

Science Olympiad: Physics Lab.

- Students will compete in lab activities in the areas of thermodynamics and/or basic physical properties of materials.
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- This presentation is available on-line from
www.nscl.msu.edu/~starosta/physlab.pdf

Event Parameters:

- Students may bring and use any type of calculator.
- No resource material may be used unless provided by the event supervisor.
- Students will work in teams of up to 2.
- Approximate time for the lab is 45 minutes.

The Competition:

- The competition will consist of experimental tasks and questions related to thermodynamics and/or basic physical properties of materials.
- All answers will need to be provided in SI units (such as Watts, Joule, Newtons, Kilograms, Ampere, Ohm, Seconds).
- All answers will need to be provided with proper significant figures.

Data Presentation:

- Brief (~5 min) demonstration on how to collect and present data will be provided to the students at the beginning of the lab.
- Students will be expected to analyze and/or interpret simple graphs and/or tables.
- Presentation of the data in forms of graphs and tables will be expected from the students.
- Computers will NOT be permitted for data collection, analysis or presentation.

Thermodynamics:

may include topics such as:

- Temperature scales and conversions: C, F, R, and K;
- Heat and energy quantities: cal, kcal, BTU, J and kJ (definitions and conversions);
- Heat transfer: conduction convection and radiation;
- Calorimetry;
- First and Second Laws of Thermodynamics;
- Ideal heat engines and/or pumps: efficiency, coefficient of performance.

Basic Physical Properties of Materials

may include topics such as:

- Various densities such as mass, weight, number, etc.;
- Heat properties of materials: specific heat capacity, heat of fusion, heat of vaporization, temperature of state changes, thermal expansion coefficient;
- Dimensional measurements using rules/scales, non-electronic and/or non-dial vernier calipers, and/or micrometers.

Scoring:

- Points will be awarded for correct measurements, calculations, analysis, and answers.
- Standardized forms will be provided for students to show all measurements and calculations.
- Ties will be broken using a designated task(s) or question(s).
- The tiebreaker question(s) or task(s) will be identified on the answer form provided to the students at the beginning of the competition period.

Skills to be tested:

- Understanding of physics concepts.
- Laboratory skills.
- Data analysis and presentation.

Example for: understanding of physics concepts.

Density is a measure of physical property per measure of space. There are many physical properties, such as mass, weight, number of items and more. There are many ways to measure space: length, area and volume. When speaking of density, one normally states the type of space measurement first and then the physical property followed by the word “density” (e.g., volumetric mass density, surface number density, or linear weight density). The numeric density value is found by dividing the measure of the physical property by the measure of space used.

Example for: laboratory skills.

This example have been modified following the discussions after the Physics Lab. presentation at the workshop on Saturday, Dec. 6th. For further details see the handout on significant figures posted on the web. at www.nscl.msu.edu/~starosta/sigfig.pdf

Example for: data analysis and presentation.

Tables provide a neat and convenient way to gather the experimental data. These are hard, however, for recognizing physical trends and relationships.

Tab. 1. Hourly temperatures forecasted for Sunday, Dec. 7, 2003.

Time [h]	7	8	9	10	11	12
Temperature [F]	25	26	27	28	30	32
Time [h]	1	2	3	4	5	6
Temperature [F]	34	35	35	34	32	29

Example for: data analysis and presentation.

Graphs are great for recognizing physical trends and relationships!

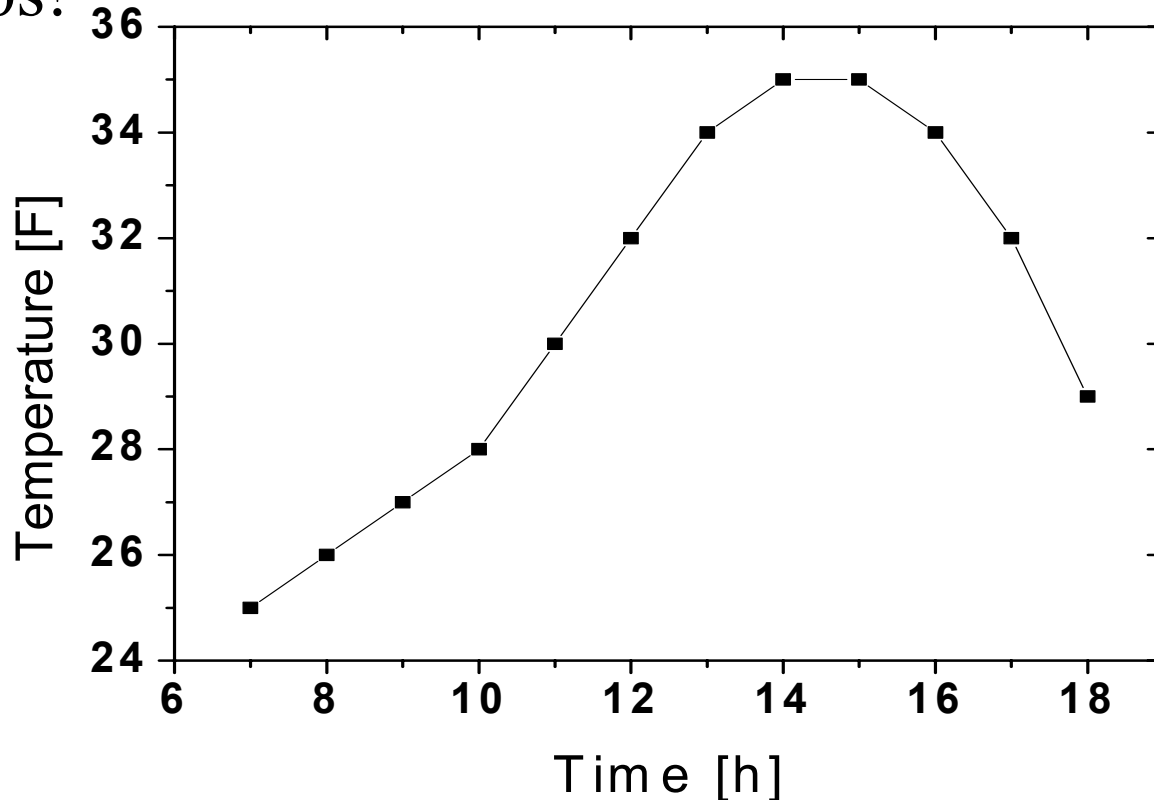


Fig. 1. Hourly temperatures forecasted for Sunday, Dec. 7, 2003.

Example for: data analysis and presentation.

Preparing a good graph is a skill! Both graphs below present the same data.

