2017 PIKES PEAK REGIONAL ELEMENTARY

SCIENCE & ENGINEERING FAIR

Date: Saturday, April 22, 2017

Location: Mitchell High School
1205 Potter Drive
Colorado Springs, CO 80909

Sponsored by: Colorado Springs School District 11
For information please visit: http://www.d11.org/Instruction/science/Pages/default.aspx
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Frequently Missed or Forgotten Pieces of Information About the Science and Engineering Fair

The top three finishers at a school in each grade (4th & 5th), for each category (biological, consumer, health & behavioral, physical, and engineering) may advance to the Pikes Peak Regional Science and Engineering Fair.  

No live organisms are allowed at the fair. This includes projects with plants, animals, fungi, bacteria, protozoan, mold, spoiled food, etc. Photos of living organisms are required.  

No names, schools, or grades are permitted on the project display or on accompanying items.  

A science notebook (traditional or electronic) is a required component of a project and is used to record data and store research. The student may use the notebook during the presentation to support the project’s information.  

Requests for electrical or network access must be made on the application form.  
- Projects that require electricity- students need to provide their own extension cords and duct tape.  
- Projects that require network access- students need to provide their own equipment & devices.  

The building will not be open for student check-in until 8:00 AM.  

All applications MUST be completed online at:  
http://www.d11.org/Pages/MySchoolBucks.aspx  
Fees may be paid online with a credit or debit card  
You may also drop off or send payment (cash or check) to:  
Matt Lucero, District 11 Instruction and Curriculum  
1115 North El Paso Street, Colorado Springs, CO 80903  
All applications and fees are due by April 17th, 2017.
Important Facts for Students, Parents, and Teachers

Science and Engineering Fair Date and Times: Saturday, April 22, 2017

8:00 – 8:45 Students will set-up projects in Mitchell's Main Gym.
9:00 – 12:00 Judging begins. **Only students are allowed in the gym during judging.**
12:00 – 1:00 Public viewing of students' projects is in Mitchell's Main Gym. Viewing start time may vary due to the length of time needed to judge.
1:00 – 1:15 All student projects must be removed from the gym prior to the awards assembly.
1:15 – 2:15 The awards assembly is in Mitchell's Auditorium in the Main Building.

Participants: Only 4th and 5th grade students are eligible to compete in the fair. Each school may send the top three students per category.

Location: Mitchell High School, 1205 Potter Dr., Colorado Springs, CO. 80909

Parking: Parking is available in the open parking area on the west side of the school.

Judging and Parent Information: **Only students are allowed in the gym during judging.**

- All students should know what category they are participating in before registering.
- Parents are welcome to wait outside the gym in the open area or leave campus and return for public viewing at 12:00.
- All 4th and 5th grade students and all categories will be judged at the same time. Students are not identified by grade level during judging. Award winners are determined by grade level and by category.
- Students are required to wait in front of their exhibits the entire time of the judging. Chairs are provided for students. We encourage students to bring a book to read or other quiet computer games to play.
- **NO** horseplay will be tolerated. Please prepare your students for a long wait time. They must remain in the gym the entire morning for judging.
- Although we will provide snacks and lunch to participants, we are **not able to provide “special dietary needs”** for students so please send your child to the fair with the drinks and snacks they will need.

Lunch: A lunch of pizza and a drink will be provided for each participant. They may also bring snacks to munch on while they wait. Water is the only drink allowed on the gym floor.

Public Viewing: Public viewing is from 12:00 to 1:00 p.m. in Mitchell’s Main Gym. All students must be at their display during this time.

Awards Assembly: The Awards Assembly is from 1:15 – 2:15 p.m. in Mitchell’s Auditorium in the Main Building. Families are welcome and pictures are encouraged! **This time is subject to change due to the number of participants and the time needed to complete the judging. Your flexibility is appreciated. 😊**

Projects: All projects should be left on display in Mitchell’s Main Gym until the public viewing is completed around 1:00. Parents should remove the displays from the gym area before the Awards Assembly begins.

Application and Payment: All applications for the science and engineering fair are to be completed online at:


Application fee is $5.00 per participant. This may be paid online with a debit or credit card, or by cash or check (payable to District 11) through the mail or delivered to:

Matt Lucero, District 11 Instruction and Curriculum
1115 North El Paso Street, Colorado Springs, CO 80903

- See the online application and payment directions on page 18 of the packet for detailed instructions.
- **No late applications will be accepted. Applications and fees are due no later than April 17, 2017.**
The Scientific Process or Engineering Design Process

“Which Category Do I Select?”

While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences. Because scientists and engineers have different objectives, they follow different processes in their work. Scientists perform experiments using the scientific process; whereas, engineers follow the creativity-based engineering design process. Both processes can be broken down into a series of steps, as seen in the diagram and table below.
PROJECT REQUIREMENTS

You may choose to do a project following the Scientific Process or by following the Engineering Design Process. For either, follow the basic steps that are provided in this information packet and document your work in a science notebook. Keep a timeline of your work. This is your daily journal of events as you study and learn about your project. Plan ahead. Don’t wait until the last minute. Provide your notebook as part of your project display and use it as a resource during your interviews. The notebook is a requirement on the judging rubric.

**Scientific Process:**
1. Ask and select a testable question. This is a question yet to be answered.
2. Learn about the testable question. Do research at the library, online, or talk to a professional. Record your research and data in your science notebook.
3. Develop a hypothesis. Use what is learned from the research to predict and answer the question. Use an “if…then” statement.
4. Identify and state the variables. State each one clearly.
5. Design an experiment. Carefully plan a test of the hypothesis. It must use comparisons and measurements with the correct units.
6. Collect data. Do the experiment! Take the measurements. Draw and label the graphs and complete summary tables. Identify the units for each axis.
7. Draw a conclusion. Compare the results of the data collection with the hypothesis. Was the hypothesis supported? Can what happened be explained? What was learned? Upon reflection, did your thoughts change? What would you change the next time?
8. Construct a display. See page 13 for a diagram of the display layout.
9. Practice your presentation. Do not just memorize it; be able to talk about your project. Look the judges in the eye. Practice in the mirror or with people who know nothing about the project. Refer to your science notebook and explain the process, data, and results to the judges.

**Engineering Design Process:**
1. Define the problem. After narrowing down your interests to one problem, explain the problem.
2. Learn about the problem. Do background research about the problem, gathering possible solutions and existing solutions to similar problems.
3. Specify requirements. Your problem’s solution must do or perform certain ways. List these as performance items; how well will your solution work?
4. Create alternate solutions. There has to be at least three ways to solve your problem. You will choose one based on your capability, costs, time and knowledge.
5. Build a prototype. Choose a solution from Step 4, and build your model to show how your solution solves your problem.
6. Test and redesign as necessary. While building your prototype, or after you’ve evaluated your prototype, change and retest to get a better result. Keep in mind your requirements from Step 3; these should not change very much.
7. Construct a display. You need to communicate your results. See page 15 for a diagram of the display.
8. Practice your presentation. Do not just memorize it; be able to talk about your project. Look the judges in the eye. Practice in the mirror or with people who know nothing about the project. Refer to your science notebook and explain the process, data, and results to the judges.
Category Descriptions

Proper placement in these categories is important. Please choose carefully. For assistance in category selection and/or rules interpretations, please contact your school sponsor or Linda Sanders.
520-2034 or email linda.sanders2@d11.org

Biological Science: Check RULES to know what you can and cannot bring in!

Projects with plants, animals, fungi, bacteria, or protozoan as subjects. Topics include ecological relationships and environmental problems related to organisms. **No live organisms are allowed at the fair.** This includes projects with mold, spoiled food, etc.

*See Rules for Exhibits, Section 3, Live Organisms, Page 9*

Consumer Science:

Projects with consumer products as subjects. Topics include comparison testing, consumer psychology, environmental impact, and waste management.

*See Rules for Exhibits, Section 5, Safety, Pages 9-10*

Health and Behavioral Science:

Projects involving the health or behavior of humans or the behavior of other organisms. Topics include, but are not limited to, hygiene, mental health, learning, social interactions, environmental health problems, and the behavior of organisms.

*See Rules for Exhibits, Section 3, Live Organisms, Page 9*

Physical Science:

Projects dealing largely with non-living materials. Topics include, but are not limited to, physical and chemical changes of matter, geology, astronomy, energy, electricity, magnetism, heat, light, and sound.

*See Rules for Exhibits, Section 5, Safety, Pages 9-10*

Engineering Design:

Engineering Design includes projects that create a solution to a problem or a need. Topics include designing, building, analyzing, modeling, or improving a device. Testing and creating materials is also engineering design.

*See Rules for Exhibits, Section 5, Safety, Pages 9-10*

Electrical Access: If your project requires electrical access, a request must be made on the application form. You will need to **BRING YOUR OWN EXTENSION CORDS** and duct tape if electricity is required for your project.

Internet Access: If your project requires Internet access, a request must be made on the application form. You will need to bring your own computer, device, hardware, etc.
General Operations Plan

The following Operations Plan for the Elementary Division of the Regional Science and Engineering Fair is established for the guidance and information of concerned personnel. ALL PARTICIPANTS SHOULD HAVE A COPY OF THE GENERAL OPERATIONS PLAN.

1. School District Science and Engineering Fair Coordinators are to assist in carrying out the following:
   a. Dissemination of information and rules regarding the Science and Engineering Fair.

2. Judges and Judging Procedures:
   a. Judgments will be based on the Scientific Process Rubric or the Engineering Design Process Rubric.
   b. Judges will only identify participants by project number on the rubric.
      Entrants will be disqualified if they have names, schools, or grades anywhere on the project, including computer programs.
   c. Judging will take place in the Mitchell High School Main Gymnasium.

3. Participants:
   a. When the participants arrive at the Science and Engineering Fair to set up their display, they will be instructed to do the following:
      1. Line up in the category line that they selected in the Project Application Form.
      2. Pick up their cards with their exhibit number and exhibitor badge at the registration table.
         Verify that they are assigned to the correct category.
      3. NO NAMES, SCHOOLS, OR GRADES WILL BE PERMITTED ON THE DISPLAY OR ACCOMPANYING ITEMS.
      4. Find the matching exhibit number on the table on which they are to place their displays.
         Students are required to wear their exhibitor badge during judging.
   b. Only students, judges, and fair personnel may be present on the gym floor during judging.
      Parents, family, and friends must be off the gym floor during judging. Thank you for your support.
   c. Participants should be prepared to respond to questions by the judges.
   d. Participants should bring their notebooks or reports for judges to refer to during judging.
   d. 4th and 5th grade students should be present at 1:00 p.m. on Saturday, April 23, 2017 for the awards assembly.
   e. Participants will be responsible for the removal of their exhibits beginning at 1:00 p.m. The Science and Engineering Fair will not be responsible for exhibits left after 2:15 p.m. in the gym.
   f. As a courtesy to the awards assembly audience, all participants should wait until the assembly is over prior to leaving the auditorium.

4. Parking: Parking is available in the west-side parking area in front of Mitchell High School.
Rules for Projects

The Science and Engineering Fair Committee reserves the right to refuse, correct, or disassemble an exhibit which is considered unsafe or in violation of the rules as set forth in this booklet and interpreted by the Director and/or his/her delegates. It is the sponsor’s responsibility to see that each participant follows the rules.

Advisors and students are urged to check these carefully as they are based on the requirements of the International Science Fair; a violation may disqualify any exhibit.

Section One: Basic Rules and Regulations

1.1 The students must construct all exhibits. The sponsor may give general and limited advice, but must not assist in construction.

1.2 No abstract is required.

1.3 All equipment and component assemblies which are borrowed or purchased, or which have been constructed by a person other than the exhibitor, must be identified.

1.4 An exhibit that has won an award in a previous year’s science fair may not be entered again. However, components or equipment from one year’s project may be used in a subsequent year to develop a new principle or to extend the scope of the project. For example, the circuit for a radio receiver might be developed as a project one year. It would be permissible then to use the receiver for a research project, possibly in radio astronomy, the next year.

1.5 Each student is eligible to submit one “individual” exhibit, of which he/she is the sole creator. Group exhibits will not be judged at this fair. No demonstrations are allowed.

1.6 Materials and construction should be durable. All moving parts must be firmly attached. Push buttons and levers must be securely mounted on the exhibit.

1.7 No equipment or materials, other than those specified in this pamphlet, will be made available to exhibitors.

1.8 Emphasis should be placed on communicating the details of the student’s work; the fair is not for demonstrating. Encourage the use of graphing and summaries, not the inclusion of props.

1.9 Water connections WILL NOT be furnished. Students needing water must provide their own gravity feed equipment or a circulating pump. Any spills must be cleaned up immediately. Bring paper towels or cloth towels to clean up spills.

1.10 No windows are available in the exhibit areas. Therefore, exhibits needing sunlight should be planned so that artificial light can be used. Photographs are preferred.

1.11 Experiments involving sound shall not raise the noise level above the normal level of the room, except that a piece of equipment may be operated at a higher level only as long as necessary to demonstrate for the judges.
Rules for Projects (cont.)

Section Two: Size and Space Regulations

2.1 Maximum table space for any one entry shall be limited to the height of four feet above the top of the table. Space limit is three feet across the front and 28 inches front to back. Over-sized exhibits will be disqualified.

2.2 All posters and charts must be contained within the allotted space. No part of an exhibit may be attached to tables or walls. Exhibitors must furnish their own supports since no posters may be hung on, or leaned against, the walls.

2.3 No project parts may be placed on the floor, other than necessary electrical equipment. Please provide your own electrical cords and duct tape if needed.

Section Three: Live Organisms

3.1 Experiments involving starvation or cruelty of any kind to animals WILL NOT be permitted.

3.2 Live animals, bacteria, or fungi WILL NOT be permitted with any display. This includes mold, spoiled food, etc. Encourage the use of photography and graphing.

3.3 No live plants may be displayed. Encourage the use of pictures and/or construct graphs that summarize the data.

Section Four: Electricity

4.1 110-VOLTS, 60 cycle, single-phase electric power will be available. No other electricity will be provided. The maximum amount of current allowed for each exhibit is five amperes. Motors larger than ¼ HP will be prohibited. Please provide your own electrical cords and duct tape if needed.

Section Five: Safety

5.1 Dangerous chemicals and explosives will not be permitted.

5.2 All electrical apparatuses must be provided with a suitable extension cord, at least eight feet long, a switch, and a durable two-prong plug. Please provide your own electrical cords and duct tape if needed.

5.3 All electrical apparatuses must comply with standard electrical safety codes. If in doubt, consult a competent electrician or your local electrical inspector.

5.4 Ordinary doorbell push buttons shall not be used to control 110-volt apparatus. Use a 110-volt toggle or push button switch mounted on suitable panels or switch boxes. Open knife switches will not be allowed on apparatus with more than 12 volts.

5.5 All wiring, switches, and metal parts that carry potentials of 100 volts or higher, such as in radio and electronic apparatus must be located out of reach of observers and properly insulated. This rule is most essential to prevent serious electric shock.
Rules for Projects (cont.)

5.6 Nails, tacks, and uninsulated staples shall not be used for fastening wires. Use porcelain or other suitable types of insulators.

5.7 All wire used in exhibits must be of proper size and properly insulated for the current and voltage it must carry.

5.8 If batteries are used, they must be sufficient to maintain operation throughout the time of the fair, at least four hours. Storage batteries shall be so encased that they will not cause any damage.

5.9 No open fires will be allowed.

5.10 Projects concerning ballistics will follow the requirements of the Colorado Springs School District 11Board of Education Policy JICl. Encourage the use of photos to display information. No demonstrations will be allowed.
Scientific Process Criteria
This criterion should be documented on the exhibit and in your notebook.

Scientific Process:
• Title—this should be the same title as is included on the Project Application Form and on the student’s display board
• Testable question
• Background research
• Hypothesis (use an “if...then” statement)
• State the variables—Clearly identify the independent (manipulated) and the dependent (responding) variables
• Design of the experiment
• Procedures/Test Method to include measurements and comparisons
• Communicate results (in table, chart, and/or graph form with corresponding units)
• Conclusion (supported or not supported)

Example of a Science Fair Experiment:
An experiment should follow a scientific process of which the results are not obvious. Variables should be used in the procedure/test methods. A rule to follow: If the hypothesis is easily obtained from resources or classroom science experiences, it usually is considered a demonstration.

The following testable question is a typical example: “Does light increase the reproduction of Paramecium?”

Title: Light and the Reproduction of Paramecium

Testable Question: Does light increase the reproduction of Paramecium?

Hypothesis: If light is increased, the reproduction of Paramecium will increase.

Variables: Independent variable- amount of light    Dependent variable- number of Paramecium

Materials: Four culture dishes, microscope with camera, slides, Slo solution, light, and eyedropper.

Experimental Design: How will the experiment be done?

Procedure- Test Method:
Steps used in the experiment; list only what’s necessary, and use diagrams to cut words.
Measurement: the number of paramecia
Comparison: growth at different light levels

Results: Daily data table with data collection, photos, graph comparing the number of paramecia in the different cultures. (You cannot bring in life organisms such as these).

Conclusion: This is a detailed discussion of the student’s findings as it relates to the hypothesis; the student should include inferences based on the results; the student should state whether the hypothesis is supported or not supported and explain the reasons for the statement. The student should not state that they hypothesis was proven or correct. The student should use evidence from the experiment to support their findings. Then reflect on what they learned. What might the next steps be? What was learned on reflection of the data?
Complete graphs have a TITLE, SCALE on each axis, and a LABEL and UNIT for each scale.

Bar graphs are used for categories; i.e., type of fertilizer, type of trash, brand of product. Order does not matter.

Line graphs are used for continuous data; i.e., time, dates, amount of substance used. Order does matter.
Engineering Design Process Criteria
This criterion should be documented on the exhibit and in your notebook.

Engineering Design Process:
• Title- this should be the same title as is included on the Project Application Form and on the student’s display board
• Define the problem
• Background research
• Design statement/specify requirements/materials/variables
• Brainstorm, evaluate, and choose a solution (preliminary designs)
• Prototype description and its development (redesign, test methods)
• Test, data and results (tables/charts/graphs)
• Conclusion/Communicate results (did the solution meet the requirements?)

Example of an Engineering Design Project:
An engineering design project should solve a problem; the work should create a solution for a specific need. Your project may include using the scientific method while best solving the problem.

The following problem definition is a typical example:
“What is the best material to put in a sandbag to block water, such as during a flood?”

**Title:** Stop the Water!

**Define the Problem:** What is the best material to put in a sandbag to block water during a flashflood?

**Background Research:** What is typically used for sandbags (inside as well at outside) and its effectiveness, other possible materials, absorption, etc.

**Requirements:** Sandbag must block/deflect water for an extended period of time and be safe for the environment as well.

**Solutions:** From the research, possible materials are discussed as well as how to test. First discussion of variables could happen here.

**Prototype Description:** Discussion of the material(s) chosen, creation steps and testing protocols.

**Results:** How did the material(s) hold up? What was discovered during testing? Did other variables become apparent?

**Conclusion/Communication:** This is a detailed discussion of the student’s findings as it relates to the problem; the student should include inferences based on the results; the student should state whether the problem was solved, was it reliable and cost-effective. The student should use evidence from the prototype testing to support their findings. Then reflect on what they learned. What might the next steps be? What was learned on reflection of the data?
Complete graphs have a TITLE, SCALE on each axis, and a LABEL and UNIT for each scale.

Bar graphs are used for categories; i.e., type of fertilizer, type of trash, brand of product. Order does not matter.

Line graphs are used for continuous data; i.e., time, dates, amount of substance used. Order does matter.
### SCIENTIFIC PROCESS Rubric

**Project Title**

**Category**

### Scientific Process

<table>
<thead>
<tr>
<th>Scientific Process</th>
<th>Needs Improvement</th>
<th>Satisfactory</th>
<th>Good</th>
<th>Excellent</th>
<th>Superior</th>
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<td>Materials</td>
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<td>Results: graphs, charts &amp; journals</td>
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<td>Conclusion/Reflection</td>
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### Presentation

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<td>Display: student uses notebook to</td>
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<td>discuss findings &amp; data</td>
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<td>Oral Discussion Quality</td>
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### Time and Effort

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<td>Effort</td>
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### SCORING

| Checks per column                  |                  |              |      |           |          |
| Multiply by                         | X 1              | X 2          | X 3  | X 4       | X 5      |
| Totals                              | +                | +            | +    | +         | =        |

### SCORING GUIDELINES

- Judges mark the appropriate column with a check.
- The check marks are tallied and the total is entered under “Checks per column”.
- The check mark totals in each column are then multiplied by the specific factor (x1, x2, x3, x4, x5).
- The totals are recorded in the row marked “Totals”.
- These individual "Totals" are then added together for the “Grand Total".
### Engineering Design Process Rubric

#### Project Title

![Image](image.png)

#### Category

![Image](image.png)

#### Project #

<table>
<thead>
<tr>
<th>Engineering Design Process</th>
<th>Needs Improvement</th>
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<td>Research Present</td>
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<td>Requirements and materials specified</td>
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<td>Preliminary design evidence (more than one solution)</td>
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<td>Well-developed prototype</td>
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<td>Defined prototype testing</td>
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<td>Results: graphs, charts &amp; journals with units</td>
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<td>Conclusion/Reflection (supported with data)</td>
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<tr>
<td>Display: organized &amp; attractive to audience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display: student uses notebook to discuss findings &amp; data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Discussion Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Time and Effort

<table>
<thead>
<tr>
<th>Needs Improvement</th>
<th>Satisfactory</th>
<th>Good</th>
<th>Excellent</th>
<th>Superior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoroughness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Scoring

<table>
<thead>
<tr>
<th>Multiplied by</th>
<th>X 1</th>
<th>X 2</th>
<th>X 3</th>
<th>X 4</th>
<th>X 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Grand Total**

#### Scoring Guidelines
- Judges mark the appropriate column with a check.
- The check marks are tallied and the total is entered under “Checks per column”.
- The check mark totals in each column are then multiplied by the specific factor (x1, x2, x3, x4, x5).
- The totals are recorded in the row marked “Totals”.
- These individual “Totals” are then added together for the “Grand Total.”
Online Application and Payment Directions

2. Click on My School Bucks Guest
3. Click on School Store at the top right of the window and scroll to Categories.
4. Choose Science Fair (District-Wide) from the categories
5. If you are completing the application and payment online, click View Details for the z App Form & Payment: Pikes Pea…
6. If you are only completing the application online and sending or delivering the payment, click View Details for the z App Form Only: Pike Peak Scien…
7. Complete the application form and Add to Basket
8. Hover over the shopping cart icon at the top right of the window and choose View Cart/Check Out
9. Review the application. Complete the payment method only if making an online payment.
10. Finally, click on Place Store Order

If you have questions about the online application or payment contact

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