DEPARTMENT 24: MECHANICAL SCIENCES

Superintendent:
Don Kreul 608-574-2693

PREMIUMS: Blue $3.00; Red $2.75; White $2.50; Yellow $2.25

Tractors Grades 3-5

1. Poster identifying tractor parts and their functions
2. Poster on how to start and stop a tractor
3. Display showing different kinds of nuts, bolts, etc. used on tractors, properly labeled
4. Poster on safety hazards when operating a tractor
5. Display showing the role of ROPS (rollover protective structure)
6. Poster on hand signals
7. Poster on machine hazards
8. Poster on types of fire extinguishers
9. Other tractor exhibit

Tractors Grades 6-8

1. Poster on general farm safety rules
2. Poster on PTO (power take-off) safety
3. Display showing causes of tractor rollovers
4. Exhibit on maintenance checks before operating a tractor
5. Poster on types of tractor fuels
6. Display showing types and functions of tractor systems
7. Poster on recycling tractor batteries and oil
8. Other tractor exhibit

Tractors Grades 9-older

1. Poster on flowing grain hazards
2. Exhibit showing how to safely hitch and unhitch implement
3. Poster on hydraulic systems compared
4. Poster on mower safety
5. Exhibit showing how to use conveyors and augers safely
6. Poster on cooling system safety
7. Poster on hydraulic system and fuel safety
8. Exhibit showing tractor maintenance log
9. Poster on battery types, functions, and care
10. Poster on oil viscosity and classification
11. Poster on servicing oil, fuel, and hydraulic filters
12. Poster on engine air requirements
13. Other tractor exhibit

Aerospace

- Each aerospace exhibit must be accompanied by a 3x5 card with the following information
    - Difficulties in building the model
    - Manufacturer of kit (box name, kit number, etc.)
    - Type of paint used and how applied
    - Finishing procedures after built (decals, sealers, etc.)
    - Any help in building the kit

Aerospace Grades 3-5

1. Rubber powered airplane
2. Electric or gas-powered airplane
3. Non-powered airplane
4. Exhibit on the parts of an airplane or rocket, displayed and labeled
5. Exhibit explaining one or more principles of flight
6. Hot air balloon model
7. Paper airplane or helicopter
8. Single stage rocket
9. Multi stage rocket
10. Other airplane exhibit
11. Other rocket exhibit

Aerospace Grades 6-8

1. Electric or gas-powered airplane
2. Non-powered airplane
3. Exhibits on the parts of an airplane or rocket; displayed and labeled
4. Exhibit showing remote control parts and their functions
5. Paper flight simulator
6. Homemade hang glider
7. Controllable glider
8. Balloon shuttle
9. Single stage rocket
10. Multi stage rocket
11. Other airplane exhibit
12. Other rocket exhibit

Aerospace Grades 9-older

1. Rubber powered airplane
2. Electric or gas-powered airplane
3. Non-powered airplane
4. Exhibit on the parts of an airplane or rocket, displayed and labeled
5. Exhibit explaining one or more principles of flight
6. Altitude tracker
7. How to earn a pilot's certificate
8. Navigation system
9. Homemade hang glider
10. Single stage rocket
11. Multi stage rocket
12. Other airplane exhibit
13. Other rocket exhibit

Robotics

- Exhibitor may enter no more than 5 entries, 1 per lot
- All entries must include a printout of your program
- Any entries that require a course or props must be created or provided by the youth and brought to judging with the robot

Robotics Grades 3-8

1. Poster on parts of a robot
2. Exhibit on programming sensors
3. Exhibit on programming language
4. Chart of 20 robotic terms and their definitions
5. Robot you made with a card attached explaining how robot was designed and built
6. Robot that goes forward for 4 seconds
7. Program: robot goes forward and backward
8. Program: robot navigate a maze designed by the youth
9. Program: robot stops, using a light sensor
10. Program: robot stops, using a touch sensor

Robotics: Grades 9-older

1. Robot that you designed and built with a card attached describing how the robot was built
2. Poster: types of gears
3. Report: how gear ratio affects distance traveled
4. Report: how gear ratio affects travel speed
5. Program: robot does multiple tasks at same time
6. Program: robot follows a line, using loops
7. Exhibit about possible careers in robotics
8. Exhibit on 10 different tasks robots can accomplish
9. Program: robot goes completely around a container without touching it
10. Program: robot grips soda can and returns it to starting point

Scale Models

Rules:

1. **No more than 2 entries** may be made by one exhibitor in this class. One per lot number
2. The largest scale to be used is 1/12 scale (1 inch equals 1 foot). A 1/64 scale is preferred but not required. Do not mix scale sizes.
3. First year modelers can build Snap Tite kits, but must follow kit rules.
4. All models must be fully glued, painted, or covered except models built from Legos or K'Nex
5. Each exhibit must be accompanied by a minimum of a 3x5 card. Be prepared to tell the judge about the project.
6. Model card information:
    a. Difficulties in building the model
    b. Any help and amount of time building it
    c. Manufacturer of kit (box name, kit number, etc.)
    d. Specify any customized pieces, purchases or customized by the exhibitor
    e. Type of paint used and how applied
    f. Finishing procedures after built (decals, sealer, etc.)
7. Diorama card information
    a. Diorama title
    b. Difficulty with the build
    c. Any help building it
    d. Amount of time building it
    e. Specify any custom pieces and whether those pieces were purchased or customized by the exhibitor
    f. Explain the activity in your diorama, you may use an additional card if needed
8. **Dioramas will be limited in size to 3x4'. Youth must provide their own 3x4' or smaller base. The 3ft side must be the front of the display.**
9. Failure to follow the above rules/requirements will be lowered one place setting.

Definitions:

- Scratch built-buying or making individual parts and building a scale model or diorama
- Custom built-starting with a kit or a model and completely changing or modifying its appearance
- Kitbashed-taking two or more kits and combining them into one scale model or diorama
- Cut-in-half exhibit-consists of a non-living object (purse, shoe, sock, clock, etc.) cut in half then a Lego structure created and attached to the object
- Diorama-a three-dimensional representation of a scene in which objects or models are arranged in a natural setting, i.e. farm display

Scale Model Grades 3-5

1. Military item (tanks, trucks, cannons, personnel vehicles)
2. Aquatic item (ships, submarines, boats)
3. Highway transportation item (semi, truck, car, motorcycle)
4. Railroad item (engine, railroad car, railroad equipment)
5. Air transportation item (airplane, helicopter)
6. Agricultural item (tractor, wagon, farm equipment)
7. Model constructed from Legos
8. Model constructed from K'Nex
9. Cut-in-half Lego exhibit
10. Any other model not listed above kit built
11. Any other model not listed above scratch built

Dioramas Grades 3-5

12. Agricultural diorama built from a kit
13. Agricultural diorama, scratch built, custom built or kitbashed
14. Other diorama, not agricultural, built from a kit
15. Other diorama, not agricultural, scratch built, custom built, or kitbashed

Scale Models Grades 6-8

1. Military item (tanks, trucks, cannons, personnel vehicles)
2. Aquatic item (ships, submarines, boats)
3. Highway transportation item (semi, truck, car, motorcycle)
4. Railroad item (engine, railroad car, railroad equipment)
5. Air transportation item (airplane, helicopter)
6. Agricultural item (tractor, wagon, farm equipment)
7. Model constructed from Legos
8. Model constructed from K'Nex
9. Cut-in-half Lego exhibit
10. Any other model not listed above kit built
11. Any other model not listed above scratch built

Dioramas Grades 6-8

12. Agricultural diorama built from a kit
13. Agricultural diorama, scratch built, custom built or kitbashed
14. Other diorama, not agricultural, built from a kit
15. Other diorama, not agricultural, scratch built, custom built, or kitbashed

Scale Models Grades 9-older

1. Military item (tanks, trucks, cannons, personnel vehicles)
2. Aquatic item (ships, submarines, boats)
3. Highway transportation item (semi, truck, car, motorcycle)
4. Railroad item (engine, railroad car, railroad equipment)
5. Air transportation item (airplane, helicopter)
6. Agricultural item (tractor, wagon, farm equipment)
7. Model constructed from Legos
8. Model constructed from K'Nex
9. Cut-in-half Lego exhibit
10. Any other model not listed above kit built
11. Any other model not listed above scratch built

Dioramas Grades 9-older

12. Agricultural diorama built from a kit
13. Agricultural diorama, scratch built, custom built or kitbashed
14. Other diorama, not agricultural, built from a kit
15. Other diorama, not agricultural, scratch built, custom built, or kitbashed

Small Engines

- Posters may not exceed 14x22" in size

Small Engines Grades 3-5

1. Tools and their use for small engines
2. Exhibit on proper engine care
3. Poster on protective gear to wear when working with small engines
4. Safety rules when using small engines
5. Parts of a small engine
6. Safety labels
7. Small engine related careers
8. Written account of an interview with a professional in the field of small engines

Small Engines Grades 6-8

1. Internal small engine parts and their function
2. Exhibit showing preparation of engine for storage
3. Exhibit on at least two different engine types
4. Specialty tools for working with small engines
5. Types of lawn mowers
6. Mowing safety rules
7. Chart showing displaces of two engines
8. Engine oil grades

Small Engines Grades 9-older

1. Diagnostic tools and their use for working with small engines
2. Engine sounds
3. Lawn mower maintenance
4. Exhibit describing the procedure to successfully reassemble the air and fuel system of a small engine
5. Exhibit describing the procedure to successfully reassemble the electrical system of a small engine
6. Exhibit describing the procedure to successfully reassemble the engine base of a small engine
7. Trends in the small engine industry
8. Local small engine laws and regulations
9. Comparison of small engine prices

Geospatial

1. Poster or display on types of geographical tools
2. Poster explaining the coordinate-grid reference system
3. Poster or display on types and uses of snaps
4. Map of "my neighborhood" with list of features
5. Display on the difference between population and road maps
6. Themed geocache packaged in a watertight container. You should include a small notebook for finders to log their visit and small trinkets for finders to take or trade. Documentation should include a title, teaser description and the geographic coordinates of intended placement.

Welding

- Posters may not exceed 14x22" in size

Welding Grades 6-8

1. Poster showing different types of welding
2. Poster showing different equipment used for welding
3. Repaired item
4. Manufactured item
5. Any other welding project

Welding Grades 9-older

1. Poster showing different equipment used for welding
2. A display of 3 welds (T-joint, butt weld, and lap weld) using oxyacetylene, arc, and wire welder. Joints may be no more than 3" long
3. Repaired item
4. Manufactured item
5. Any other welding project
6. Any welding project done in an industrial arts class