

**DEPARTMENT H
SCIENCE, ENGINEERING
& TECHNOLOGY**

Superintendent, Sue McDonald



Science Engineering Technology (SET) Careers

H930-001. Careers Interview (SF239) Interview someone who is working in any field associated with science, engineer and technology and research that career (i.e. computer programmer, architect, engineer, pilot, etc.). 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.

Rules

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. 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.)
4. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
5. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
6. Demonstration boards should include an overall title for the display, plus other necessary labeling.
7. 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.
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9. Premier 4-H Science Award is available in this area. Please see General Rules for more details.

Aerospace

PREMIUM	Purple	Blue	Red	White
	\$5.00	\$4.00	\$3.50	\$3.00

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 3/4" thick. No metal bases. If the rocket fins extend beyond the edges of the required base (12" x 12"), then construct a base that is large enough to protect the fins. The base size is dictated by the size of the rocket fins. The rockets must be mounted vertically. Please do not attach sideboards or backdrops to the displays. In addition, a used engine or length of 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 skill 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 and 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 at the State 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 score sheets. *For scoring for the State Fair, 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) 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.

FLIGHT CREW – UNIT 1

H850-901 Single Stage Rocket up to 15” in length.

H850-902 Display: Display exemplifying one of the principles learned in Flight Crew. Examples include: diagram of rocket or jet, interview with firefighter, pilot or air traffic controller, design for an airport, model space station.

H850-903 Trebuchet – mini-catapult

WATER ROCKETS

H850-904 Rocket: Any water rocket made with a 2-liter plastic bottle.

H850-905 Display: Display exemplifying one of the principles learned in the Water Rocket Project. Examples include: Display of rocket parts and purpose, interview of someone in the aerospace field, picture board and description of building and/or launching a water rocket, story of building and/or launching a water rocket. Display can be any size and any material can be used.

PREMIUM	Purple	Blue	Red	White
	\$6.00	\$5.00	\$4.50	\$4.00

LIFTOFF – UNIT 2

H850-001 Rocket: Any Skill Level 2 rocket with wooden fins painted by hand or air brush (Scoresheet: SF92)

H850-002 Display: Display exemplifying one of the principles learned in the Lift Off project. Examples include: display of rocket parts and purpose, 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”. (Scoresheet: SF93)

H850-003 Rocket: Any Skill Level 2 Rocket with wooden fins painted using commercial application. Example – commercial spray paint (Scoresheet: SF92)

REACHING NEW HEIGHTS – UNIT 3

H850-004 Rocket: Any skill level 3 rocket with wooden fins painted by hand or air brush (Scoresheet: SF92)

H850-005 Display: Display exemplifying one of the principles learned in the Reaching New Heights Project. Examples include: airplane instrumentation, kite flying, or radio-controlled planes. Display can be any size up to 28” by 22”. Include notebook containing terminology (definition), and what was learned. (Scoresheet: SF93)

H850-006 Rocket: Any Skill Level 3 Rocket with wooden fins painted using commercial application.

Example – commercial spray paint. (Scoresheet: SF92)

PILOT IN COMMAND – UNIT 4

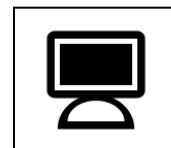
H850-007 Rocket: Any skill level 4 rocket with wooden fins or any self-designed rocket Scoresheet: SF92

H850-008 Display: Display exemplifying one of the principles learned in the Pilot in Command Project. Examples include: flying lessons, or careers in aerospace. Display can be any size up to 28” by 22”. (Scoresheet: SF93)

DRONES- UNIT 5

H850009-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” by 22”. Formatted: Font :(Default) Times New Roman, 13.5pt, Bold, Complex Script Font: Times New Roman,13.5pt Formatted: Line spacing: single

COMPUTERS



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6. Premier 4-H Science Award is available in this area. Please see General Rules for more details.
7. Please refer to the General Rules for the policy regarding firearms, items with a blade, and other related items.
8. Team entries: To qualify for entry at the NE State Fair team materials entered in H860009- 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 the team members receiving the same ribbon placing.

PREMIUM	Purple	Blue	Red	White
	\$4.00	\$3.00	\$2.50	\$2.00

COMPUTER MYSTERIES – UNIT 1

H860-902 4-H Promotional Flier – Exhibit should be created on 8 ½ x 11” page using a commercially available software package. Flier can be color or black & white. Fliers can be a whole page or a folded flier. Put exhibit in protective cover.

PREMIUM	Purple	Blue	Red	White
	\$5.00	\$4.00	\$3.50	\$3.00

COMPUTER MYSTERIES – UNIT 2

H860-001 Computer Application Poster -Exhibit designed to educate yourself and others on the use of computer application/program or techniques of internet/social media safety. Examples of the computer application/program could include but are not limited to: how to download digital photos from a camera and create a usable way of storing and accessing them in the future; details of how to use instant messaging programs like Skype; or how to create a social networking page (ex. “Facebook,” “SnapChat,” “Instagram,” “Twitter,” “FaceTime,” etc). Examples of internet/social media safety include but not limited to identity theft, predator safety, internet etiquette, social networking pages precautions, etc. Posters can be any size up to 28” by 22”.

H860-002 Produce a Computer Slideshow Presentation (SF277) Using presentation software. Files must be saved in a PC compatible format with county name and last name of participant before emailing to County Extension Staff. 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 up loaded.

PREMIUM	Purple	Blue	Red	White
	\$8.00	\$7.00	\$6.00	\$5.00

COMPUTER MYSTERIES - UNIT 3

H860-004 Produce an Audio/Video Computer Presentation (SF276) Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. 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.

H860-005 How to STEM (Science, Technology, Engineering and Math) Presentation (SF276) Youth design a fully automated 2 to 5 minute 4-H “how to” video. Submissions should incorporate a picture or video of the 4-Her, as well as their name (first name only), age (as of January 1 of the current year), years in 4-H, and their personal interests or hobbies. Videos should be designed for web viewing. Any of the following formats will be accepted: .mpeg, .rm, .wmv, .mp4, .ov, .ppt, or .avi.

H860-006 Create a Web Site/Blog or App– Design a 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 isn’t live including all files comprising the Web site 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. Scoresheet: SF275

H860-007 3D PRINTING Unique Items: 3D printing uses plastic or other materials to build a 3-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, PVS, ABS, etc.)
- e. In-fill density
- f. Moving parts

H860008. 3D Pen Creation (SF...): 3D pens rapidly melt and cool plastic filament allowing the 4-Her 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:

- a) Copy of the template if used and description of any changes the youth created.
- b) If no template used – an explanation of how the creation was built.
- c) Must include paragraph of what the youth learned while creating their project (i.e. way to improve their next creation)
- d) Paragraph on how 3D pens impact Science Engineering and Technology

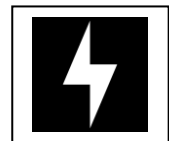
H860009–Digital Fabrication–This project is a computer generated projected created using a laser cutter, vinyl cutter, heat press or CNC router. Vector or 3D based software such as coreldraw or Fusion 360 would be an example of an appropriate software used to create your finished project. Project should 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 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

ELECTRICITY

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PREMIUM	Purple	Blue	Red	White
	\$5.00	\$4.00	\$3.50	\$3.00

MAGIC OF ELECTRICITY – UNIT 1

H870-901 Unit 1 Control the Flow: Make a switch. Use the following items: D cell battery, battery holder, insulated wire, 1 or 2 - flash light bulb(s), bulb holder, paper clip, cardboard, and two brass paper fasteners to create a circuit that you can open and close. Label your circuit board parts and explain the complete circuit process.

H870-902 Unit 1 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 insulators or conductors. Create a table that illustrates your results.

H870-903 Demonstration Board This exhibit is to be prepared on a board that is 1/4" thick x 24" high x 32" wide. Include two graphics and four items made or studied in the Unit I Magic of Electricity project. The graphic may show what electricity is, how a battery works, IO electricity safety rules, the results of the home lighting survey, etc. The four items may include a simple fuse, simple switch, circuit board, cut away flashlight, electra-plated object, conductors-nonconductors, etc. Be sure to include the appropriate labeling.

H870-904 Quiz Board or Steady Hand Tester Game will be judged on usefulness, craftsmanship and wiring skill. Include battery or power supply to operate exhibit. Questions on the quiz board could deal with any topic.

PREMIUM	Purple	Blue	Red	White
	\$6.00	\$5.00	\$4.50	\$4.00

INVESTIGATING ELECTRICITY – UNIT 2

H870-905 Rocket Launcher: Construct a rocket launcher out of the following materials: a plastic pencil box that is at least 4 inches by 8 inches, 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 inch 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 inch and 1/4 inch 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 of the launcher. Create a poster using photographs to show the "step by step process" you used to build your launcher.

H870-906 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" by 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.

H870-907 Modified Toy Motors Electric motors entered with changes made by the 4-Hers to improve design and operation. Any motors entered with design changes must also include a story telling what changes were made and the results. Enclose story in a clear plastic cover. NO premanufactured kit electric motors will be accepted.

H870-908 Electric Motor Converted to DC or AC Generator Exhibit is to consist of the toy electric motor shown in Unit II, converted to use as a DC or AC generator. Generator should be exhibited on a base including a battery and a light bulb or Galvanoscope to demonstrate its operation. Title the exhibit and label the major parts.

H870-909 Switching Circuits: Build a three-way switch. Use the following items: D cell battery, battery holder, insulated wire, 2 -7.5-volt light bulb, bulb holder, 2 paper clips, cardboard and 4 brass paper fasteners to build a three-way switch circuit. Label your circuit board parts and explain the process.

PREMIUM	Purple	Blue	Red	White
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CLASSES 4 & 8	\$4.00	\$3.00	\$2.50	\$2.00
CLASSES 1-3 & 5-7 & 10	\$8.00	\$7.00	\$6.00	\$5.00

WIRED FOR POWER – UNIT 3

H870-001 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.

Scoresheet: SF224

H870-002 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.

H870-003 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. (Do not bring a lamp shade)

Scoresheet: SF226

H870-004 Poster should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28" by 22". Scoresheet: SF227

ELECTRONICS – UNIT 4

H870-005 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

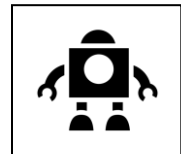
H870-006 Electronic Display Show an application of one of the concepts learned in the Electronics project.

Examples include: components of an electronic device. SF229

H870-007 Electronic Project Exhibit an electronic item designed by the 4-Her or from a manufactured kit that shows the electronic expertise of the 4-Her. Examples include: a radio, a computer, or a volt meter. SF230

H870-008 Poster should exemplify one of the lessons learned in the Entering Electronics Project. Posters can be any size up to 28" by 22". SF231

ROBOTICS



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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

PREMIUM	Purple	Blue	Red	White
Classes1	\$4.00	\$3.00	\$2.50	\$2.00
Classes 2-7 & 901	\$8.00	\$7.00	\$6.00	\$5.00

ROBOTICS

Youth enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1, 2 or 3) Robotics Platforms or GEAR TECH 21 (manual only on-line) may exhibit in any class within this division.

H861-001 Robotics Poster – Create a poster (14” X 22”) communicating a robotics theme such as “Robot or Not”, “Pseudocode”, “Real World Robots”, “Careers in Robots”, “Autonomous Robotics”, “Precision Agriculture” or a robotic topic of interest to the 4-H’er. Scoresheet: SF236

H861-002 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, programming skill, calibration, sensor exploration, or any of the topics suggested in Class 1. Scoresheet: SF237

H861-003 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. Scoresheet: SF238

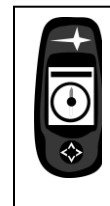
H861-004 Robotics Careers Interview – Interview someone who is working in the field of robotics and research the career in robotics. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double spaced, 12-point font, and 1” margins. Multimedia reports should be between 3 to 5 minutes in length. Scoresheet: SF239

H861-005 Robotics - Sensor Notebook – Write pseudo code which includes at least one sensor activity. Include the code written and explain the code function. Scoresheet: SF241

H861-006 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. 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. Scoresheet: SF243

H861-007 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. 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. Scoresheet: SF243

Geospatial



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PREMIUM	Purple	Blue	Red	White
Classes 1 & 2	\$4.00	\$3.00	\$2.50	\$2.00
Classes 3-10	\$5.00	\$4.00	\$3.50	\$3.00

GEOSPATIAL

Youth enrolled in Geospatial (Exploring Spaces, Going Places CD) or GEAR TECH 21 (manual only on-line) may exhibit in any class within this division.

H880-001 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", "GIS in Agriculture", "Precision Agriculture" or a geospatial topic of interest. Scoresheet: SF 299

H880-002 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". Scoresheet: SF272

H880-003 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. Scoresheet: SF300

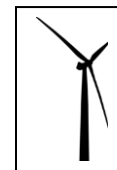
H880-004 Geocache Assemble a themed geocache. Each geocache should be a water-tight container. It should include a log book and pencil for finders to log their visits and may include small trinket, geocoins, etc. for the finders to trade. Documentation should include a title, teaser description and the geographic coordinates of intended placement. Register the site at geocaching.com, and include a print-out of its registry. The entry may include a photograph of the cache in its intended hiding place. SF301

H880-005 Agriculture Precision Mapping (SF302) 4-Hers will assemble a notebook that will include a minimum of 2 digital copies of various data layers that can be used in precision agriculture to identify spatial patterns and/or correlations (printed copies of websites were applications can be purchased is acceptable) A report of how the analysis of the various data will be used to make a management decision. Scoresheet: SF302

H880-007 4-H History Map Preserve 4-H History: Nominate a Point of Interest for the 4-H History Map Project 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)

H880-008 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.

Alternative/ Renewable Energies



Rules

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. 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.)
4. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
5. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
6. Demonstration boards should include an overall title for the display, plus other necessary labeling.
7. 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.
8. 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.
9. Premier 4-H Science Award is available in this area. Please see General Rules for more details.

PREMIUM	Purple	Blue	Red	White
	\$4.00	\$3.00	\$2.50	\$2.00

H900-001. Create and Compare Energy Resources Poster (SF...) – 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."

H900-002. Experiment Notebook (SF...) – 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.

H900-003. Solar as Energy Display (SF....) - 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.

H900-004. Water as Energy Display (SF....) - 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.

H900-005. Wind as Energy Display (SF308) – 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.

H900-006. Other Nebraska Alternative Energy (SF..) –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.

Resources:

<https://4-h.org/parents/national-youth-science-day/wired-for-wind/>

<https://4-h.org/parents/national-youth-science-day/biofuel-blast/>

<http://web.cals.uidaho.edu/biodiesel/4-h-curriculum-for-ages-8-12/>

<http://extension.oregonstate.edu/clackamas/energy-education-curriculum-lessons>

WOOD SCIENCE



Rules

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 woodworking exhibit per class. All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.
3. 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.)

4. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
5. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
6. Demonstration boards should include an overall title for the display, plus other necessary labeling.
7. 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.
8. 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.
9. Premier 4-H Science Award is available in this area. Please see General Rules for more details.

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 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 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 used outside, it will be displayed outside. Only one exhibit allowed per 4-Her per class. 4-Hers must be in Unit 3 or Unit 4 for the exhibit to be considered for State Fair.

WOOD SCIENCE

PREMIUM	Purple	Blue	Red	White
	\$4.00	\$3.00	\$2.50	\$2.00

MEASURING UP – UNIT 1

H911-901 Articles Made with Hand Tools. Select from Unit I (new manual or use comparable plans from other sources)

H911-902 Woodworking Display: Display exemplifying one of the principles learned in the Measuring Up Project. Examples include: tools, safety, wood types, glues, sanding tips, finishing methods.

MAKING THE CUT – UNIT 2

H-911-903 Article as shown in Woodworking Unit 2 Manual or comparable items using power hand tools, electric jig saw, power drill, and/or oscillating sander.

H911-904 Woodworking Display: Display exemplifying one of the principles learned in the Making the cut Project. Examples include: tools, safety, wood types, cutting on the angle, finishing methods.

PREMIUM	Purple	Blue	Red	White
	\$8.00	\$7.00	\$6.00	\$5.00

NAILING IT TOGETHER – UNIT 3

H911-001 Woodworking Article: SF91- 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.

H911-002 Woodworking Display: SF91- Display exemplifying one of the principles learned in the Nailing It Together Project. Examples include: measuring angles, wood lamination and joint types.

H911-003 Recycled Woodworking Display SF91– Article made from recycled, reclaimed or composite wood. Article must be appropriately finished **and/or sealed** and utilize one or more woodworking techniques from 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. 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 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 choose this finish?)
6. Evaluate (How does your item solve the original need?)

7. Present results (How would you do this better next time?)

PREMIUM	Purple	Blue	Red	White
	\$10.00	\$8.50	\$7.00	\$5.50

FINISHING UP – UNIT 4

H911-004 Woodworking Article: scoresheet: SF91- 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.

H911-005 Woodworking Display: scoresheet: SF91- Display exemplifying one of the principles learned in the Finishing It Up Project. Examples include: career opportunities, types of finishes, or dovetailing.

H911-006 Recycled Woodworking Display scoresheet: SF91– Article made from recycled, reclaimed or composite wood. Article must be appropriately finished **and/or sealed** and utilize one or more woodworking techniques from page 2 of the Unit 4 manual. Exhibit must include the woodworking plan and a minimum one-page report of how the design and engineering process was used to develop the woodworking plan.

1. State the problem (Why did you need this item?)
2. Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
3. Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)
4. Reason for article finish (What type of finish, how did you finish or why you choose this finish?)
5. Build the item (What was your woodworking plan, and what processes did you use to build your item?)
6. Evaluate (How does your item solve the original need?)
7. Present results (How would you do this better next time?)

WELDING

Rules

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. 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.)
4. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
5. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
6. Demonstration boards should include an overall title for the display, plus other necessary labeling.
7. 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.
8. 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.
9. Premier 4-H Science Award is available in this area. Please see General Rules for more details.

(All metal welding processes 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. If no plans are included with welding article or welding furniture, item will be disqualified.

PREMIUM	Purple	Blue	Red	White
	\$4.00	\$3.00	\$2.50	\$2.00

ARCS AND SPARKS

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

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.

PREMIUM	Purple	Blue	Red	White
	\$10.00	\$8.50	\$7.00	\$5.50

H920-001 Welding Joints (scoresheet: SF281) a display of one butt, one lap and one fillet weld.

H920-002 Position welds (Scoresheet: SF281) a display showing three beads welded in the vertical down, horizontal and overhead positions.

H920-003 Welding article (scoresheet: SF281) any shop article where welding is used in the construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. All plans, plan alternations, and a bill for materials must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

H920-004 Welding furniture (scoresheet: SF282) any furniture with 75% welding is used in the construction. 60% of item must be completed by 4-Her 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. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside

H920-005. Plasma Cutter/Welder Design (SF...) Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4Hers will create a notebook describing the design process to create the "artwork" to butt cut into the metal. This exhibit is not eligible for entry at the State Fair.

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

H920-901 Welded Article

“4-WHEELIN PHYSICS FUN”

This is a project using remote control cars to test physics (not a 4-wheeler used for transportation).



PREMIUM	Purple	Blue	Red	White
	\$4.00	\$3.00	\$2.50	\$2.00

4-WHEELIN’ PHYSICS FUN

H895-901 Poster. Poster should exemplify one of the lessons learned in the 4-Wheelin’ project. Posters can be any size up to 28” by 22”.

H895-902 Completed 4 Wheeling’ Project Book.

H895-903 Poster Exhibit with six photos demonstrating the experiments in the 4-Wheelin’ 4-H manual on pages 8 to 25.

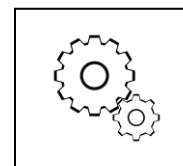
H895-904 Tool Box – put together using guidelines from the 4 Wheelin’ manual. Include a description of the kit’s purpose and a list of individual contents.

H895-905 4-H Wheelin’ Vehicle – The vehicle needs to be mounted on a base that is equal to or less than 12” x 12” and the base should be ¾” thick. Please make your vehicle stable. Please do not attach sideboards or backdrops to the display. A report, protected with a clear, plastic cover, needs to be included with the following information: 1) vehicle specification, 2) results of driving, pulling and climbing tests, 3) track diagram, 4) pictures.

H895-906 Track or Course Design Drawing – Scale drawing to actual track or course design. Indicate the direction the course is used with arrows. Display on a 14” x 22” poster.

SMALL ENGINES

PREMIUM	Purple	Blue	Red	White
	\$5.00	\$4.00	\$3.50	\$3.00



SMALL ENGINES

CRANK IT UP – UNIT 1

H890-903 Small Engine Display/Item: Show an application of one of the concepts learned in the Unit 1 project. Examples include: identify the parts of a small engine, safety rules for starting a small engine, small engine repair tool identification.

H890-904 Automotive Models - to be exhibited by an individual only. Exhibit should show some part or system of an automobile. Include a brief description of how the part or system functions. Prepare the display on a board 24” high x 32” wide, not over 1/4” thick.

PREMIUM	Purple	Blue	Red	White
	\$5.00	\$4.00	\$3.50	\$3.00

WARM IT UP – UNIT 2

H890-901 Small Engine Display/Item: Show an application of one of the concepts learned in the Warm It Up project. Examples include: comparison of engine oil types, transmissions, or safety related to engines. Exhibit could be a poster display, or an actual item.

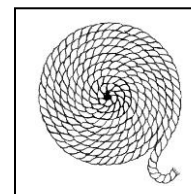
PREMIUM	Purple	Blue	Red	White
	\$6.00	\$5.00	\$4.50	\$4.00

TUNE IT UP – UNIT 3

H891-902 Engine Display/Item: Display/Item should exemplify one of the lessons learned in the Tune It Up project. Examples include: diagnostic tools, fuel systems, ignition systems. If a complete engine is exhibited, it will not be started. However, display needs to report process of building/rebuilding engine and how/where engine will be utilized (i.e. lawn mower, weed eater, snow blower, etc.)

ROPE

Rope exhibits must be mounted on 1/4” plywood or equivalent. The board should measure 24” high by 32” wide. All items on demo-boards must be made according to instructions found in the 4-H “Rope and its uses” Manual. Mount the knots in the same position as shown in the 4-H Rope Manual. Either manila or synthetic rope may be used. When halters are exhibited, the tie rope, plus a required second piece of rope must show any three of the following items: 1) end whipping, 2) eye splice, 3) crown splice, 4) rosebud knot, 5) Matthew Walker knot, or 6) diamond knot.



<i>PREMIUM</i>	<i>Purple</i>	<i>Blue</i>	<i>Red</i>	<i>White</i>
\$5.00	\$4.00	\$3.50	\$3.00	

ROPE

H950-901 Single Loop or Double Loop Halter-Sheep and Goats (use 3/8" rope)

H950-902 Single Loop or Double Loop Halter-Cattle and Horses (use 5/8" or 3/4" rope)

H950-903 Display of at least 10 or not more than 12 knots, hitches and splices (include two splices) made of 3/8" rope. Include appropriate board title and item labels. The ends of all ropes must be whipped.