

EXPERIMENTAL DESIGN

1. **DESCRIPTION:** This event will determine a team's ability to design, conduct, and report the findings of an experiment actually conducted on site.

A TEAM OF UP TO: 3

EYE PROTECTION: #4

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS:** Students must bring ANSI Z87 indirect vent chemical splash goggles and a writing instrument(s). Students may also bring a timepiece, a ruler, and a non-programmable calculator. **Chemicals that require other safety clothing will not be used.**

3. **THE COMPETITION:**

- Supervisors must provide teams with identical sets of materials at a distribution center or in a container. The materials will be listed on the board or placed on a card for each team. If provided, both the card and the container will be considered part of the materials. The identity of the materials is to remain unknown until the start of this event and will be the same for each team. The students must use at least two of the provided materials to design and conduct an experiment.
 - The supervisor must assign a question/topic area that determines the nature of the experiment. The assigned question/topic area should be the same for all teams and allow students to conduct experiments involving relationships between independent and dependent variables (like height vs. distance).
 - The students will be given an outline (patterned after the scoring rubric) to follow when recording/reporting their experiment with additional paper to record data, graphs and procedures.
 - When the teams are finished, all materials must be returned to the event supervisor along with all written materials. The content of the report must be clearly stated and legible.
4. **SCORING:** Scoring of the event will be done using the scoring rubric at the bottom of this page. Zero points will be given for an inappropriate or no response. Points will be awarded dependent upon the completeness of the response. Ties will be broken by comparing the point totals in the scoring areas in the following order: Total points for 1-Variables, 2-Procedure, 3-Analysis of Results, 4-Graph, 5-Data Table. Any team not following proper safety procedures will be asked to leave the room and will be disqualified from the event. Any student not addressing the assigned question or topic area will be ranked behind those who do, because not conducting an experiment is a violation of the spirit of the event.

EXPERIMENTAL DESIGN RUBRIC/REPORTING FORM

- Statement of Problem: Experimental Question (2 Points)
- Hypothesis: Including prior knowledge that contributed to hypothesis (4 Points)
- Variables:
 - Constants: (Controlled Variables) Factors that are purposefully kept the same (4 Points)
 - Independent Variable: Factor being manipulated (3 Points)
 - Dependent Variable: Factor being measured which responds (3 Points)
- Experimental Control: (Standard of Comparison) (2 Points)
- Materials (3 Points)
- Procedure: Including Diagrams (6 Points)
- Qualitative Observations During Experiment & Summary of Results: (4 Pts)
- Data Table: Including Use of Significant Figures for Division C (6 Points)
- Graph(s): (6 Points)
- Statistics: **Div. B:** Average (mean), median, mode, range, or drawn in line of best-fit (2 Points).
Div. C all of B: + standard deviation and any other relevant statistics that teams choose (4 Points).
- Analysis of Results: Interpretation (4 Points)
 - Possible Experimental Errors including identified human errors (3 Points)
- Conclusion: Include why your results did or did not support the hypothesis: (4 Points)
- Recommendations for Further Experimentation Based on Your Data & Practical Applications: (4 Points)



Hints: a. Statement of problem should not have a yes or no answer. It should be specific to the experiment being conducted and is not the same as the assigned topic area. b. Experiments should consist of repeated trials. c. The variables should be operationally defined. d. Experiments should be simple and have only one independent and one dependent variable.

Recommended Resources: All reference and training resources including the **Experimental Design Guide** or CD are available on the Official Science Olympiad Store or Website at <http://www.soinc.org>