Name_____ Section _____Final Grade_____

Topic: _____

Parent Signature (at conclusion) _____

2016-2017 SGGA SCIENCE FAIR INVENTION CHECKLIST AND RUBRIC

For Grade 8 Students ONLY!

Description:
An invention is a unique device or process that solves a real life problem in order to make life easier. Sometimes an invention is an improvement on an object that was already invented. An invention must serve a purpose.

Requirements:
Inventors are strongly encouraged to use recycled material and not to spend more than $25 in supplies if possible. Inventors must do their own work but parents should be advising and supervising for SAFETY reasons.

Experimentation:
Once you have an idea for your invention, you must go through the scientific method to prove your invention's purpose or effectiveness. Because this is a fairly new option, your teachers will be available to closely guide you through the scientific method and guide you in your pursuits.

***Note: If a project change is necessary after the topic has been approved, the new topic MUST be submitted to your teacher for approval before any experimentation.**

The SGGA Science Fair provides a unique opportunity for students to engage in a long-term scientific investigation. It will require the use of the scientific method as well as research skills. In addition, it gives the student a chance to develop skills in responsibility, organization, and communication. The following document is to be used as a guide and ultimately, a grading rubric. Good luck, scientists!

Grading:
All requirements are bulleted and bolded under each heading below. The eighth grade student must complete 90% of the requirements for a passing grade. If 90% is not achieved, the project must be revised until the requirements are made.

It is MANDATORY that the student and the parent each initial every bullet to assure completion at a high quality of work.

- ❑ Parent initials
- ❑ Student initials
- ❑ Rubric present with project on due date

TOPIC: Due on Friday, September 16, 2016 on the Project Proposal Form.

First and foremost, please choose a topic that you are interested in learning about; be sure that it is age appropriate and a challenge! Although there are many suitable projects to choose from or design, if a project includes human test subjects or animal test subjects, there must be strict compliance to ISEF guidelines. **Projects dealing with animals, humans, and hazardous materials should be pre-certified by Mercer Science and Engineering Fair committee prior to experimentation**. Permission slips for test subjects - minors and adults, risk assessments, and permission from SGGA faculty and administration is required as well.) Please visit the Mercer Science and Engineering Fair webpage (http://www.mercersec.org/resource/fair) for ISEF guidelines. **NO growth of mold, bacteria, or other biologicals. NO gases, NO flammable liquids, and NO fumes! The use of heat is discouraged and is only to be used with parental approval and supervision. Teachers must also be notified. All electrical equipment must be constructed according to standard electrical safety rules.** Contact local electrician inspection bureau if necessary.

*Electrical exhibits must operate on 120 volt current. If using batteries, they must be either dry cell or storage.
*120 volt toggle or pushbutton type switches mounted on suitable panels or switch boxes must be used for electrical exhibits. Doorbells and open knife switches are prohibited on 120 volt apparatus.
*All electrical joints must be properly soldered and taped.
*Nails, tacks, and un-insulated staples may not be used for fastening wires. *Use porcelain or other approved types of insulators.
*No unprotected flames, heaters, or dangerous chemicals are permitted.
*Parental supervision when using sharp objects
SAFETY is #1.

SCIENTIFIC METHOD

- ❑ **Steps must be clearly labeled on the board**
- ❑ **Scientific Method steps #1-7 is logically placed and followed on the board (refer to diagram)**

1. **Question**
2. **Research with works cited**
3. **Hypothesis**
4. **Experimental Procedure (Including Materials)**
5. **Collect Data (Data Tables and Graphs)**
6. **Data Analysis**
7. **Conclusion/Benefits**

*Communicating your project and project results as a presentation to your class will occur after the Science Fair is completed. This will be addressed in a separate rubric.

PROCESS & PRESENTATION BOARD

Title: A creative title will attract your audience to want to learn about your investigation.

You may use *pre-made letters/labels and artistic fonts (*some pre-made labels have the tendency to not stick well, adjust accordingly)
Example: The Miracle of Growing Plants

- ❑ **Placed on the top center of board and is easy to read from a far distance**
- ❑ **The title is creative**

Question: What question will be answered or what problem will be solved? A scientific question usually starts with: How, Can, Will, What, When, Who, Which, Why, or Where.
Example: Can increasing the amount of fertilizer given to three of the same plants cause the plants to grow taller?

- ❑ **You ask a question that is able to be tested and measured quantitatively**
- ❑ **The question that you want to answer is easy to understand and stated as simply as possible.**

Research: Before moving in a new direction, it is important to gather the information that already is known about the subject. Some sources may include textbooks, Internet articles from valid sources, journals, magazines, and encyclopedias to name a few. It is important to choose reliable sources. Avoid sources in which validity is questionable. Consult the most current resources. All sources are subject to validation by your teacher for reliability and accuracy. Read at least three sources and then write an **authentic summary** of what you learned from your research. You should use your best Language Arts skills in writing your summary. No plagiarism or cutting and pasting. DO NOT CITE search engines. Reference SGGA approved databases. Research plays an important role in applying the scientific method. Plagiarism rules: http://wps.prenhall.com/hss_understand_plagiarism_1/6/1668/427073.cw/index.html Follow SGGA Student Handbook as a guide.

- ❑ **Research is an authentic summary, by the student, reflecting knowledge gained during the research process.**
- ❑ **You used at least 3 sources to gather your information**
- ❑ **A minimum of two double-spaced typed pages (Font should be easy to read and size 14)**
- ❑ **Use your question to help guide your research.**
- ❑ **Research summary also defines new vocabulary found in the topic, question, and/or body of the research summary.**

Works Cited: Always list the sources of your research. You will be given a MLA guide sheet and many examples. You may find www.bibme.org/mla/website-citation helpful. This page may be placed behind your research summary.

- ❑ **Attempted to cite sources using MLA format**
  Clearly labeled as "Works Cited" on the board
  All the sources are in alphabetical order according to author's last name or article's name and use reverse indentation format

Hypothesis: A hypothesis is an educated guess, prediction, or possible explanation based on previous knowledge and observations. To be valid, a hypothesis has to be something you can test by using an investigation.

Example: **If** three plants are fertilized with increasing amounts of fertilizers, **then** the plant that receives the most fertilizer will grow the tallest.

- ❑ **Must be presented in "If….. then" format**
- ❑ **It is a prediction of what you think the outcome of your experiment will be**
- ❑ **The hypothesis you write is based on the research that you have gathered**
- ❑ **It is quantitatively measureable**
- ❑ **It answers the "Question"**
- ❑ **Correct hypothesis for the chosen experiment**

Experimental Design: The experimental design is the plan to test your hypothesis. This is not a specific item on your board, but it is determined by your hypothesis, variables, materials, and process that you need to carry out for your investigation.

- ❑ **Experiment is set up correctly and correlates with the question and the hypothesis**
- ❑ **Experimental design must be able to produce recordable data. No project will be accepted without recordable and interpretable data.**
- ❑ **Data must be able to be collected that represents a quantity such as count, length, width, weight, percentage, time etc. If the outcome of your investigation does not produce sufficient and reasonable data, you MUST revise your experimental design. Allow sufficient time to revise if needed.**

Materials: After planning your experiment, make a list of all equipment and materials that will be used.

- ❑ **List of all of the materials that were used throughout your experiment**
- ❑ **Precise amounts or numbers of items must be clearly listed**

Procedure: A procedure tells you what to do step by step in a detailed description. Remember, any scientist should be able to take your procedure and repeat your experiment following your instructions. Be clear!

- ❑ **You have a step-by-step list of everything you must do to perform your experiment**
- ❑ **Procedure is listed by number**
- ❑ **The audience is able to follow the directions and reproduce the experiment**
- ❑ **Validity: the experimental procedure specifies how many times you repeated your experiment.**
- ❑ **The minimum number of trials is three and is represented in the photos.**
  - ❑ **Trial 1 and shown in photos**
  - ❑ **Trial 2 and shown in photos**
  - ❑ **Trial 3 and shown in photos**

Variables: In an experiment, it is important to keep everything the same except for the item that you are testing. Variables explain what you are changing in your experiment and what you are keeping the same.

Independent variable: the one factor that you change. Only ONE independent variable.
Example: the amount of fertilizer
Dependent variable: the factor that is being measured in an experiment & gives you data
Example: height of plant

Constant variables: the parts of your experiment that remains the same so that you can compare the results of your test.
Example: size of the pot, type of plant, amount of water and sunlight, brand of fertilizer...
Control: the part of your experiment that does not receive the independent variable.
Example: plant that does not receive any fertilizer

- ❑ **Independent variable is listed and correct**
- ❑ **Dependent variable is listed and correct**
- ❑ **Constant variables are listed and correct**
  A control has been set up for the experiment, listed and correctly done, if applicable.

Log Book: The log book acts as a record of the progression of your science fair project. It is a book which may contain handwritten, computer generated, or a combination of both pages outlining the entire process from beginning to end. Computer generated pages can be made by using your Google Drive. In keeping with MCSEF guidelines, rules for using computer generated log book pages are listed below. Most importantly, the log book should always include data. When carrying out your experiment, you **must** collect and record valid data. The data in the form of numbers and/or descriptions must be recorded in an organized way. (This is the first time you present your data)

- ❑ **Use a new black and white marble composition notebook**
- ❑ **Label the log book's cover with the title of your experiment**
- ❑ **Organize your log book by date at the top of each page and page number at the bottom of the page**
- ❑ **If it is a personal handwritten record of your work then all the information must be legible and organized.**
- ❑ **If the log book contains computer generated entries, each entry must be printed, initialed, and dated.**
- ❑ **All computer printed log entries are to be attached to a numbered page in the log book and placed in chronological (date) order.**
- ❑ **The log book was used during all phases of your experiment. You included ideas or thoughts you may have had, data you collected, graphs, charts, sketches and calculations.**
  *Glue any loose papers, and photographs you have gathered during the experiment. Additional pictures may be placed in a photo album instead of your log book

Measurement: Refer to Glencoe Science text for SI units.

- ❑ **All quantities are in metric measurements (SI units are used).**

Data Tables: A data table is an organized chart to display the numerical results of your experiment. (This is the second time that you present your data.)

- ❑ **All data is organized in a computer made data table showing all data and averages**
- ❑ **Data table with descriptive title**
- ❑ **Includes appropriate subtitles on columns**
- ❑ **Units of measurement are clearly noted next to the subtitles**
- ❑ **Data reflects at least three trials**
- ❑ **Data is correctly recorded and calculated**
- ❑ **Data MUST appear on the board**

Graphs: This is the third way of presenting your data. You have a number of options in making your graph: scatter plot, line, bar, pie graph etc. Choose the type of graph that will best represent your data.

- ❑ **The graph is appropriate for the data being presented showing all trials or the averages of the data**
- ❑ **The graph explaining what is being resulted in the experiment**
- ❑ **The graph is computer made from the data you collected**
- ❑ **Graph titled**
- ❑ **X and Y axis are both titled**
- ❑ **Proper units of measure are noted in parenthesis after the axis titles**
- ❑ **Graph uses reasonable increments to display the data**
- ❑ **Data and plotting is correct**
- ❑ **Independent and dependent variables are represented on the proper axis**

Data Analysis: This is your final way to show your data using words. To determine the meaning of your observations and investigation results, you will need to look for patterns in the data. Critical thinking is needed in explaining what your data means. What did the data show? Why? Identify the control group and the test group to see whether or not changes in the independent variable had an effect. Look for differences in the dependent variable between the control group and test groups. Classify, compare/contrast, and recognize cause and effect when analyzing your data. Display this in a narrative form in at least two paragraphs.

- ❑ **Data is analyzed and you clearly interpret the experiment's results through logical thought**
- ❑ **You use data to explain WHY!**
- ❑ **At least two well-written paragraphs**

Conclusion/Benefits: Look at your hypothesis again and decide if your experimentation supported your hypothesis or refuted it. (You may be concerned if your data does not support your hypothesis. Don't worry! Remember, it is also important for scientists to know when something doesn't give the expected outcomes, too!) What were your major findings? What are possible reasons for the results? What are the benefits to the science community or to everyday life? Are there new questions to be investigated?

- ❑ **A few sentences summarizing your results**
- ❑ **Give an answer to the "Question" by using evidence from results**
- ❑ **State whether your results supported or refuted your hypothesis**
- ❑ **Suggest changes in the experimental procedure (or design) and/or possibilities for further study if necessary**
- ❑ **Benefits**

Board

- ❑ **An eye-catching, organized, and neatly completed visual display on a trifold board that is sturdy. The board does not lean, bend, or has fallen apart during transport. Maximum size of project is:**
  Depth (front to back): 30 inches or 76 centimeters
  Width (side to side): 48 inches or 122 centimeters
  Height (floor to top): 108 inches or 274 centimeters
  There is no drawing or hand written materials on the board
  Decorations are appropriate and connected to topic
- ❑ **Correct grammar, usage, and spelling is used throughout**

Photographs

- ❑ **Photographs of your experiment are glued to the display board; other pictures may be placed in the log book or photo album**
- ❑ **Photographs should have computer typed captions and attributions. (Taken by…)**
  Photographs do not have your face or any family members faces present
- ❑ **Photographs should represent the process of the experiment (construction, experimentation, and/or results)**

Neatness:

- ❑ **Avoid sloppiness. Cutting with straight edge strongly advised**
  Be attentive to gluing (too much, too little) and no visible tape
  Placement of text, labels and photographs should be in alignment (no skewing)

Name

- ❑ **Your name should not be present anywhere on the board or on the log book**

Extras: You can bring in parts of your experiment for display, as long as it does not exceed the size restrictions. We cannot be responsible for any lost or damaged items.

REMINDER: Please refer to the SGGA Family Handbook, regarding Science Projects. "All projects must conform to Christian moral and ethical values. Therefore, displays may not contain pictures or materials that are related to acts of violence. Guns and look alike guns (toy guns, water guns, paint ball guns etc.) explosives, including fireworks, bullets, knives, and bows and arrows are not permitted in the display."

Any further changes or updates to MCSEF guidelines will be forwarded to you as they are received. Please remember, these are guidelines to assist you, **the student**, in creating a wonderful, informative, and exciting Science Fair project. Please use your CREATIVITY and INTELLIGENCE every step of the way! God bless you as you begin this memorable and enjoyable project! ☺ **Rev: 06 14 2016**

Sample Board: