

PHYSICS LAB

DESCRIPTION: Students will compete in lab activities in the areas of thermodynamics and/or basic physical properties of materials.

EVENT PARAMETERS: Students may bring and use any type of calculator. No resource material may be used unless provided by the event supervisor.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 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, Meters, Volts, Ampere, Ohm and Seconds) with proper significant figures.

Thermodynamics may include topics such as:

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

Basic physical properties of materials may include:

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

*Density is a measure of a physical property per measure of space. There are many physical properties, such as mass, weight, number of items and more. There are three ways we 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.

Where feasible, supervisors are encouraged to provide students with brief demonstration(s) of data collection by computer and/or calculator sensors/probes followed by distribution of previously prepared data sets. If used, data will be presented to students in a tabular and/or graphic format(s) and students will be expected to analyze and/or interpret the data.

SCORING: Points will be awarded for correct measurements, calculations, analysis, and answers. Supervisors are encouraged to provide a standardized form on which students can show all measurements and calculations. Ties will be broken using a designated task(s) or question(s). The event supervisor will identify the tiebreaker question(s) or task(s) on the answer form provided to the students at the beginning of the competition period.