CHEMISTRY LAB

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 Aqueous Solutions and **Oxidation/Reduction**.

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

2. **EVENT PARAMETERS:**
   a. Each participant must bring safety equipment (e.g., goggles, lab coat, apron), a writing implement, and may bring a stand-alone calculator of any type.
   b. 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.
   c. Teams should bring any or all of the items listed as Recommended Lab Equipment for Division C Chemistry Events, posted on soinc.org. Teams not bringing these items will be at a disadvantage, as they are not provided.
   d. Participants 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 or disqualified.
   e. 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 similar to those in first year high school courses. 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.
   b. Teams may be asked to collect data using a probeware set-up demonstrated by the Supervisor(s). Following a demonstration of the sensors/probes, participants may be given data sets to interpret.
   c. **Given the data/watching a running Redox titration, students should be able to determine the endpoint of the titration and the number of moles of target ion in the titration.**
   d. Participants should understand the following **Oxidation/Reduction** Chemistry concepts:
      i. **Writing and balancing half reactions**
      ii. **Oxidation numbers**
      iii. **Balancing redox reactions in neutral, acidic, and basic solutions**
      iv. **Calculating standard cell potentials using a table of standard reduction potentials**
      v. **State and Nationals Only - knowledge of fuel cells, knowledge & application of the Nernst equation & common storage batteries may be included**
   e. Participants should understand the following about Aqueous Solutions:
      i. Principles, properties, terms, and definitions concerning aqueous solutions
      ii. Calculate solution concentration given quantities of solute and solvent
      iii. Calculate the amount of material needed to achieve a specific concentration
      iv. Different measurements of concentration (e.g., molarity, molality, mass percentage, and parts per million) and how to calculate each
      v. State and Nationals Only: conversions between concentration units

4. **SAMPLE QUESTIONS/ACTIVITIES:**
   a. Titrations to determine percent composition, molarity, and/or molecular mass.
   b. **Given an unbalanced Redox equation, students should be able to determine the 2 half reactions and balance the equation.**
   c. **Given the data/watching a running Redox titration, students should be able to determine the endpoint of the titration and the number of moles of target ion in the titration.**
   d. Use freezing point depression to determine the molar mass of a solute.
   e. Identify and explain factors that affect solution formation.
   f. Determine whether a solution is saturated, unsaturated, or supersaturated.

5. **SCORING:**
   a. High score wins. Points will be divided evenly between Aqueous Solutions and **Oxidation/Reduction**.
   b. Time may be limited at each task but will not be used as a tiebreaker or for scoring.
   c. Ties will be broken by pre-selected questions.
   d. A penalty of up to 10% may be given if the area is not cleaned up as instructed.
   e. A penalty of up to 10% may be given if a team brings prohibited lab equipment to the event.

Recommended Resources: The Science Olympiad Store (store.soinc.org) carries a variety of resources to purchase for this event; other resources are on the Event Pages at soinc.org

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