SECTION 20 STEM - SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS ENGINEERING

EXPERIMENTS ***(Yellow or White Entry Cards)-*** Individuals and groups are encouraged to enter exhibits/displays emphasizing what they learned and experienced in learning about science concepts in areas of agriculture, human ecology, life or physical sciences.

Any type or combination of science projects along with creativity is encouraged.

388 **(A)** **EXPERIMENTS**: Describe your hypothesis (what you think will happen); describe the procedures you performed; describe the observations you made and what conclusions you drew from your experiment; include photos or drawings and samples (if possible) from your experiment. Use display board or poster board for display. Include experiment description, introduction, hypothesis, methods, results and your conclusions.

(B) **PUBLIC SERVICE/CIVIC ENGAGEMENT PROJECTS**: Exhibits can be of any public service or public education activity you took part in that had a scientific component. Examples may include watershed rehabilitation, recycling programs and educational models. Project exhibit posters/display must be clearly labeled with a written statement of what the project is, how it relates to science and why you are interested in the project.

(C) **DESCRIPTIVE SCIENCE**: Science projects that are not experiments and service projects but do consist of systematic observations and tell us about the natural world. Exhibit could show summaries of what you observed (ex: how the local bird population changes with the seasons, where flies like to breed in a barn, how many bites of food different animals eat per minute). Could present collections and classifications of materials which display physical or biological articles.

(D) **CITIZEN SCIENCE**: is the engagement of public participants in real-world scientific collaborations – asking questions, collecting data, and/or interpreting results. A display or record of participation in a Citizen Science project, could be part of a local, regional national or international project, but needs to include some kind of connection to scientists, researchers, or policy makers and contribute to scientific knowledge that will be put to some type of use (by researcher, policy makers, etc.) Examples include Wasp Watchers, Project Feeder Watch, eBird, Lost Ladybug, Adopt a Pixel, Nature's Notebook, or a local project. More info:
http://www.birds.cornell.edu/citscitoolkit/contexts/youth-development/4-h/

389 **MODELS** - show a scientific model that you have made such as: a planet, solar system, weather system, parts of an animal, etc. Project must be clearly labeled with a written statement of what the project is, how it relates to science, and why you are interested in the project.

390 **GEOSPATIAL SCIENCE** – 4-H exhibits that show skills and knowledge learned through 4-H GPS and GIS projects.

- **GIS Maps** – maps made using Environmental Systems Research Institute, Inc. Arc View software, or other mapping software. Criteria and Guidelines for Community Mapping Projects can be found on NYS-4-H Web page at http://nys4h.cce.cornell.edu/about%20us/Pages/4-HGeospatialScience.aspx. exhibits may be selected for display competition sponsored by NIFA and National Geographic Society.
- **Story or Outline of a 4-H GIS or GPS Project** including photos, purpose of activity, and summary or results.
- **GIS or GPS project or activity** undertaken by individual or group. Exhibit may be in the form of a project record book, video, CD/DVD, photo documentation, or whatever. Exhibit must include project report documenting statement of the purpose and outcome.
- **Community Service/Youth Community Action Mapping Project**. A GPS or Mapping project built around a specific community issue or project.
- **Educational Poster Exhibit** displaying 4-H GPS or GIS activities.
  Public Presentation on 4-H and Geospatial Science.

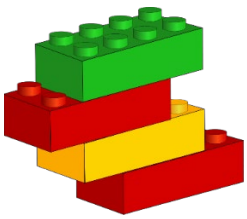
391 **RENEWABLE & SUSTAINABLE ENERGY AND CLIMATE CHANGE:**

Educational exhibits/display(s) describing your 4-H project work done in areas of Renewable Energy (solar, wind, geothermal, bio fuels, hydro-electric); Energy Conservation (home, school, community); Tracking (or studying) Climate Change; Activities/Studies related to managing "Carbon Footprints" in environment. Exhibits may consist of stationary or working models, posters, photo story/display or electronic media. Electronic media must be submitted on a storage device like a CD or flash drive. Information must be included on media to indicate method of viewing entry. A short description of what was undertaken in the project, your experience and what you learned through project must be included. This can be included in the entry itself or on the entry card. Note: some energy exhibits may fit in other classes – select only one class to enter your exhibit.

(A). Renewable and Sustainable Energy **(B). Climate Change**

SECTION 20- STEM –

CONSTRUCTION PROJECTS WITH MANUFACTURED COMPONENTS



General Information:-Youth entering projects in the following classes use **manufactured construction pieces** to complete projects. ***(Examples)*** **Lego*, K'nex*, Brio* and Mechano*,** (***but projects are not limited to these examples***.)

- Projects can incorporate design, following instructions, three-dimensional thinking, design modifications, problem solving, and creativity, architecture, and structural design, principles of mechanics and use of color in the planning and design process. These skills relate to the professions of engineering, science construction, architecture and art**.**

Judging: will be based on completion complexity, presentation and explanation of design, understanding of principals and visual presentations:

- **<u>MUST INCLUDE FOLLOWING</u>:**
  a) **Number of pieces:** youth must know the approx. number of pieces used in assembly. For kits, this number is on the box. It is understood that after a long creative process, it may be difficult to know exact number of small pieces; the youth must provide an estimate rounded to 25.
  b) **Diagram:** (***Diagrams are required***) A diagram could be a photograph printed on printer paper, a scale drawing on graph paper, a photocopy of an instruction sheet or a variable scale rough drawing. Relevant labels and explanation must be added. ***<u>The diagram must include</u>***: Name **(2)** title of project **(3)** the exact or approx. number of pieces and **(4)** a self-judgement of complexity level (i.e.) **easy**-less than one-hour to assemble; **medium** 1-3 hours construction time or **complex**-more than 3-hours of construction time.
  - **JUNIORS may use a photocopy of kit provided drawings** for the basis of their diagrams, but brand logo MUST be covered and not visible.
  - The diagram can be displayed in a plastic stand, mounted on poster board or attached in a folder.
  - Art value, ability of written work to attract, use of color and use of font add to design presentation. Protection: Youth may prepare a display box for the project. There is no evaluation or points for this box, it is merely protection. A simple box could be a cardboard box with two sides removed and replaced with clear plastic.

392 **<u>KIT</u>:** This category is restricted to Juniors (8-13). Juniors are limited to two projects in this class. If two projects are entered, they must differ significantly (for example- a creature, a building or a vehicle). Youth must enter a completed kit. Original story must describe design process and describing play with the model.
Judging criteria includes completion, complexity (number of pieces), diagram (of the completed model and key elements labeled), explanation/story (explanation of the design process, difficulties and interesting elements; describe plan value, imaginative play, what steps could be taken to improve model) and overall presentation.

393 **<u>ORIGINAL MODEL</u>:** Youth are limited to two projects in this class, projects must differ significantly. The project can be a scene, diorama, models, building, vehicle, plants or creature. **Judging criteria includes; *completion design*** (number of pieces, moving parts-gear systems, axle systems (wheels), hidden entrances, pulleys, joints, projectiles and hinged components; unity of design and originality.

Use of color, symmetry of creativity, fully developed concept diagrams comprehensive and detailed: an overall diagram of design process, difficulties encountered and their solutions, description of play value, future expansion of project and overall presentation.

394 MODEL DEMONSTRATING A MECHANICAL SCIENCE CONCEPT:
Projects must be original no kits & can include level arms, gears, pulleys, friction, belts, airfoils (flight, wind); catapults and load bearing bridges and beams. Science concepts can include energy transfer, stress analysis, Newton's laws, gravity, etc.

Entries in this class must include **a working model** an equation describing a principal of science, a labeled diagram of the project and written explanation of the science involved. Evaluation will also include a presentation and visual impact of the project. Youth may conduct experiments with model and provide results in a report.

Judging criteria:
1.a working model that demonstrates a principle of mechanical science, must move or work as necessary; scientific equation that relates the principle, including clear definition of each term with equation displayed; labeled diagram provided that labels major parts of the model and also notes how parts or movement relates to equation; written report (not more than 2-pages); which explains the principle and how model illustrates the principal (may also include additional page of experimental results using the model);
2.written explanation that explains designs and construction of the model, including any difficulties and how they were overcome, description of the principles of mechanical science that is demonstrated, clear understanding of scientific principles and explanation of how the model illustrates principle; and overall visual impact project as prepared for display, including attractiveness of display.

395 TRANSPORTATION DESIGN: applies transportation pieces such as Brio* in which youth design a transportation system (road, railroad). Drawings are to be hand drawn. ***Judging criteria;*** Presentation labeled with title of project to include schematic of system drawn to scale, roads, railroads and bridges clearly labeled or identified in the legend, seniors to use 11 x 17 drawing paper, must have fully developed concept, clear details, completeness of system (no dead ends) and show creativity, legend that explains the meaning of symbols such as roads, railroads bridge, water, vegetation, buildings, written explanation that explains the design and purpose of the system, problems encountered and their solution and directions project could take in the future, and overall presentation, visual impact as prepared for display and attractiveness.

SECTION 20 - 3-D PRINTING

General Information: 3D printing uses plastic or other materials to build a 3-dimensional object from a digital design.

- Youth may use original designs or someone else's they have ***"re-designed"*** in a unique way.

- Youth must bring their finished printed object (we cannot print objects at Fair). Exhibits will be judged based on the complexity of the design and shape.

Must include the following:

(1) Software used to create 3D design.

(2) Design or, if using a ***"re-design"***, the original design and the youth's design with changes.

(3) Orientation that the object was printed.

396 **3D PROTOTYPES** – 3D objects printed as part of the design process for robot or other engineering project. ***Must include:*** Statement of what design question the prototype was supposed to answer and what was learned from the prototype.

397 **3D UNIQUE OBJECTS** – 3D objects printed for their own sake. May be an art design, tool, or other object.

SECTION 20 STEM – COMPUTER SCIENCE

GENERAL INFORMATION: all exhibits must include something visual, such as a poster or printed copy of a digital presentation, which will remain on display during the exhibition. Electronic equipment will only be used during the judging time and will not remain on display during the entire week of fair. Programs available online (such as Scratch) should include a link to the specific project youth have created.

398 COMPUTER SCIENCE:

(A) **Beginning Programming** – Exhibit a simple program using Scratch (or other simple graphic programming language). The program should include 8 different commands including looping and getting input from the keyboard and mouse.

(B) **Intermediate Programming** - Exhibit a program using Scratch (or other simple graphic programming) that you have downloaded from the internet and modified. Compare the two programs and demonstrate the changes you made to the original program; or create an animated storybook or video game using Scratch (or other simple graphic programming language).

(C) **Advance Programming** – Exhibit an original program using a higher-level programming language such as Python, JavaScript, C++, etc.

(D) **App Development** - Exhibit an original mobile app. Describe the purpose of the app and what inspired you to create it in the exhibit information statement.

MAKER/TINKER INVENTIONS & ROBOTS

General Information: An excellent project either solves a problem or creates something new. This project invents, build or experiment on ideas and include science, technology, engineering, art and math (STEM) principles.

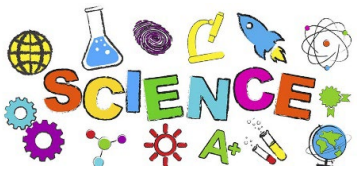
All exhibits must include something visual which will remain on display during the exhibition.

Maker/Tinker project should communicate what problem is being solved or what new idea was created. Include a brief description of the exhibit that shows how the project uses materials to create skills were developed while creating the product. (expensive electronic or other equipment will only be used during judging time and will not remain on display during the entire exhibit period).

399 (A) MAKER/TINKER INVENTIONS: Exhibits should display how youth used the design process to bring their idea and invention to life. Exhibit may be the item the youth has created or a notebook, poster or other display that depicts their project.

a) May include elements from kits such as Arduino or Little Bits
b) Computer coding may be written by the exhibitor or someone else's code the exhibitor has modified.
c) Should cite the sources of any designs or codes they tinkered with to create their invention.

Examples must include re-programming a toy to do something different or adding circuity (lights, sounds, etc). to an existing item like a sweater.
Ideas can be found at sites like:
http://makezine.com/
http://www.instructables.com
http://makered.org/youngmakers/
http://tinering.exploratorium.edu/



399 (B) JUNK DRAWER ROBOTICS: All exhibits should be original designs made from everyday objects and materials. Exhibits with purchased kits will not be accepted. Robots should be designed to carry out a series of at least 3- actions automatically to accomplish a task.
Examples are included in the 4-H Junk Drawer Robotics curriculum or Rube Goldberg Machine contests.