

SCIENCE ENGINEERING TECHNOLOGY (SET)

GENERAL RULES: The name and county of each exhibitor should appear separately on the back of each board, poster, or article and on the front cover of the notebooks so owner of exhibit may be identified if the entry tag is separated from the exhibit. Each individual is limited to one exhibit per class. Several classes require a display board which should be a height of 24" and **NOT** to exceed 1/4" in thickness. A height of 23 7/8" is acceptable to allow for the saw kerf (width) if two 24" boards are cut from one end of a 4'x8' sheet of plywood. Nothing should be mounted within 3/4" of the top or bottom of the board. (Example: Woodworking and Electricity.) Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit. Demonstration boards should include an overall title for the display, plus other necessary labeling. Reports should be written using the scientific method whenever possible (background; the question or hypothesis; what you plan to do and what you did; method used and observations; and results: what you learned.) **All reports should be computer generated and enclosed in a clear, plastic cover.** The reports should be attached securely to the display.

DIVISION 930

- *1. **Careers Interview** – Interview someone who is working in any field associated with science, engineering 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-pt font, and 1" margins. Multimedia reports should be between 3 to 5 minutes in length.

DEPARTMENT H – SET COMPUTERS

This category gives 4-H'ers a chance to display their knowledge of computers. Through participation in this category, 4-H'ers will develop presentations that show judges their knowledge in the different aspects of computer science. Involvement in SET Computers gives participants a first-hand experience in modern technology. For help getting started with this project, contact the extension office.

DIVISION 860

Class

COMPUTER MYSTERIES - UNIT 1

901. **Create a Poster** on a lesson learned in Unit 1. Examples might include: hardware, software programs, how to take care of a computer and operating systems.
903. **Computer Art Poster (Black & White)** – Exhibit should be created on at least an 8½"x11" page using a commercially available graphics software package and a single-color printer/plotter. **NO** theme required.
904. **Computer Art Poster (Color)** – Exhibit should be created on at least an 8½"x11" page using a commercially available graphics software package and color printer/plotter. **NO** theme required.
905. **Computer Designed Greeting Card** – Exhibit will consist of six greeting cards -- each for a different occasion/holiday. Cards should be created on an 8½"x11" page using commercially available graphics program and either single-color or color printer/plotter. The cards should vary in folds and design. Tell which software program was used. Prefabricated cards from commercially available card programs will **NOT** be accepted. **NO** theme required. Put cards in some type of protective cover.
906. **4-H Promotion Flier** – Exhibit should be created on 8½"x11" page using a commercially available software package. Flier can be color or black and white. Fliers can be a whole page or a folded flier. Put exhibit in protective cover.
907. **Internet Exploration** – Exhibit will be a notebook consisting of the following: 1) printout of five web sites; 2) what you liked and did **NOT** like about each site; and 3) how will you use the Internet in the future.
909. **Internet Web Site Creation** – Exhibit will be a notebook of the documentation and printout of the web site. The notebook should include: 1) cover page; 2) print-out of the web site; 3) summary page, including goals of the page, purpose, steps taken to create the page and intended audience; and 4) completed general record book.

COMPUTER MYSTERIES - UNIT 2

- *1. **Computer Application Notebook** – 4-H'er should use computer application to create a graphic notebook utilizing computer technology. 4-H'er may create any of the following: greeting cards (5 different cards such as a birthday, wedding, anniversary, sympathy, get well or other); business cards (3 cards for 3 different individuals and businesses); menu (minimum of 2 pages including short description of foods and pricing); book layout (1-book); promotional flyers (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) detailed report describing: (a) the task to be completed; (b) the computer application software required to complete the task; and (c) specific features of the computer application software necessary for completing the task (2) printout of your project. Project may be in color or black and white.
- *2. **Produce a Computer Slideshow Presentation** – Using presentation software. A notebook with a printout of all the slides should be submitted. The slideshow should include a minimum of 10 slides and **NO** more than 25. Incorporate appropriate slide layouts, graphics and 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. The exhibit includes a copy of the presentation saved to a flash drive or CD-ROM in a PC compatible format with county name and last name of participant.

COMPUTER MYSTERIES - UNIT 3

- *3. **Produce an Audio/Video Computer Presentation** – Using presentation software, a 4-H'er 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.
- *4. **How to STEM (Science, Technology, Engineering and Math) Presentation** – 4-H'er designs a fully automated 2 to 5 minute 4-H "how to" video. Submissions should incorporate a picture or video of the 4-H'er, as well as their name (first name only), age (as of January 1 of the current year), years in 4-H, and their personal interests or hobbies. Videos should be designed for web viewing. Any of the following formats will be accepted: .mpeg, .rm, .wmv, .mp4, .mov, .ppt, or .avi.
- *5. **Create a Web Site, Blog or App** – Design a simple Web site/blog or app for providing information about a topic related to 4-H'er using either software programs such as an HTML editor like Microsoft's FrontPage or Macromedia's Dreamweaver, and image editor like IrfanView or GIMP **OR** online using a WIKI such as Google Sites. If the Web site, Blog or App isn't live, include all files comprising the Web site, Blog or App should be submitted on a CD-ROM in a plastic case along with the explanation of why the site was created. If developed using a WIKI or other online tool, include a link to the website in the explanation of why the site was created.

- *6. **3D Printing - Unique Items** – 3D printing uses plastic or other materials to build a 3-dimensional object from a digital design. 4-H'er 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. Notebook will include the following: (1) Define motivation/problem solved; (2) Software used; (3) Document purpose of material and print settings; (4) Material choice (PLA, PVA, ABS, etc.); (5) In-fill density; and (6) Moving parts.
- *7. **3D Pen Creation** – 3D pens rapidly melt and cool plastic filament allowing the 4-H'er to draw in 3D. 4-H'er may use original designs or use a template to create their 3D item. Exhibits will be judged based on the complexity of the design and shape. 3D pen creation will include a notebook with the following: (1) Copy of the template if used and the description of any changes the 4-H'er created; (2) If no template used – an explanation of how the creation was built; (3) **MUST** include paragraph of what the youth learned while creating their project (i.e. way to improve their next creation.); and (4) Paragraph on how 3D pens impact Science Engineering and Technology.
- *8. **Maker Space/Digital Fabrication** – This can be either an individual or team exhibit. This project is computer-generated project created using a laser cutter, vinyl cutter, heat press or CNC router. Vector or 3D based software such as Corel Draw or Fusion 360 would be an example of an appropriate software used to create your finished project. Project should include a notebook with the following: (1) What motivated you to create this project; (2) Software and equipment used; (3) Directions on how to create the project; (4) Prototype of plans; (5) Cost of creating project; (6) Iterations or modifications made to original plans; (7) Changes you would make if you remade the project. **Team Entries:** To qualify for entry at the Nebraska State Fair, team materials entered in this class must clearly be the work of a team instead of an individual and must have at least 505 of all team members enrolled in 4-H. Additionally, all enrolled 4-H'ers 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.

DEPARTMENT H – SET 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. For more resources and materials in this category, refer to the manuals.

DIVISION 870

Class

Electronics - Unit 1 Magic of Electricity

901. **UNIT 1 Bright Lights** – Create your own flashlight using items found around your house. Flashlights should be made out of items that could be recycled or reused. **NO** kits please.
902. **UNIT 1 Control the Flow** – Make a switch. Use the following items: D cell battery, battery holder, insulated wire, 2 or 2.5 volt light bulb, a bulb holder, paper clip, cardboard, and two brass paper fasteners to create a circuit that you can open and close.
903. **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 conductors and five items that are insulators. Create a table that illustrates your results.
904. **UNIT 1 Is There a Fork in the Road** – Use the following items to construct one parallel and one series circuit. Items: D cell battery, battery holder, insulated wire, bulb holder and a 2 or 2.5 volt light bulb.

Electronics - Unit 2 Investigating Electricity

905. **UNIT 2 Case of the Switching Circuit** – Use the following items: two D cell batteries, two battery holders, light bulb, bulb holder, a 3"x6" piece of cardboard, six brass paper fasteners and approximately 2' of 24 gauge insulated wire to build a three-way switch. Write a short essay or create a poster that illustrates how three-way switches function.
906. **UNIT 2 Rocket Launcher** – Construct a rocket launcher out of the following materials: a plastic pencil box that is at least 4"x8", single pole switch, single throw switch, normally-open push button switch, 40' of 18 or 22 gauge stranded wire, four alligator clips, 2x6 board 6" long, 1/8" diameter metal rod, rosin core solder, soldering iron or gun, wire stripper, small crescent wrench, pliers, small Phillips and straight blade screwdrivers, drill, 1/8" and 1/4" 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.
907. **UNIT 2 Stop the Crime** – Build an ALARM using the following materials: On-off push button switch, mercury switch, buzzer-vibrating of piezoelectric, 9-volt battery, 9-volt battery holder, 4"x4"x1/8" Plexiglas board to mount circuit on; rosin core solder, soldering gun/iron, 2' 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.

Electronics - Unit 3 Wired for Power

- *1. **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.
- *2. **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.
- *3. **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.
- *4. **Poster** – Poster should exemplify one of the lessons learned in the Wired for Power project. Posters can be any size up to 28"x22".

Electronics - Unit 4 Entering Electronics

- *5. **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.
- *6. **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 project manual "Entering Electronics").
- *7. **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 volt meter.
- *8. **Poster** – Poster should exemplify one of the lessons learned in the Entering Electronics Project. Posters can be any size up to 28"x22".

DEPARTMENT H – SET WOODWORKING

In this category, 4-H'ers have the opportunity to create exhibits about varying levels of woodworking. In addition, participants can also create informational exhibits about their woodworking projects. Through involvement in this category, 4-H'ers will be better educated about the topic and better their woodworking skills.

The 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 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. **TWO** articles per class may be entered in Class 1, 2, 3, and 4. All projects must have appropriate finish. Only one entry per class per exhibitor is eligible for State Fair.

DIVISION 911

Class

UNIT 1 - Measuring Up

901. **First Woodworking Article** – Item made using skills learned in the Measuring Up project manual. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.
902. **Second Woodworking Article** – Item made using skills learned in the Measuring Up project manual. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.
903. **Third Woodworking Article** – Item made using skills learned in the Measuring Up project manual. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

UNIT 2 - Making the Cut

904. **Woodworking Article** – Item made using skills learned in the Making the Cut project manual. Examples include: birdhouse, foot stool, napkin or letter holder.

UNIT 3 - Nailing It Together

- *1. **Woodworking Article** – Item should be made using either joints, hinges, dowels, or a dado joining using skills learned in the Nailing It Together project manual. Item is required to be appropriately finished. Examples include: bookcase, coffee table or end table.
- *2. **Woodworking Display** – Display exemplifying one of the principles learned in the Nailing It Together project manual. Examples include: measuring angles, wood lamination and joint types.
- *3. **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?)
- *4. **Composite Wood Project** – 60% of the project **MUST** be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alterations **MUST** be attached to the article. Protect plan with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.
- *5. **Outdoor Wood Project Made With Treated Wood** – Treated wood projects do **NOT** have to have a finished coating. All plans and plan alterations **MUST** be attached to the article. Protect plans with a cover.

UNIT 4 - Finishing Up

- *6. **Woodworking Article** – Item made using skills learned in the Finishing Up project manual. Examples include: dovetailing, making a pen using lathe, overlays, using a router, etc. Item is required to be appropriately finished.
- *7. **Woodworking Display** – Display exemplifying one of the principles learned in the Finishing Up project manual. Examples include: career opportunities, types of finishes, or dovetailing.
- *8. **Recycled Woodworking Display (SF91)** – Article made from recycled, reclaimed or composite wood. Article **MUST** be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 manual. Exhibit **MUST** include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan. **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?)

DEPARTMENT H – SET 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 and display what they have made. Involvement in SET Welding gives 4-H'ers a first-hand experience in a skill that can be used for a lifetime. For help getting started with this project, contact the extension office.

(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 **NOT** to exceed 3/8" thickness. Attach each weld on a wire loop hinge or equivalent, so judge can look at the bottom side of the weld when necessary. Each weld **SHOULD** be labeled with information stating (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 & 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 1½" to 2" wide and 3½" to 4" long. A good way to get this size is to buy new cold rolled strap iron and cut to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too cold at the bead start, just about right in the middle, and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full-length bead.

Stick Welding – Suggested coupon thickness is 1/4" if using 1/8" rod. Suggested rod is AC and DC straight or reverse polarity – first E-7014, second E-6013.

MIG Welding – Suggested coupon thickness is 1/4" if using .035 wire and 1/8" if using .023 wire.

Oxy-Acetylene – Suggested coupon thickness is 1/8". Suggested rod is 1/8" mild steel rod.

Class 2 – (1) It is suggested that all welds be on same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4”x4” or on individual coupons that are about 2”x4” 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.

Class 3 & 4 – (1) All welds should be cleaned or 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.

DIVISION 920

Class

- *1. **Welding Joints** – A display of one butt, one lap, and one fillet weld.
- *2. **Position Welds** – A display showing three beads welded in the vertical down, horizontal and overhead positions.
- *3. **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. All plans, plan alterations, and a bill for materials **MUST** be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.
- *4. **Welding Furniture** – Any furniture with 75% welding is used in the construction. 60% of item **MUST** be completed by 4-H'er and notes regarding laser welding or machine welding **MUST** be included. All plans, plan alterations, and a bill for materials **MUST** be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.
- *5. **Plasma Cutter/Welder Design** – 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 Exhibit 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 judge 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.
- *6. **Composite Weld Project** – 60% of the project **MUST** be welded and 40% made from other materials such as wood, rubber, etc. All plans, plan alterations, and a bill for materials **MUST** be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.

DEPARTMENT H – SET ROBOTICS

This category involves the many different aspects of Robotics. 4-H'ers 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 4-H'ers a first-hand experience in modern technology.

4-H'ers enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1, 2, or 3), or Robotics Platforms may exhibit in any class within this division. Creating a video of robot in action would be helpful for the judge but not mandatory. Present on a CD Rom with entry.

Team Entries: Team materials entered in robotic classes **MUST** clearly be the work of a team instead of an individual and **MUST** have at least 50% of all team members enrolled in 4-H. Additionally, all enrolled 4-H'ers 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.

DIVISION 861

Class

- *1. **Robots Poster** – Create a poster (14”x22”) 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.
- *2. **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.
- *3. **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. Files **MUST** be saved in a PC compatible format. Include your pseudocode and screenshots of the actual code with a written description of the icon/command functions.
- *4. **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.
- *5. **Robotics Sensor Notebook** – Write pseudo code which includes at least one sensor activity. Include the code written and explain the code function.
- *6. **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” wide and 20” tall, they may not be displayed in locked cases. We recommend that you submit the project under Class 3 - Robotics Video. Junk Drawer Robotics do **NOT** qualify.
- *7. **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 4-H'er 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” wide and 20” tall, they may not be displayed in locked cases. We recommend that you submit the project under Class 3 - Robotics Video.
- *8. **3D Printed Robotics Parts** – This class is intended for youth to create parts through 3D printing, that help create their robot or aid the robot in completing a coded function. Project should include notebook describing the process used to create the project, describe the success of your designed piece (did it work), intended use of the product, and the modifications made to the item.

DEPARTMENT H – SET 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.

4-H'ers enrolled in Geospatial may exhibit in any class within this division.

DIVISION 880

Class

- *1. **Poster** – Create a poster (not to exceed 14”x22”) 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.
- *2. **4-H Favorite Places, or Historical Site Poster** – The 4-H'er identifies a favorite place or historical site (including gravesites) in Nebraska. Exhibit should include latitude and longitude, digital picture, and local area map. Poster size should **NOT** exceed 14”x22”.
- *3. **GPS Notebook** – Keep a log of at least five 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.
- *4. **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, 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.

- *5. **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 much the analysis of the various data will be used to make a management decision.
- *6. **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 (minimum of one paragraph).
- *7. **GIS Thematic Map** – Using any GIS software, create a thematic map. 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 “8.5x11” 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”x11” up to 36”x24”, which should include Title, Base Map, Neat Line, North Arrow, and Legend. Identify the source of your information on the back of the map.

DEPARTMENT H - ENTOMOLOGY

Entomology exhibits give 4-H’ers the opportunity to demonstrate their knowledge about insects and insect displays. This category has multiple exhibits that allows 4-H’ers to progress over numerous years. For help getting started with this project, contact the extension office.

Specimens in display collections should be mounted properly and labeled with the location, date of collection, name of collector, and order name. Follow mounting and labeling instructions in the Nebraska 4-H Entomology Manual. Boxes are preferred to be 12” high x 18” wide with landscape orientation. Purchase of commercially made boxes is allowed. All specimens **MUST** be from the collector.

DIVISION 800

Class

- *1. **Entomology Display – First-Year Project** – Collection to consist of 25 or more different kinds (species) of insects representing at least 6 orders. Limit of one box.
- *2. **Entomology Display – Second-Year Project** – Collection to consist of a minimum of 50 kinds (species) of insects representing at least 8 orders. Replace damaged or poorly mounted specimens. At least 25 species **MUST** be present from after July 1 of previous year. Limit 2 boxes.
- *3. **Entomology Display – Third-Year or More Project** – Collection to consist of minimum of 75 kinds (species) of insects representing at least 10 orders. Replace damaged or poorly mounted specimens. At least 25 species **MUST** be present from after July 1 of previous year. Limit to 3 boxes.
- *4. **Special Interest or Advanced Insect Display** – Educational display developed according to personal interests and/or advanced identification capability. This is also an opportunity to highlight favorite insects in a creative arrangement. Insects should conform to pinning and mounting standards as in Classes 1-3 and be protected in an insect box. Each specialty display should include names of the insects, interesting information about them, and why the display was made. Advanced identification collections should have insects grouped with labels that correspond with identification level (e.g. family, genus, species). A specialty collection may consist of insects by taxonomic group (e.g. butterflies, grasshoppers, scarab beetles, dragonflies, etc.) or by host, subject or habitat (e.g. insect pests of corn, aquatic insects, insect mimicry, insect galls, insects from goldenrod, insect pollinators, etc.).
- *5. **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.
- *6. **Macrophotography** – Subjects should be insects, spiders, or other arthropods, or any nests, webs or constructions they make. All exhibit prints should be 8”x10” or 8½”x11” and mounted on rigid, black 11”x14” 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, printed on white paper, and glued below the print on the poster or mat board.
- *7. **Insect Poster/Display Exhibits** – Exhibits can be posters or 3-dimensional displays, and artistic creativity is encouraged. Posters should be **NO** larger than 22”x28”. 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”x28” area.
- *8. **Reports of Journals** – Reports of journals should be in a 3-ring binder. A report may be informational; that is, an original article about a favorite insect, a history of insect outbreaks, diseases caused by insects, insects as food, etc. Or, it may be a research report about an investigation or experiment done in a scientific manner. It then should have a basic introduction of the insect studied, methods used, observations, and results of the project. Tables, graphs and images are helpful to include. A journal is an observational study over a period of time with personal impressions. It may cover watching changes in kinds of butterflies over the summer, rearing a specific insect from egg to adult, managing a beehive, observations of insects in a specific habitat, accounts of insect behavior in a forest or flower garden, etc.

DEPARTMENT H - VETERINARY SCIENCE

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

A Veterinary Science exhibit may consist of a poster, notebook, or a display. The exhibit may represent material from any of the Veterinary Science projects including entry level exhibits from Unit I.

If photographs are to be part of the exhibit, remember that they will be viewed by the public. Make sure that the photographs are in good taste and will **NOT** be offensive to anyone. Graphic photographs of excessive bleeding, trauma or painful procedures are **NOT** appropriate. For exhibits related to veterinary surgical procedures, aseptic techniques need to be shown; for example, use of drapes, use of sterile procedures, wearing of gloves, and other appropriate veterinary medical practices.

First-Aid Kits: Because of public safety concerns and risk of theft of first-aid kit contents (veterinary drugs/equipment) with perceived potential for drug abuse, animal first aid kits containing any drugs or medications will be immediately disqualified and **NOT** displayed. First Aid kits wishing to include medication information should instead utilize written descriptions, photographs, drawings, computer generated printouts, or empty packaging of pharmaceuticals.

Veterinary Science Poster: 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"x28" and may be either vertical or horizontal.

Veterinary Science Display: 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"x28" or on 1/4" plywood or equivalent that does **NOT** exceed 24" high x 32" wide or in a three-ring binder or another bound notebook format. Each display **MUST** be identified with name, address and county on the back.

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 exhibitor's choosing relating to veterinary medicine or veterinary science

****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. **Plagiarism will result in a disqualification. Please study your topic and present the information to your audience in your own words.**

DIVISION 840

Class

- *1. 4-H Veterinary Science Large Animal Poster, Notebook, or Display
- *2. 4-H Veterinary Science Small Animal/ Pet Poster, Notebook, or Display

DEPARTMENT H - ROCKETRY/AEROSPACE

This category gives 4-H'ers a chance to display the rockets and drones they have created. Through participation in this category, 4-H'ers will show judges what they learned about and how they adapted their exhibit throughout this project. Involvement in SET Aerospace gives participants a first-hand experience in modern technology. For help getting started with this project, contact the extension office.

The exhibitor's name and the county should appear separately on the back of each board, poster or article and on the front cover of the notebooks so identification can be made in case the entry tag is lost.

Rockets **MUST** be supported substantially to protect the rocket from breakage. Rocket **MUST** be mounted on a base that has dimensions equal or less than 12"x12" and the base should be 3/4" thick. **NO** metal bases. If the rocket fins extend beyond the edges of the required base (12"x12"), 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 rocket's 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 county or 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, only actual launches count. Misfires will **NOT** count towards one of the required three launches. Contact the extension office for scoresheet to see how exhibit is judged.

For self-designed rockets only, please include a digital recorded copy of one flight. In the documentation, please include a description of stability testing before the rocket was flown.

Skill level of project is **NOT** determined by number of years in project. Skill level is determined by the level listed on the manufacturing packaging.

4-H Rocket project levels are **NOT** intended to correspond to National Association of Rocketry model rocket difficulty ratings or levels.

High power rockets (HPR) are similar to model rocketry with differences that include 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.**

DIVISION 850

Aerospace – Unit 1

The following project ideas can be found in the 4-H manual Aerospace Adventures Stage 1 "Pre-Flight".

Class

- 901. **Space Buggy** – Design and make a spacecraft from household items or items that could be re-used instead of being thrown away. Materials list: scissors, glue, assorted clean household materials such as; paper towel tubes, tissue boxes, plastic bottles, etc... Draw a picture design of your buggy on a sheet of paper. On another separate sheet of paper briefly explain the job/jobs your space buggy can do.
- 902. **Space Station** – Draw a design of what you think an International Space Station of the future might look like. Using household items build a model of that station. On a sheet of paper briefly describe how scientists would use your Space Station.
- 903. **Other**

Rocketry – Anyone enrolled in Aerospace 2, 3, or 4 may exhibit in any class

Class

- 904. **Rocket** – Any Skill Level 1 Rocket with wooden fins or plastic fins painted by hand or air brush.
 - *1. **Rocket** – Any Skill Level Rocket with wooden fins and cardboard body tubes painted by hand or air brush.
 - *2. **Aerospace Display** – Poster or display board that displays or exemplifies one of the principles learned in the Lift Off project. Examples include: display of rocket parts and purpose, explains the parts of a NASA rocket or shuttle, interview of someone in the aerospace field, or kite terminology. Include notebook

- containing terminology (definition), and what was learned. Display can be any size up to 28"x22".
- *3. **Rocket** – Any Skill Level 2 Rocket with wooden fins and cardboard body tubes painted using commercial application, for example: commercial spray paint.

Self-Designed Rocket – Anyone enrolled in Aerospace 2, 3, or 4 may exhibit in any class

- *4. Any self-designed rocket with wooden fins and cardboard body tubes.

Drones – Anyone enrolled in Lift Off – Unit 2, Reaching New Heights – Unit 3 and Pilot In Command – Unit 4 may exhibit in any class

- *5. **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. Poster can be any size up to 28"x22".
- *6. **Drone Video** – Exhibit **MUST** demonstrate how the drone interacts with the outside world. Examples: field scouting, surveying damage from natural disasters, drones used in commercial applications and settings, and drones used for structural engineering. Video should **NOT** exceed five minutes. Videos should be submitted to Kathy Burr at kathy.burr@unl.edu by July 24, of the current year.

DEPARTMENT H – SET Physics/Power of Wind

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. For more resources and materials in this category, refer to the resource section at the bottom of the page. For help getting started with this project, contact the extension office.

The name and county of the exhibitor **MUST** appear separately on the back of each exhibit. See general rules on page 43.

DIVISION 900

Class

- *1. **Create and Compare Energy Resources Poster**- Poster should explore two alternative/renewable energy resources. Compare and contrast the two 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"x22".
- *2. **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.
- *3. **Solar as Energy Display**- Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6' tall or 2'x2'. 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.
- *4. **Water as Energy Display** – Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6' tall or 2'x2'. Include a notebook of why the item was designed and how it harnesses the power of water.
- *5. **Wind as Energy Display** – Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6' tall or 2'x2'. Include a notebook of why the item was designed and how it harnesses the power of wind.
- *6. **Other Nebraska Alternative Energy** – Notebook should explore Nebraskan alternative energy source besides wind, water, and solar power. Include information on type of power chosen, infrastructure for distribution, what resources are needed to create this alternative resource, cost of production, and potential uses of bio-products.

DEPARTMENT H - ROPE

Each rope exhibit **MUST** be mounted on a board that is 1/4" thick x 24" high x 32" wide. All items placed on demo-boards in Classes 1, 2, and 3 **MUST** be made according to instructions found in the 4-H Rope Manual, EC 7-01-79. 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.

DIVISION 909

Class

901. **Rope Display** – at least 10 and **NOT** more than 12 knots, hitches, and splices (include two splices) made of 3/8" rope. Include appropriate board title and item labels. The end of all ropes **MUST** be whipped. Judging consideration will be given to difficulty of items shown on the board. Score Sheet F 7-06-79
902. **Single Loop or Double Loop Halter** – sheep and goats use 3/8" rope. See above requirements for halter exhibits. Score Sheet 4-H F 27
903. **Single Loop or Double Loop Halter** – cattle and horses use 5/8" or 3/4" rope. See above requirements for halter exhibits. Score Sheet 4-H F 28

DEPARTMENT H - TRACTOR UNIT

DIVISION 902

Class

901. **Completed Tractor Manual** – complete as of fair.
902. **Individual Tractor Service Record** – as described in UNIT III of the Tractor Project Manual. 4-Hers will need to design own service record form or adapt the service record shown in UNIT IV of Tractor Project.
903. **Tractor Demonstration Display** – to be exhibited by an individual **ONLY**. Exhibit **SHOULD** show some part or system of a tractor. Include a brief description of how the part or system functions. Prepare the display on a 24" high x 32" wide board **NOT** to exceed 1/4" thickness.

DEPARTMENT H - BICYCLE

Bicycle club 4-H'ers **MAY** exhibit a bicycle safety poster in Department B - Posters.

DIVISION 903

Class

901. **Bicycle Demonstration Display** – to be exhibited by an individual. Exhibit may include: (1) parts or system of a bicycle; (2) worn or broken parts or; (3) a step by step procedure of how some repair or service job is performed. A limited number of photographs are acceptable. Actual parts or cut-a-ways of parts are recommended. The exhibit is to be prepared on a 24" high x 32" wide board **NOT** to exceed 1/4" thickness. Score Sheet F 7-56-79.