BEST MEDICINE | Bridging Engineering, Science & Technology

Washkewicz College of Engineering

BEST Medicine

Engineering Fair
Student Handbook and Rules and Regulations

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Table of Contents

BEST Medicine Fair

BEST Medicine is an initiative focused on encouraging middle and high school students to address problems at the interface between healthcare and engineering. It emphasizes interdisciplinary skills and concepts taught in K-12 classrooms throughout NE Ohio. If further developed in college, these skills are a precursor to many sought-after jobs in medical and allied healthcare fields. Due in no small part to our region's research and clinical strengths, and a broad existing biomedical industry, the region has become a major center of healthcare innovation and commercialization.

Previous BEST Medicine events have highlighted the creativity and ingenuity of middle and high school students. Examples include (i) an orthopedic cast that allows a fractured bone to heal while allowing a skin wound to be treated, (ii) a wheelchair that could ascend staircases, (iii) a hearing aid that could be 3D printed and (iv) a sensor system that alerts parents or Emergency Responders if a baby was left unattended in a hot car.

Cleveland State University is an ideal site for BEST Medicine. We have partnerships with the Cleveland Clinic, Akron Children's Hospital, multiple companies in the medical device field and a very active Fenn Academy that encourages high school students to pursue post-secondary education and careers in engineering. For more information on this exciting program see: https://engineering.csuohio.edu/fennacademy/fennacademy.

If you have questions, begin by exploring our website,

https://engineering.csuohio.edu/bestmedicine/BEST_Medicine

Contacts Us: bestmedicine@csuohio.edu

Eligibility

Dear Student/Teacher,

This handbook contains a lot of information that can take some time to read. There are a few important things that we at BEST Medicine would like to make you aware of before beginning the engineering fair process at your school.

- BEST Medicine is open to students in grades 6-12 in any public, private, parochial or home school. BEST Medicine projects should use engineering to solve a medical problem.

- Students may only submit **one** project to BEST Medicine. Students cannot resubmit a previous year's project unless it has been substantially expanded and redeveloped.

- Team projects are accepted at BEST Medicine with teams up to 4 students. A larger team may enter with the approval of the BEST Medicine Chair.

- In order to participate, students must obtain signatures from both their teacher and parent/legal guardian. Plus, students must complete the online registration.

- A maximum of 15 projects can be entered from any high school or middle school. If your school is holding a science fair, prior to BEST Medicine, and you would like a BEST Medicine organizer to judge your project or your students' projects, you must schedule this via Dr. Brian Davis (bestmedicine@csuohio.edu).

- There are two paths to BEST Medicine: (1) A letter is received from the BEST Medicine Chair at your school or district fair, or (2) A student may enter BEST Medicine as an independent if her/his school does not conduct a school-wide science fair. See the Two Paths to BEST Medicine on Page 7.

- Note: All projects at BEST Medicine are subject to the review of the Scientific Review Committee (SRC). Projects which do not adhere to correct scientific principles, or which involve inadequate protection of human or animal subjects, may be disqualified.

- If your project is accepted, an acceptance letter will be sent to the email addresses provided during online registration.

Contact Information

For general questions about the BEST Medicine Engineering fair contact Brian Davis at

bestmedicine@csuohio.edu

Scientific Review Committee

The Scientific Review Committee (SRC) will assess and approve each project that is submitted to BEST Medicine Engineering Fair. The SRC evaluates the scientific integrity of the project, especially those projects using human and/or animal subjects. The SRC also verifies that all project-appropriate paperwork is submitted with each student's application. Students that need to consult with the SRC about their project either before or after the application deadline may contact the Program Chair listed below for assistance.

NOTE: After the SRC reviews all accepted applications, the SRC has the authority to **change** or **add project categories** to equally distribute projects amongst categories and to benefit the student(s) participating in the BEST Medicine Engineering Fair during judging.

Brian Davis, Ph.D.
BEST Medicine Chair
Cleveland State University

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Paths to BEST Medicine

1

Pre-selected by the BEST Medicine Chair at a school or district fair. You will receive a latter from the BEST Medicine Chair inviting you to attend

Complete the appropriate application forms and complete the registration

2

You are not pre-selected at a school or distract fair, but do an independent project

Complete the appropriate application forms and complete the registration

- A student may enter the BEST Medicine Engineering Fair as an independent if her/his school does not conduct a school-wide science fair
- If your school is holding a science fair prior to BEST Medicine and you would like a BEST Medicine Engineering Fair Chair to come and judge your project or your students projects you must schedule this vis Dr. Brian Davis (bestmedicine@csuohio.edu)

Event Location

Campus International School: 2160 Payne Ave, Cleveland, OH 44114

- Check-in
- Hands on demonstrations
- Judging

Washkewicz College of Engineering: 2121 Euclid Ave, Cleveland Ohio 44115-2214

- Family/Parent/Guardian tour of Washkewicz
- Keynote speakers
- Lunch
- Awards ceremony

Free parking is available in Lot 51, corner of E 22nd and Payne Ct.

BEST MEDICINE | Bridging Engineering, Science & Technology

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Category Descriptions

Environmental: Relating to the natural world (hydrology, climatology, ecology, geology, natural resource studies) and the impact of human activity on its condition. Projects in this category are encouraged to consider the themes "Reduce", "Reuse", and/or "Recycle" in the project design.
Sustainability: The ability to meet the needs of the present, without compromising the ability of the future generations to meet their own needs.
Pollution: The presence in or introduction into the environment of a substance or thing that that has harmful or detrimental/poisonous effects.
Computer/IT: The use of hardware, software, services, and supporting infrastructure to manage and deliver information using voice, data, and video.
Sensors/Imaging: Involving technologies used to view the body or environment in order to diagnose, or monitor various conditions. For example, pollution, wildfire risk, blood pressure, etc.
Modeling/Simulation: The use of a device to imitate or represent reality, such as computer models of weather/environments/human physiology to test a new device or model. Technology involves the development, maintenance, and use of computer systems, software and networks for the processing and distribution of data.
Health/Medicine: The study of health and disease in humans or animals, including disease diagnosis, causes of disease, ways of treating disease, medical procedures, alternative therapies for diseases, or the way in which the human or animal body functions normally.
Medical Device: An instrument, apparatus, implant, or similar article that is used to diagnose, prevent, or treat disease or other conditions, and does not achieve its purposes through chemical action within or on the body.
Biomaterials/Polymer Medicine: A natural or synthetic material, such as a metal or polymer, that is suitable for introduction into living tissue especially, as part of a medical device (as an artificial joint). Polymer medicine involves macromolecules.
Musculoskeletal: Relating to the musculature and skeleton together. Disorders affect muscles, bones, joints, tendons and ligaments.
Cardiovascular/ Soft Tissue Wound Healing: Relating to or involving the heart and blood vessels. The healing of an injury to the body typically involves laceration or breaking of a membrane, such as the skin, and usually damage to underlying tissues.
Clinical Trials: A scientifically controlled study of the safety and effectiveness of a therapy using consenting human subjects (Note that Institution Review Board (IRB) approval is required – even for studies that involve surveys)
NEW: **Entrepreneurship:** Original idea using engineering design resulting in innovation that disrupts the current market with possibilities of patents/intellectual property

Elements of a Successful Project

Science is a process by which we learn about the universe around us. **Engineering** is the application of knowledge toward some useful goal. A good engineer fair project includes the proper use of scientific and engineering ideas, such as the scientific method or the engineering design process. The following steps will help you get started, and hopefully guide you to a well-rounded and winning engineering fair project. If you need help, do not be afraid to consult with a scientist or engineer that specializes in your field of study.

STEP 1: Pick a Topic to Study

- Spend some time and give serious consideration to this part of your engineering fair project. Don't settle for a project that has been done before because it is easy. Originality tends to win over judges at BEST Medicine. Pick a topic that grabs your interest, and you want to learn more about. The BEST Medicine website (under Resources) lists over 100 potential project ideas.

STEP 2: Do a Background Search

- While not the most exciting part of doing an engineering fair project, you will learn more about the topic. This will provide you with the necessary information needed to come up with a hypothesis or a defined problem, determine appropriate methods to test your hypothesis or design, and allow you to draw conclusions about your results.
- This information will need to be included in your project report and engineering fair display.

STEP 3: Formulate a Hypothesis or Goal

- A hypothesis (for the scientific method) is a sentence or two stating that based on all the information you must go on this is what you truly believe will be the outcome of what you are going to test.
- A good hypothesis does not necessarily mean that it is a correct hypothesis. Frequently in science, a hypothesis may be disproved by the results of your experiments. This is not a flaw in your engineering fair project.
- Be sure your goal can actually be achieved within the confines of the timing and resources available to you.

STEP 4: Document Your Work (The Laboratory Notebook)

- One of the most important attributes of a good scientist is good record keeping. Doubt is a human trait, so you need to be able to prove that what you found is correct and true. Do not rely on your memory.
- The lab notebook should contain all the procedures used in your experiments and all the data that came from them. Both good results and bad results should be documented. Not every experiment works perfectly.
- Summaries, conclusions for each experiment, and any plans you may have for the next experiment should be written in your notebooks. While it is easy to write too little in your lab notebook, you can never write too much.

STEP 5: Design Experiments to Test Your Prototype (Methods)

- Experiments should test your prototype. Do not be afraid to design more than one experiment to test your idea. Some of the best designs test a prototype device using more than one strategy.
- Be sure to include appropriate comparisons to other design concepts.
- While it may seem labor intensive, test for only one thing in each of your experiments.

STEP 6: Results

- This is the data generated from your experiments. It is best to repeat your experiments more than once to ensure reproducibility.
- SI units (grams, liters, meters, etc.) rather than English units (pounds, gallons, yards, etc.) are typically used in science. These units should be used whenever possible, although it will not count against you at BEST Medicine if you use English units.
- Statistics provide a quick summary of your data. Some commonly used statistics are the number of samples in each group (n); an indicator for the mid-point of your groups (average); the range (minimum and maximum values); and an indication of the variability of the data
  (standard deviation or standard error of the mean).
- Statistical tests (such as t-tests and ANOVA) can be used to mathematically determine if the differences between your groups are a result of the treatment you imposed rather than if it happened merely due to chance.

STEP 7: Evaluate Your Results and Strengthen Your Project

- Closely examine your data for any inconsistencies to fix, and any interesting findings.
  Take your project a step further. Many times, the data you collect generates new
- questions to be answered. Most judges are impressed by the second efforts.
  If your project has any shortcomings in the experimental design, you may want to
- resolve these problems in a second effort, or at least be ready to discuss them.

STEP 8: Draw Conclusions

- Try to decipher what the information you have obtained from your data means. Sometimes there can be more than one answer. If your finding is very specific, try to relate it back into the big picture.
- This section is also a good place to describe what future directions you would take your project.

STEP 9: Present Your Findings in a Research Paper

- A research paper is a formal written presentation of your engineering project. Good research papers are well written (using proper sentence structure, correct spelling and punctuation, etc.), well-organized, and contain all the following items:
  a. Introduction: A paragraph or two that states your topic, your goals, what you hope to achieve, and how you hope to achieve it.
  b. Background: A general introduction to the topic of study, which includes the key findings or factors that lead you to what you decided to study.
  c. Hypothesis: A statement or two about what you believe will be the outcome of what you are testing. A hypothesis is necessary for the scientific method but is not necessary for the engineering design process.
  d. Methods: Describe in detail the protocol(s) used to test your design. A person reading your research paper should be able to repeat your experiments completely based on what is written in this section.
  e. Results: Describe the data that you obtained from your experiments. In addition to the written text, photos, tables, figures, and graphs are good ways to help present your data to the reader. Do not forget to express your data values using appropriate units of measure (examples: 1.29 cm or 5.8 mL, etc.)
  f. Discussion: Explain what your data means. State how your experiments and data support or refute your idea. This section may be the longest and most important section of your paper!

g. Conclusion: Did your idea work? Why or why not? What would you do differently? What would you do next?
h. Acknowledgements and References: List the people and literature sources that assisted you with your project. Don't forget to thank any people or companies who donated time or supplies for your project.

STEP 10: Present Your Findings in a Project Display

- For engineering fairs, you need to construct a display that shows off your project and all the components discussed above. Spend some time on this part of the process. It is your opportunity to showcase your hard work.
- The project display is a visual tool to communicate your project and should be designed to explain your project in your absence.
- Make your display attractive and eye-catching to draw judges and passersby to your project. Make a good first impression. You may not get a second chance.
- Like a good research paper, a successful project display should have all of the following:
    a. Start with a good title. It may or may not be the same title as your research paper, but it should be displayed prominently.
    b. Have text to summarize your project from start to finish. It is unlikely that you will be able to use all of the written text in your research paper on your display board. Select the most important points from each section to put on the board. You need enough information to convey your points, but do not overdo it. The text should be fairly large and easy to read. If possible, use a printer rather than writing by hand.
    c. Have an organized flow of information. Your display can be organized like your research paper, but make sure the different sections are placed in a logical order around your display board.
    d. Include any necessary display items, especially your laboratory notebook and research paper.

SUMMARY:

- Identify a need. Be sure your idea is something that has a solution and is within your ability to construct.
- Determine limits or other criteria that you must impose on your solution. Cost, materials, and time are all possible limiting criteria.
- Do some preliminary research to see what has already been done to satisfy your need. This process may provide additional ideas.
- Design something that you think will satisfy your need.
- Build and test a prototype, refining or redoing if necessary.

Rules and Regulations

Thank you for expressing interest in participating in BEST Medicine. To conduct an experiment and participate in the fair, all students must adhere to the rules and regulations. These rules are meant to ensure the safety of all participants, research subjects, and spectators. Projects will be inspected for adherence to these rules the day of the fair and any projects with violations must be corrected for the student to compete.

Ethics Statement

Scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include plagiarism, forgery, use or presentation of other researchers' work as one's own, or fabrication of data. Fraudulent projects will fail to qualify for competition in BEST Medicine fairs.

Eligibility/Limitations

1. BEST Medicine is open to students in grades 6-12 in any public, private, parochial or homeschool. BEST Medicine projects should use engineering to solve a medical problem.
2. Students may only submit **one** project to BEST Medicine. Students cannot resubmit a previous year's project unless it has been substantially expanded and redeveloped.
3. Team projects are accepted at BEST Medicine with teams up to 4 students. A larger team may enter with the approval of the BEST Medicine Chair.
4. A maximum of 15 projects can be entered from any high school or middle school. If your school is holding a science fair, prior to BEST Medicine, and you would like a BEST Medicine organizer to come judge your project or your students' projects you must schedule this via Dr. Brian Davis (BESTMedicine@CSUOhio.edu).
5. A student may enter BEST Medicine as an independent if her/his school does not conduct a school-wide science fair. See the Two Paths to BEST Medicine on
6. Note: All projects at BEST Medicine are subject to the review of the Scientific Review Committee (SRC). Projects which do not adhere to correct scientific principles, or which involve inadequate protection of human or animal subjects may be disqualified.
7. If your project is accepted, an acceptance letter will be sent to the email addresses provided during online registration.

Requirements

1. All students competing in BEST Medicine must adhere to the rules as set forth in this document.

2. All projects must adhere to the Ethics Statement above.
3. Projects must adhere to local, state, and U.S. Federal laws, regulations and permitting conditions.
4. The use of non-animal research methods and the use of alternatives to animal research are strongly encouraged and must be explored before conducting a vertebrate animal project.
5. Introduction or disposal of non-native species, pathogens, toxic chemicals or foreign substances into the environment is prohibited.
6. BEST Medicine exhibits must adhere to BEST Medicine display and safety requirements.

Approval and Documentation

1. The required forms that are listed on the **Required Forms Checklist** of the BEST Medicine Engineering Fair Student Application must be submitted.
2. Projects which are continuations of previous years' work, and which require IRB/SRC approval must be reapproved prior to experimentation/data collection for the current year. Any continuing project must document that the additional research is new and different. See **Continuation Projects Form (6).**
3. If work was conducted in a regulated research institution, industrial setting, or any work site other than home, school or field at any time during the current BEST Medicine project year, the **Regulated Research Institutional/Industrial Setting Form (2)** must be completed and displayed at the project booth.
4. A lab notebook and research paper are required.
5. All signed forms, certifications, and permits must be postmarked **a month before the event.**

Continuation of Projects

1. If the current year's project could not have been done without what was learned from past years' research, then it is a continuation project for competition. These projects must document that the additional research is an expansion from prior work (for example, testing a new variable or new line of investigation, etc.) Repeating previous experiments with the exact same methodology and research questions or increasing the sample size are examples of unacceptable continuations.
2. Display boards and abstracts must reflect the current year's work only. The project title displayed may mention years (for example, "Year Two of an Ongoing Study"). Supporting data books (not research papers) from previous related research may be exhibited on the table, properly labeled as such.
3. Longitudinal studies are permitted as an acceptable continuation under the following conditions:

a. The study is a multi-year study testing or documenting the same variables in which time is a critical variable. (Examples: Effect of high rain or drought on soil in each basin, return of flora and fauna in a burned area over time.)
b. Each consecutive year must demonstrate time-based change.
c. The display board must be based on collective past conclusionary data and its comparison to the current year data set. No raw data from previous years may be displayed.
d. All continuation projects must be reviewed and approved each year and forms must be completed for the new year.

NOTE: For competition in BEST Medicine, documentation must include the **Continuation Project Form (6), the current year's abstract, and previous year's abstract.** The documentation should be clearly labeled in the upper right-hand corner with the year (ex: 2013-2014). Please retain all prior years' paperwork.

Team Projects

1. At BEST Medicine, team projects compete within the scientific category of their research and will not be a separately judged category.
2. Teams can have up to 4 students. A larger team can enter with the approval of the event director. **NOTE**: Teams may not have more members at a local fair and eliminate members to qualify for BEST Medicine.
3. Team membership cannot be changed during a given research year, including conversion from an individual project or vice versa. However, team membership *may* be altered in subsequent years.
4. Each team should appoint a team leader to coordinate the work and act as spokesperson. However, each member of the team should be able to serve as spokesperson, be fully involved with the project, and be familiar with all aspects of the project. The final work should reflect the coordinated efforts of all team members and will be evaluated using similar rules and judging criteria as individual projects.
5. The required forms that are listed on the **Required Forms Checklist** of the BEST Medicine Engineering Fair Student Application must be submitted.
6. Full names of all team members must appear on the abstract and forms.

PROJECT SET-UP Maximum Display Size:

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

Fair-provided tables will not exceed a height of 36 inches (91 centimeters). Maximum project sizes include all project materials, support, and demonstrations for the public and the judges. The table becomes part of the project and must not exceed the allowed dimensions. The table, plus any part of the project, must not exceed the allowed dimensions.

Only students may set up the exhibit. No parents, teachers, siblings, etc. are permitted in the Exhibit Hall during set-up. (If the student is unable to set up his/her project, contact BEST Medicine to make other arrangements prior to the day of the event.) At BEST Medicine, demonstration of a project must be within the confines of the student's booth. When not being demonstrated, the component plus the project must not exceed allowed dimensions.

The display must be set up in its entirety, inspected, and approved by BEST Medicine Officials. Students must be present at their projects for the BEST Medicine Officials. The inspection is with the student and the BEST Medicine Officials; no other people should be present representing, except for an interpreter if necessary. Any CDs, printed materials, etc. (including unofficial abstracts) for distribution to judges or the public will be confiscated and discarded immediately by the BEST Medicine Officials. Students may not add additional material to their display after inspection without permission from a BEST Medicine Official.

The BEST Medicine Officials reserve the right to remove any project for safety reasons or to protect the integrity of BEST Medicine and its rules and regulations. If a project fails to qualify and is not removed by the student, the BEST Medicine Officials will remove the project in the safest manner possible but are not responsible for damage to the project. Project sounds, lights, odors, or any other display items must not be distracting. No food or drinks, except small containers of bottled water for personal consumption, are allowed in the Exhibit Hall.

While the Exhibit Hall is relatively secure, there is public access to the event. BEST Medicine recommends that you avoid bringing expensive equipment, such as microscopes, calculators, etc.

Required to be Visible and Vertically Displayed

- Originals of official abstract and certification as approved by the BEST Medicine Committee
- Continuation Projects Form (6) — when applicable

- Photograph / image credits

Display Rules/Regulations

We recommended that you take pictures or draw schematics of important steps/results that you wish to convey to the judges. You may bring packaging from non-permitted items, but all packages must be empty. We also suggest using artificial items to substitute for items not permitted at the fair (for example, artificial plants or food).

Not Allowed at Project Display or in Booth

1. Living organisms, including plants
2. Taxidermy specimens or parts
3. Preserved vertebrate or invertebrate animals
4. Human or animal food
5. Human/animal parts or body fluids (for example, blood or urine)
6. Plant materials (living, dead, or preserved) that are in their raw, unprocessed, or non-manufactured state (Exception: manufactured construction materials used in building the project or display)
7. All chemicals including water (Exceptions: water integral to an enclosed, sealed apparatus)
8. All hazardous substances or devices (for example poisons, drugs, firearms, weapons, ammunition, reloading devices, or lasers)
9. Dry ice or other sublimating solids
10. Sharp items (for example syringes, needles, pipettes, or knives)
11. Flames or highly flammable materials
12. Batteries with open-top cells
13. **Awards, medals, business cards, flags, logos, endorsements, and/or acknowledgments** (graphic or written) unless the item(s) are an integral part of the project
14. Photographs or other visual presentations depicting vertebrate animals in surgical techniques, dissections, necropsies, or other lab procedures
15. Prior years' written material or visual depictions on the vertical display board. (Exception: the project title displayed may mention years or which year the project is.) Continuation projects must have the **Continuation Project Form (6)** vertically displayed.
16. Glass or glass objects unless deemed by the BEST Medicine Officials to be an integral and necessary part of the project. (Exception: glass that is an integral part of a commercial product, such as a computer screen.)
17. Any apparatus deemed unsafe by the Scientific Review Committee, the BEST Medicine Officials, or Society for Science & the Public (for example large vacuum tubes or

dangerous ray- generating devices, empty tanks that previously contained combustible liquids or gases, etc.)

Allowed at Project Display or in Booth BUT with the Restrictions Indicated

Photographs and/or visual depictions if:

a. They are not deemed offensive or inappropriate by the Scientific Review Committee, BEST Medicine Officials, or Society for Science & the Public. This includes, but is not limited to, visually offensive photographs or visual depictions of invertebrate or vertebrate animals, including humans. The decision by any one of the groups mentioned above is final.
b. They have credit lines of origin ("Photograph taken by..." or "Image taken from..."). (If all photographs being displayed were taken by the student or are from the same source, one credit line prominently displayed is sufficient.)
c. They are from the Internet, magazines, newspapers, journals, etc., and credit lines are attached. (If all photographs/images are from the same source, one credit prominently displayed is sufficient.)
d. They are photographs or visual depictions of the student.
e. They are photographs of human subjects and signed consent forms are at the project display. A photo release signed by the subject, and if under 18 years of age, also by the guardian of the subject must be available. The consent text can be as follows: "I consent to the use of visual images (photos, videos, etc.) involving my participation/my child's participation in this research."
f. Finalists using audio-visual or multi-media presentations (for example, 35mm slides, videotapes, animations, etc., displayed on computer monitors, or other non-print methods) must be prepared to show the entire presentation to the BEST Medicine Officials before the project is approved.

Any apparatus with unshielded belts, pulleys, chains, or moving parts with tension or pinch points, **if for display only and not operated.**

Any demonstration for judges or the public must be performed within the maximum size of the display area permitted [30" (Depth) by 48" (Width) by 108" (Height)].

a. Class II lasers **if**:
   a. The output energy is <1 mW and is operated only by the student.
   b. Operated only during the Display and Safety inspection and during judging.
   c. Labeled with assign reading **"LaserRadiation:DoNotLookintoBeam".**
   d. Enclosed in protective housing that prevents physical and visual access to beam.
   e. Disconnected when not operating

Note: *Class II lasers are found in laser pointers and in range-finding devices. They pose a risk if the beam is directly viewed over a long period of time.*

5. Class III and IV lasers **if for display only and not operated.**

6. Any apparatus producing temperatures that will cause physical burns **if adequately insulated.**

Note: *The only items that may be displayed on the front of the provided tables are the ones listed in the section "Required to be Visible and Vertically Displayed"*

Electrical Regulations

1. Participants are welcome to bring laptops and other technology as needed for their project.
2. Finalists requiring 120 Volt A.C. electrical circuits must provide a **UL-listed 3-wire extension cord** which is appropriate for the load and equipment.
3. Electrical power supplied to projects and the maximum allowed for projects is **120 Volt, A.C., single phase, 60 Hz.** Maximum circuit amperage/wattage available is determined by the electrical circuit capacities of the exhibit hall and may be adjusted on-site by BEST Medicine Officials.
4. All electrical work must conform to the National Electrical Code or Exhibit Hall regulations. The guidelines presented here are general ones and other rules may apply to specific configurations. The on-site electrician may review electrical work on any project.
5. All electrical connectors, wiring, switches, extension cords, fuses, etc. must be **UL-listed** and must be appropriate for the load and equipment. Connections must be soldered or made with **UL-listed** connectors. Wiring, switches, and metal parts must have adequate insulation and over-current safety devices (such as fuses) and must be inaccessible to anyone other than the student. Exposed electrical equipment or metal that possibly may be energized must be shielded with a non- conducting material or with a grounded metal box to prevent accidental contact.
6. Wiring ***not*** part of a commercially available UL-listed appliance or piece of equipment must have a clearly visible fuse or circuit breaker on the supply side of the power source.
7. There must be an accessible, clearly visible on/off switch or other means of disconnect from the **120 Volt** power source.
8. Any lighting that generates considerable and excessive amounts of heat (high-intensity lamps, halogen lights, etc.) must be turned off when the student is not present.

9. Participants **must assume responsibility** for their own electrical needs on the day of the event and bring their own extension cords or other items.
10. Participants must email BESTMedicine@csuohio.edu, **if their project needs to be close to an electrical outlet** a week before the event takes place.

All students should be trained and instructed before working with chemical substances, tools, and heat sources. Adult permission and supervision is required when using any potentially dangerous or hazardous materials.

Judging

- Students must remain at their project during judging. Parents/guardians/siblings/ teachers are **not** allowed at the project during judging.
- Please allow time for the BEST Medicine Officials to calculate scores after judging and before the awards ceremony.
- Students who are not present at their projects during the judging process will not be eligible for any awards. No exceptions to this rule will be made. BEST Medicine Officials will verify attendance during the judging period.

Judges will focus on:

- What the student did in the current year.
- How well a student followed the scientific, engineering, computer programming or mathematical methodologies.
- The detail and accuracy of research as documented in the lab notebook. Whether experimental procedures were used in the best possible way.

You want to make a good first impression. Greet the judges and introduce yourself. Appearance, good manners, appropriate attire, and enthusiasm for what you are doing will impress the judges. Judges look for well thought-out research. They look at how significant your project is in its field, how thorough you were, and how much of the experiment thought and design is your own work. Initially, judges get their information from your board, abstract, and research paper to learn about the project, but it is the **Interview** that will be the final determination of your work. Judges applaud those students who can speak freely and confidently about their work. They are not interested in memorized speeches or presentations. They simply want to talk with you about your research to see if you have a good grasp of your project from start to finish. Judges often ask questions to test your insight into your project such as:

- How did you come up with this idea?
- What was your role?

- What further plans do you have to continue research?
- What are the practical applications of your project?

Remember that the judges need to see if you understand the basic principles of science behind your project or topic area. They want to determine if you have correctly measured and analyzed the data. They want to know if you can determine possible sources of error in your project and how you might apply your findings to the 'real' world.

Finally, the judges seek to encourage you in your scientific efforts and your future goals/ career in science. Relax, smile, and enjoy your time learning from them and accept their accolades for your fine work.