original or photo of manufacture packaging stating rocket level)
 2. A flight record for each launching (weather, distance, flight height)
 3. Number of launchings
 4. Flight pictures
 5. Safety (how did you choose your launch site? Document safe launch, preparations, and precautions)
 6. Objectives learned.
 7. Conclusions

- The flight record should describe 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 any 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 sheet. 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.
- 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.
- High power rockets (HPR) are similar to model rocketry with differences that include the propulsion power and weight increase of the model. They use motors in ranges of "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.

Rockets

CLASS

H850001 - Rocket - Any Skill Level Rocket with wooden fins and cardboard body tubes painted by hand, or air brush.

H850002 – Aerospace Display – 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".

H850003 - Rocket - Any Skill Level Rocket with wooden fins and cardboard body tubes painted using commercial application example commercial spray paint.

Self-Designed Rocket

CLASS

H850004 – Rocket – Any self-designed rocket with wooden fins and cardboard body tubes.

Drones

CLASS

H850005 – Drone Poster – Exhibit must be designed to educate yourself and others on one or more of the following topics: drone technologies, uses of drones, the different types of drones, types of training need to operate drones, and the laws and regulations users must follow. Posters can be any size up to 28" x 22".

H850006 – Drone Video – Exhibit must demonstrate straight how the drone interacts with the outside world. Examples include field scouting, surveying damage from natural disasters, drones used in commercial applications and setting, drones used for structural engineering. Video should not exceed 5 minutes.

Division 860 – SET- Computers

CLASS

Unit 1 -For each of the county only classes, use a half sheet of paper and explain the techniques used in the exhibit.

H860901 - Cards for All Occasions – Develop a series of 10 greeting cards for a variety of holiday or special occasions. Use clip art, scanned photos or draw your own pictures.

H860902 - Graphic Illustration – Using a software program, make your own drawing and print it.

H860903 - Photograph Series – Take a photograph and design a series of 4 to 6 special effects new photos.

H860904 - Create a Scrapbook or Poster – Put together a scrapbook or poster on a topic you have investigated on the Web. The topic can be anything. Print the information you found on the web and display it in a scrapbook or on a poster.

- H860905 - Storybook** – Write a story and illustrate it with pictures. Pictures can be original drawings, clip art or photos. Put together in a storybook format.
- H860906 - Design and Print a T-Shirt** – Using a design software program, create a t-shirt design using a combination of graphics and text.
- H860907 - 4-H Promotional Sign** – Exhibit should be created on 8½” x 11” page using a commercially available software package. Flier can be color or black & white. Exhibit may be laminated or put in a protective cover.
- H860908 - Promotion Sign** – Open theme. Exhibit should be created on 8½” x 11” page using a commercially available software package. Flier can be color or black & white. Exhibit may be laminated or put in a protective cover.

Computer Mysteries – Unit 2

CLASS

- H860001 - Computer Application Poster**– 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 should be used as a birthday, wedding, anniversary, sympathy get well or other) a business card (3 cards for 3 different individuals and businesses); menu (minimum of 2 pages including short descriptions 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 (1) a detailed report describing: (a) the task to be completed, (b) the computer application software required to complete the task, (c) specific features of the computer application software necessary for completing the task (2) print out of your project. Project may be in color or black and white.
- H860002 - Produce a Computer Slideshow Presentation** – Using presentation software. The 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 sound do not count). Each slide should include notes for a presenter. A notebook with a printout of all the slides should be submitted. If receives a purple and is chosen for state fair, please ask extension office about specific instructions for downloading to state fair.

Computer Mysteries – Unit 3

CLASS

- H860003 - Produce an Audio/Video Computer Presentation** – Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. 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. The presentation must be able to be played and viewed on a PC using Windows Media Player, Real Player, iTunes or QuickTime Player.
- H860004 – How to STEM (Science, Technology, Engineering and Math) Presentation** – Youth design a fully automated 2 to 5 minute 4-H “how to” video. Submissions should incorporate a picture or video of the 4-H'er, 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. Videos should be designed for web viewing. Any of the following formats will be accepted: .mpeg, .rm, .wmv, .mp4, .ov, .ppt, or .avi.
- H860005 - Create a Web Site/Blog or App** – Design a simple Web site/blog or app for providing information about a topic related to youth 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 CD-ROM in a plastic case along with the explanation of why the site was created. If developed

using a WIKI or other online tool include a link to the website in the explanation of why the site was created.

H860006 – 3D Printing Unique Items – 3D printing uses plastic or other materials to build a three-dimensional (3D) object for a digital design. Youth may use original designs or someone else's they have re-designed 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 robot or other engineering project or cookie cutter. Must include design notebook with motivation or problem statement the prototype was 3D printing will include a notebook with the following:

- a. Define motivation/problem solved
- b. Software used
- c. Document purpose of material and print settings
- d. Material choice (PLA, PVA, ABS etc.)
- e. In-fill density
- f. Moving parts

H860007 – 3D Pen Creations – 3D pens rapidly melt and cool plastic filament allowing the 4-H'er to draw in 3D. Youth may use original designs or use a template to create their 3D item. Exhibits will be judged based on the complexity of the design and shape. 3D pen creation will include a notebook with the following: 1. Copy of the template if used and description of any changes the youth created. 2. If no template used – an explanation of how the creation was built. 3. Must include paragraph of what the youth learned while creating their project (i.e. way to improve their next creation). 4. Paragraph on how 3D pens impact Science Engineering and Technology.

H860008 – Maker Space/Digital Fabrication – 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

NOTE: Team entries may be made in H860008 – Maker Space/Digital Fabrication. The work 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 member receiving the same ribbon placing.

Division 861 – SET- Robotics -Youth enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1, 2 or 3), Robotics Platforms or GEAR TECH 21 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.

Creating a video of your robot in action would be helpful for the judges but is not mandatory present as a CD with your robot entry.

CLASS

- H861001 - Robotics Poster** - Create a poster (14" X 22") communicating a robotics theme such as "Robot or Not", "Pseudocode", "Real World Robots", "Careers in Robots" or "Autonomous Robotics", "Precision Agriculture" or a robotic topic of interest to the 4-H'er.
- H861002 - Robotics Notebook** – 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.
- H861003 - Robotics Video**– 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.
- H861004 - Robotics /Careers Interview** – 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.
- H861005. Robotics Sensor Notebook** – Write pseudo code which includes at least one sensor activity. Include the code written and explain the code function.
- H861006 - Build a Robot (may use kit)** – Include a robot and notebook including the pseudocodes for at least one program you have written for the robot, the robots purpose, and any challenges or changes you would make in the robot design or programming.
- H861007 - Kit Labeled Robot (cannot be programmed)** – 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 project the youth has constructed, a description of what it does and an explanation of how it is similar to and different from a robot.
- H861008 – 3D Printed Robotics Parts** – This class is intended for youth to create parts, through 3D printing, to help create their robot or aid the robot in completing a coded function. Projects should include notebook describing the process used to create the project, describe the success of your designed piece (did it work), intended use for the product and the modifications made to the item.

Division 870 –SET- Electricity

CLASS

Unit 1 (For classes 901 – 904 please refer to Unit 1 4-H manual)

- H870901 - 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. No kits please.
- H870902 - Control the Flow** – Make a switch. Use the following items: D cell battery, battery holder, insulated wire, 2 or 2.5 volt light bulb, bulb holder, paper clip, cardboard, and two brass paper fasteners to create a circuit that you can open and close.
- H870903 - Conducting Things** – Make a circuit with a switch and a light bulb that can be used to test different household items for their ability to act as an insulator or conductor. You must find five items that are conductors and five items that are insulators. Create a table that illustrates your results.
- H870904 - Is there a Fork in the Road** – Use the following items to construct one parallel and one series circuit. Items: D cell battery, battery holder, insulated wire, bulb holder and a 2 or 2.5 volt light bulb.

Unit 2 (For classes 905 – 907 please refer to Unit 2 4-H manual)

- H870905 - Case of the Switching Circuit** – Use the following items: two D cell batteries, two battery holders, light bulb, bulb holder, a 3 inch by 6 inch piece of cardboard, six brass paper fasteners and approximately two feet of 24 gauge insulated wire to build a three way switch. Write a short essay or create a poster that illustrates how three-way switches function.

H870906 - Rocket Launcher – Construct a rocket launcher out of the following materials: a plastic pencil box that is at least 4” by 8”, single pole switch, single throw switch, normally-open push button switch, 40 feet of 18 or 22 gauge stranded wire, 4 alligator clips, 2-by 6-board 6 inches long, 1/8” diameter metal rod, rosin core solder, soldering iron or gun, wire stripper, small crescent wrench, pliers, small Phillips and straight blade screwdrivers, drill, 1/8” and ¼” drill bits, rocket engine igniters, additional drill bits matched to holes for two switches. 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 the launcher. Create a poster using photographs to show the “step by step process” you used to build your launcher.

H870907 - Stop the Crime – Build an **Alarm** using the following materials: On-off push button switch, mercury switch, buzzer-vibrating or piezoelectric, 9-volt battery, 9-volt battery holder, 4” x 4” by 1/8” Plexiglas board to mount circuit on; rosin core solder, soldering gun/iron, two feet of 22-gauge wire, wire strippers, hot glue sticks, hot glue gun and a plastic box with a lid to mount your alarm circuit on. Create a poster using photographs to show the “step by step process” you used to build your alarm.

Wired for Power – Unit 3

H870001 - Electrical Tool/Supply Kit - 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.

H870002 - Lighting Comparison - Display studying the efficiency of various lighting (incandescent, fluorescent, halogen, Light Emitting Diodes, etc.). Exhibit could be a poster display, or an actual item.

H870003 - Electrical Display/Item - 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.

H870004 - Poster - Poster should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28” by 22”.

Electronics – Unit 4

CLASS

H870005 - Electrical/Electronic Part Identification - 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.

H870006 - Electronic Display - Show an application of one of the concepts learned in the Electronics project. Examples include: components of an electronic device (refer to p. 35 of the Electronic manual).

H870007 - Electronic Project - 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 voltmeter.

H870008 - Poster - Poster should exemplify one of the lessons learned in the Entering Electronics Project. Posters can be any size up to 28” by 22”.

Division 880 – SET- Geospatial - Youth enrolled in Geospatial or GEAR TECH 21 may exhibit in any class within this division.

CLASS

H880001 - Poster - Create a poster (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.

H880002 - 4-H Favorite Places or Historical Site Poster – 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”.

- H880003 - GPS Notebook** - 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.
- H880004 - Geocache** - 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, geocoins, 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.
- H880005 – Agriculture Precision Mapping-** 4-H'ers will assemble a notebook that will include a minimum of 2 digital copies of various layers that can be used in precision agriculture to identify spatial patterns and/or correlations (printed copies of websites were applications can be purchased is acceptable). A report of how the analysis of the various data will be used to make management decision.
- H880006 – 4-H History Map/Preserve 4-H History**–Nominate a Point of Interest for the 4-H History Map Project include copy of submitted form in folder or notebook. Write a brief description of the historical significance of 4-H place or person, a minimum of one paragraph. To nominate a site for the 4-H history map please go to arcg.is/1byGogV . For more information about 4-H history go to 4hhistorypreservation.com/History_Map/ for a step video on nominating a point, please go to this link: tinyurl.com/nominate4h . Write a brief description of the historical significance of 4-H place or person (a minimum of one paragraph).
- H880007 – GIS Thematic Map** – Using any GIS software, create a thematic. Thematic maps can utilize any subject of interest to the 4-H'er. Example map would be Amelia Earhart's or Sir Francis Drake's voyage population density maps, water usage "x 11" maps or 4-H project in Nebraska. Create 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", should include Title, Base Map, Neat Line, North Arrow, and Legend. Identify the source of your information on the back of the map.

Division 900 – SET - Physics/Power of Wind

Resources: <https://go.unl.edu/ne4hphysics-powerofwind>

Class

- H900001 - Create and Compare Energy Resources Poster** – 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."
- H900002 - Experiment Notebook** – 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.
- H900003 - Solar as Energy Display** - Item should be the original design of the 4-Her. 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. Examples include solar ovens, solar panels, etc.
- H900004 - Water as Energy Display** - Item should be the original design of the 4-Her. 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.
- H900005 - Wind as Energy Display**– Item should be the original design of the 4-Her. 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.
- H900006 - Other Nebraska Alternative Energy** – 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.

Division 911 –SET- Woodworking

Woodworking 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.
- 4-H'ers must be in Unit 3 or 4 to exhibit at the State fair
- All projects must have appropriate finish. 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.

Unit 1

CLASS

H911901 – Woodworking Article – Item made using skills learned in the Measuring Up Project Guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

H911902 – Display - exemplifying one of the principles learned in the Measuring Up Project. Examples include: Butting Up, Gluing, and Sanding.

Unit 2

CLASS

H911903 – Woodworking Article – Item made using skills learned in the making the Cut Project Guide. Examples include: bird house, foot stool, and napkin or letter holder. Items should be entered with construction plans.

H911904 – Woodworking Display – Display exemplifying one of the principles learned in the making the Cut manual. Examples may include: wood grain, chiseling, scroll saws, power sanders.

Unit 3

CLASS

H911001 - Woodworking Article – Item should be made using either joints, hinges, dowels, or a dado joining skills learned in the Nailing it Together manual. Item is required to be appropriately finished. Examples include: bookcase, coffee table or end table.

H911002 - Woodworking Display - Display exemplifying one of the principles learned in the Nailing it Together Project. Examples include: measuring angles, wood lamination and joint types.

H911003 – Recycled Woodworking Display – Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and or sealed and utilize one or more woodworking techniques from page 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.

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. Build the item (What was your woodworking plan, and what processes did you use to build your item?)

5. Reason for article finish (What type of finish, how did you finish or why you chose this finish?)
6. Evaluate (How does your item solve the original need?)
7. Present results (How would you do this better next time?)

H911004 – Composite Wood Project -60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alterations 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.

H911005 – Outdoor Wood Project made with Treated Wood – Treated wood projects DO NOT have to have a finished coating. All plans and plan alterations must be attached to the article. Protect plans with a cover.

UNIT 4 CLASS

H911006 - Woodworking Article - 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.

H911007 - Woodworking Display - Display exemplifying one of the principles learned in the Finishing It Up Project. Examples include: career opportunities, types of finishes, or dovetailing.

H911008 – Recycled Woodworking Display – Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 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.

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?)

Division 920 – SET - Welding (All metal welding process accepted.)

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 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.

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 on the same size and thickness of metal. These pieces, referred to as coupons, should be 1.5 to 2 inches wide and 3.5 to 4 inches 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- ¼" if using 1/8" rod. Suggested rod-AC and DC straight or reverse polarity- first E-7014, second E-6013.
6. MIG welding: Suggested coupon thickness--¼" if using .035 wire and 1/8" if using .023 wire.
7. Oxy-Acetylene: Suggested coupon thickness– 1/8". Suggested rod– 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" inch and ¼" 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 used including steel, electrodes, paint, wheels, etc

CLASS

H920001 - Welding Joints -a display of one butt, one lap and one fillet weld.

H920002 - Position Welds -a display showing three beads welded in the vertical down, horizontal and overhead positions.

H920003 - Welding Article -any shop article or piece of furniture where welding is used in the construction. 60% of item must be completed by 4-H'er and notes regarding laser welding or machine welding must be included. All plans, plan alterations, and a bill for materials must be attached to the article. Protect plans with a cover.

H920004 – Welding Furniture– Any furniture with 75% welding is used in the construction. 60% of item must be completed by 4-H'er and notes regarding laser welding or machine welding must be included. All plans, plan alternations, dimensions and a bill for materials must be attached to the article. Protect plans with a cover. May be displayed outside.

H920005 – Plasma Cutter/Welder Design – Plasma cutters/welders are 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: A. a photo (front and back) of the finished project. Also include detailed photographs of the project to allow judges to examine cuts. B. Instructions on how the design was created, this allows for replication of the project. C. Lessons learned or improvements to the project.

H92006 – Composite Weld Project – 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. All plans, plan alterations, 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.