

SCIENCE, ENGINEERING & TECHNOLOGY

GENERAL INFORMATION

1. 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.
2. Each individual is limited to one exhibit per class. All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.
3. 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.
4. Copywritten images cannot be used.
5. Please refer to the General Rules for the policy regarding firearms, items with a blade, and other related items.
6. Several classes require a display board which should be a height of 24 inches and not to exceed 1/4-inch thickness. A height of 24 7/8 inches is acceptable to allow for the saw kerf (width) if two 24-inch boards are cut from one end of a 4 foot by 8-foot sheet of plywood. Nothing should be mounted within 3/4 inch of the top or bottom of the board. (Example: Woodworking & Electricity.)
7. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
8. Demonstration boards should include an overall title for the display, plus other necessary labeling.
9. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
10. Team Entries: To qualify for entry at the Nebraska State Fair team materials entered in H860007-Maker Space/ Digital Fabrication is 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.
11. 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/ne4haerospace>

MODEL ROCKETRY

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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.

Rockets must be supported substantially to protect it from breakage. Rockets are to be mounted on base that has dimensions equal or less than 12" x 12" and the base should be 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 should be mounted vertically. Please do not attach sideboards or backdrops to the displays.

In addition, a used engine or length of dowel pin should be glued into the board and extended up into the rocket's engine mount to give added stability.

Rockets must be equipped for launching, with wadding and parachutes. Rockets entered with "live" engines, wrong base size or sideboards will be disqualified.

A report, protected in clear plastic cover, must include: 1) Rocket specification, 2) flight record for each launching: weather, distance, flight, height, 3) number of launchings, 4) flight pictures, 5) statistics, 6) objectives learned and 7) conclusions.

The flight record should describe engine used, what rocket did in flight, and recovery success. Points will not be deducted for launchings, flight, or recovery failures described. This includes any damage that may show on the rocket.

Complete factory assembled rockets will not be accepted at the Fair.

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 scoresheets. 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.

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) 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.

Posters can be any size up to 28" x 22" when ready for display. Example: trifold poster boards are not 28" x 22" when fully open for display.

Entry level rockets, made with plastic fins and plastic body tubes are County Only projects.

AEROSPACE (ROCKETS/DRONES)

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

- *H850001** **Rocket: Any Skill Level** - Rocket with wooden fins and cardboard body tubes painted by hand or airbrush. (SF92)
- *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 kit terminology. Display can be any size up to 28" x 22". (SF93)
- *H850003** **Rocket: Any Skill Level** - Rocket with wooden fins and cardboard body tubes painted using commercial application. For example, commercial spray paint. (SF92)
- *H850004** **Rocket: Any self-designed Rocket** - Rocket with wooden fins and cardboard body.
- H850010** **Other Rocket:** Any skill level rocket with plastic fins. (SF92)

DRONES

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

- *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 needed 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 how the drone interacts with the outside world. Examples include field scouting, surveying damage from natural disasters, drones used in commercial applications and settings, drones used for structural engineering. Video should not exceed 5 minutes.
State Fair: Videos should be submitted on a flash drive for county fair and to Amy Timmerman at atimmerman2@unl.edu by August 15, 2022. Videos should also be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing.

COMPUTERS

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COMPUTER MYSTERIES - UNIT 1

- H860014 Computer Designed Greeting Card** - Exhibit will consist of four (4) greeting cards, each for a different occasion/holiday. Exhibit should be created on 8 1/2" x 11" paper using a commercially available graphics program and a color printer/plotter or single-color printer/plotter. The cards should vary in folds and design. Prefabricated cards from commercially available card programs will NOT be accepted. No theme required. Place in a Ziploc bag.
- H860015 Computer Art Poster** - Exhibit should be created on at least 8 1/2" x 11" paper using a commercially available graphics software package and a single-color printer/plotter.
- H860016 Original Graphics Poster** - Exhibit should be on an 8 1/2" x 11" page using original graphics developed by the 4-H'er.
- H860017 4-H Promotional Flyer** - Exhibit should be created on 8 1/2" x 11" page using a commercially available graphics software package. Flyer can be color or black and white. Flyers can be a whole page or a folded flyer.
- H860018 Other**

COMPUTER MYSTERIES - UNIT 2

- *H860001 Computer Application Notebook**– 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 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 description of foods and pricing); book layout (I-book); promotional flyer (3 flyers promoting 3 different events); newsletter (minimum 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 (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. (Scoresheet SF277)
- *H860002 Produce a Computer Slideshow Presentation**– Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. State Fair: All slide shows for state fair should be emailed to Amy Timmerman atimmerman2@unl.edu before August 15. Files must be saved in a PC compatible format with county name and last name of participant before emailing OR the slide slideshow

may be shared through a share link or QR code which is included in the notebook. 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. (SF276)

COMPUTER MYSTERIES - UNIT 3

- *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. (SF276)
- *H860004 How to STEM (Science, Technology, Engineering and Math)** -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 or may be uploaded to a video streaming application and exhibitors can provide a hard copy QR code for public viewing. Any of the following formats will be accepted: .mpeg, .rm,.wmv,. mp4,. mov, .ppt, or .avi (SF276)
- *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 is not live including 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. (SF275)
- *H860006 3D Printing Unique Items** – (SF1050) 3D printing uses plastic or other materials to build a 3-dimensional object from a digital design. Youth may use original designs or someone else's they have re-designed in a unique way. 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 follow:
1. Define motivation/problem solved
 2. Software used
 3. Document purpose of material and print settings
 4. Material choice (PLA, PVA, ABS, etc.) e. In-fill density
 5. Moving parts
- *H860007 Maker Space/Digital Fabrication** – (SF1050) This project is a computer generated projected created using a laser cutter, vinyl cutter, heat press or CNC router, Vector or 3D based software such as Corel Draw, or Fusion 360 would be an example of an appropriate software used to create your finished project. Project should include a notebook with the following:
1. What motivated you to create this project?
 2. Software and equipment used
 1. Directions on how to create the project
 2. Prototype of plans
 3. Cost of creating project
 4. Iterations or modifications made to original plans
 5. Changes you make if you remade the project.

ROBOTICS

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. Involvement in SET Robotics gives participants a first-hand experience in modern technology. Youth enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1, 2, or 3 Robotics Platforms may exhibit in any class within this division.

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Team Entries: To qualify for entry at the 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.

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hrobotics>

- *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. (SF236)
- *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. (Scoresheet SF237)
- *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. Files must be saved in a PC compatible format with county name and last name of participant. (SF238)
- *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. (SF239)
- *H861005 Robotics Sensor Notebook** – Write pseudo code which includes at least one sensor activity. Include the code written and explain the code function. (SF241)
- *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 robot's purpose, and any challenges or changes you would make in the robot design or programming. If robot is more than 15" inches wide and 20" inches tall they may not be displayed in locked cases. We recommend that you submit the project under class H861003 – Robotics Video. Junk Drawer Robotics do not qualify. Files must be saved in a PC compatible format with county name and last name of participant before emailing. (SF243)
- *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 like and different from a robot. (SF243)

- *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. 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. (SF244)

ELECTRICITY

In this category 4-H’ers have the opportunity to create informational 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.

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Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4helectricity>

MAGIC OF ELECTRICITY - UNIT 1

- H870015 Bright Lights** - Create your own flashlight using items found around your house. Flashlights should be made from items that could be recycled or reused. No kits please. Follow directions on page 11 of project manual. (SF226)
- H870016 Control the Flow** - Make a switch. Follow directions on page 13 of the project manual. (SF226)
- H870017 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 items that are insulators. Create a table that illustrates your results. (Scoresheet SF226)
- H870018 Is There a Fork in the Road** - Use the following items to construct 1 parallel and 1 series circuit. Items: D cell battery, battery holder, insulated wire, bulb holder and a 2 or 2.5-volt light bulb. (SF226)

INVESTIGATING ELECTRICITY - UNIT 2

- H870019 Case of the Switching Circuit** - Follow directions on page 27 of the project manual. Write a short essay or create a poster that illustrates how 3-way switches function. (SF226)
- H870020 Rocket Launcher** - Follow directions on page 31 of project manual. You must successfully build a rocket launcher and light 2 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. (Scoresheet SF226)
- H870021 Stop the Crime** - Build an alarm following the directions on page 33 of the project manual. Create a poster using photographs to show the “step-by-step process” you used to build your alarm. (SF226)

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. (SF224)
- *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. (SF225)

- *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. (SF226)
- *H870004 **Poster** should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28" x 22". (SF227)

ELECTRONICS - UNIT 4

- *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. (SF228)
- *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.) (SF229)
- *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. (SF230)
- *H870008 **Poster** should exemplify one of the lessons learned in the Entering Electronics Project. Poster can be any size up to 28" x 22". (SF231)

GEOSPATIAL

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. Take close note of the rules to ensure your exhibit qualifies. Youth enrolled in Geospatial may exhibit in any class within this division.

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Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hgeospacial>.

- *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. (SF299)
- *H888002 **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". (SF272)
- *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. (SF300)
- *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, 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. (SF301)
- *H880005 **Agriculture Precision Mapping** – 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

where applications can be purchased is acceptable) a report of how the analysis of the various data will be used to make a management decision. (SF302)

- *H880007 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. 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://www.4-hhistorypreservation.com/History_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)
- *H880008 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 map.

RENEWABLE ENERGY RESOURCES

This category provides 4-H'ers a way to present their ideas about energy. 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.

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Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hphysics-powerofwind>

- *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. (Scoresheet SF 307)
- *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. (SF305)
- *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 the sun. Examples include solar ovens, solar panels, etc. (SF308)
- *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. (SF308)
- *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. (SF308)
- *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. (SF306)

WOODWORKING

In this category 4-H'ers can create exhibits about varying levels of woodworking. In addition, participants can also create information 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.

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Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hwoodworking>

The ability to build objects as designed by another person is an important life skill. Professional woodworkers often are hired to build objects to exacting specifications as laid out in a written plan.

REQUIREMENTS

- All articles exhibited must include a plan (with drawings or sketch or blueprint) 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 alterations 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 Unit 4 for the exhibit to be considered for 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 outside, it will be displayed outside at State Fair. All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and may be attached to projects with string, zip ties, etc.

WOODWORKING UNIT 1

- H911021** Flower Box (SF91)
H911022 Napkin or Letter Holder (SF91)
H911023 Picture Frame (SF91)
H911024 Article comparable to items in Level 1 (SF91)

WOODWORKING UNIT 2

- H911025** Napkin or Letter Holder (SF91)
H911026 Birdhouse (SF91)
H911027 Foot Stool (SF91)
H911028 Article comparable to items in Level 2 (SF91)

WOODWORKING UNITS 3 & 4

- *H911001** **Wood Working Article** - Item should be made using either joints, hinges, dowels, or a dado joining made using skills learned in the Nailing It Together manual. Item is required to be appropriately finished. Examples include bookcase, coffee table or end table. (SF91)
- *H911002** **Wood Working Display** - Display exemplifying one of the principles learned in the Nailing It Together
- *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. (SF91)

Engineering Design Process

1. State the problem (Why did you need this item?)
2. Generate possible solutions (How have others solved the problem? What other alternatives of designs were considered?)
3. Select a solution (How does your solution compare based on 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 rubber, resin, etc. All plans and plan alterations must be attached to the article. Protect plans with a cover. (SF96)

***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. Examples include picnic tables, planters, outdoor furniture, etc. (SF97)

WELDING

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 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.

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Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hwelding>

(All metal welding processes accepted.)

ARCS AND 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 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.** If no plans are included with welding article or welding furniture, item will be disqualified.

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.

- o Stick welding: Suggested coupon thickness - 1/4" if using 1/8" rod. Suggested rod-AC and DC straight or reverse polarity- first E-7014, second E-6013
 - o MIG welding: Suggested coupon thickness - 1/4" if using .035 wire and 1/8" if using .023 wire
 - o Oxy-Acetylene: Suggested coupon thickness - 1/8". Suggested rod- 1/8" mild steel rod
5. All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and may be attached to projects with string, zip ties, etc.

4-H Welding Project Tips and Suggestions: 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 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.

4-H Welding Project Tips and Suggestions: 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.

***H920001 Welding Joints** - a display of one butt, one lap and one fillet weld. (SF281)

***H920002 Position Welds** - a display showing three beads welded in the vertical down, horizontal, and overhead positions. (SF281)

***H920003 Welding Art** – Any art created using tack welds to hold the metal pieces together (examples include horseshoe project). Type of welder, welder settings, all plans, plan alterations, 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 (SF281)

***H920004 Welding Article** – Any shop article 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. Type of welder, welder settings, all plans, plan alterations, 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. (SF281)

***H920005 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. Type of welder, welder settings, all plans, plan alterations, 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 (SF282)

***H920006 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. This item is not eligible for entry at the State Fair. In the notebook include:

1. A photo (front and back) of the finished project. Also include detailed photographs of the project to allow judges to examine cuts.

2. Instructions on how the design was created, this allows for replication of the project.
3. Lessons learned or improvements to the project.

***H920007 Composite Weld Project** - 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 (SF280)

ENTOMOLOGY

Entomology exhibits give 4-H'ers the opportunity to demonstrate their knowledge about insects and insect displays. This category has multiple projects that allows a 4-H'er to progress over numerous years.

Purple \$3.00 Blue \$2.00 Red \$1.00 White \$.50

Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hentomology>

Specimens to be mounted properly and labeled with the date and location of collection, name of collector, and order name. Follow mounting and labeling instructions in the Nebraska 4-H Entomology manual online as a PDF file. <http://4-Hcurriculum.unl.edu/catalog/environmental.html>

Purchased insects and other insects not collected by the participant can be included but must have accurate labels and will not be counted in meeting minimum requirements for the exhibit. Insect boxes are not to be more than 12" high x 18" wide x 3" deep.

- *H800001 First Year Display** - Collection to consist of 25 or more different kinds (species) of insects representing at least 6 orders. Limit 1 box. (SF186)
- *H800002 Second Year Display** - Collection to consist of 50 or more different kinds (species) of insects representing at least 8 orders, replace damaged or poorly mounted specimens – At least 25 species must be after July 1 of previous year. Limit 2 boxes. (SF186)
- *H800003 Third Year or More Display** - Collection of a minimum of 75 or more different kinds (species) insects representing at least 10 orders, replace damaged or poorly mounted specimens –At least 25 species must be after July 1 of previous year. Limit of 3 boxes (SF186)
- *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, and 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 pests of corn, aquatic insects, insect mimicry, insect galls, insects from goldenrod, insect pollinators, etc.) (SF187)
- *H800005 Insect Habitats** – Habitats consist of any handcrafted 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. (SF186)
- *H800006 Macrophotography** – Subjects should be insects, spiders or other arthropods, or any nests, webs, or construction they make. All exhibit 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 is 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. (SF189)

- *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 dioramas, sculptures, models, or decorative boxes should have a page of explanatory information accompanying them and fit within a 22" x 28" area. (SF190)
- *H800008 Reports or Journals** -Reports and 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 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. (SF191)
- H800009 Other Entomology Display (County Only)** - This could include a killing jar, rearing cage, Life history posters, etc.

VETERINARY SCIENCE

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

Purple \$3.00 Blue \$2.00 Red \$1.00 White \$.50

Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hvetscience>

RULES

- A. 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
- B. 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, the use of drapes, sterile procedures, wearing of gloves, and other appropriate veterinary medical practices.
- C. 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.

- D. 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.
- E. 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

****Remember, since these are science displays, all references and information need 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.

***H840001 4-H Veterinary Science Large Animal Poster, Notebook or Display (SF119)**

***H840002 4-H Veterinary Science Small Animal/Pet Poster, Notebook or Display (SF119)**