CHEMISTRY LAB C

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION**: Teams will complete one or more tasks and answer a series of questions involving the science processes of chemistry focused in the areas of kinetics and **gases**.

   A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes

   EYE PROTECTION: C **CALCULATOR:** Class III

2. **EVENT PARAMETERS**:
   a. Each participant must bring a writing utensil.
   b. Each participant may bring a Class III calculator.
   c. Each participant may bring one 8.5" x 11" sheet of paper, which may be in a sheet protector sealed by tape or laminated, with information on both sides in any form and from any source.
   d. Teams should bring any or all of the items listed on the Division C Chemistry Events Lab Equipment List, posted on soinc.org. Teams not bringing these items will be at a disadvantage, as they are not provided.
   e. Participants must bring safety equipment and must wear goggles, an apron or a lab coat and have skin covered from the neck down to the wrist and toes. Gloves are optional, but if the host requires a specific type, they will notify teams. Pants should be loose fitting; if the host has more specific guidelines, they will notify teams in advance of the tournament. Shoulder length or longer hair must be tied back. Participants removing safety clothing/ goggles or unsafely handling materials, or equipment will be penalized, up to and including possible disqualification.
   f. Supervisors will provide any required reagents, additional glassware, and/or references that are needed for the tasks (e.g., Periodic Table, table of standard reduction potentials, any constants needed).

3. **THE COMPETITION**:
   a. The competition will consist of a series of tasks focused in the areas of **gases** and kinetics These tasks could include hands-on activities, questions on listed topics, interpretation of data (e.g., graphs, diagrams, tables), or observation of an established and running experiment. At least two activities, one on each topic are required.
   b. Teams may be asked to collect data using a probe ware set-up demonstrated by the Supervisor(s). Following a demonstration of the sensors/probes, participants may be given data sets to interpret.
   c. Nomenclature, formula writing, & stoichiometry (mole conversions & percentage yield) are essential tools of chemistry & may be included in the event.
   d. Participants are expected to know the symbols and charges of the following ions at the different competition levels:
      i. Regional: monatomic cations and anions of main group elements, acetate, ammonium, bicarbonate, carbonate, cyanide, hydroxide, nitrate, phosphate, sulfate.
      ii. **State and National: chromate, dichromate, permanganate, peroxide. thiocyanate, common transition metal ions (Cu^{+}/Cu^{2+}, Fe^{2+}/Fe^{3+}, Ag^{+}, Zn^{2+}, etc.), polyatomic ions involving -ite and -ate suffixes and hypo- and per- prefixes. With a periodic table, participants should be able to obtain charges for monatomic ions (e.g., Na^{+}, S^{2-}).**
   e. **Gases:** Participants will complete experimental tasks and answer questions related to the physical properties of gases, effect of greenhouse gases and ozone depletion on our climate, behavior of gases described by the following: Avogadro's Law, Boyle's Law, Charles' Law, Dalton's Law, Gay-Lussac's Law, Graham's Law, and the Ideal Gas Law. Students may be expected to complete labs/activities such as: Determine the: density of a gas, partial pressure of a gas, molar mass of a gas, relative rates of diffusion. Examine the relationship between: Pressure and volume, Pressure and temperature, Temperature and volume
   f. Participants will demonstrate an understanding of the principles of kinetics by:
      i. Measuring reaction rates and identifying how and why reaction conditions (temperature, concentration, particle size, and catalysts) affect reaction rates.
      ii. **At the State and National Levels:** teams will be asked to determine **differential and integrated** rate laws from actual experimentation or data provided, and teams should also be able to determine rate constants with correct units. Teams may also be asked to use experimentally-determined rate laws to validate proposed reaction mechanisms **and determine the activation energy of a reaction.**

4. **SCORING**:
   a. High Score wins.
   b. Points will be divided evenly between kinetics and **gases.**
   c. Time may be limited at each task but will not be used as a tiebreaker or for scoring.
   d. Preselected questions will be used to break ties.
   e. A penalty of up to 10% may be given if the area is not cleaned up as instructed.

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