



Chemistry Contest

Object:

To identify unknown substances in teams of two students.

General Rules:

1. Safety precautions must be observed.
2. **Each contestant will bring and wear safety goggles.** Any contestant handling the chemicals in a hazardous manner or not wearing safety goggles will be disqualified.
3. Each team may collect evidence before the contest and bring a single 8 1/2" x 11" or smaller sheet of paper with whatever information it decides will be useful in interpreting experimental results. However, if such an aid is brought to the contest, a Certificate of Eligibility must accompany it, certifying that team members collected their own evidence. Students in grades 9-12 may also bring a periodic chart. Except for the periodic chart, this information may not be commercially obtained.
4. Students must bring their own pencils or pens. Paper for answers will be provided.
5. Students may only be paired within their grade categories and must work with a partner.
6. Teams will have a maximum of one-half hour to work. In the event that a laboratory will not hold all registered contestants at one seating, a time clock will be used to indicate students' start and finish times on their laboratory answer sheets.
7. The winning teams will correctly identify the most substances in the shortest period of time.

Specific Rules for Grades K-2 and 3-5

1. **Grades K-2 teams** must identify four unidentified powders taken from the following list: granular sugar, powdered sugar, baking powder, salt, bicarbonate of soda, flour, talcum powder, plaster of Paris, onion powder, corn starch, alum and chalk.
2. **Grades 3-5 teams** must identify two powders and three mixtures of common white household powders taken from the following list: granular sugar, powdered sugar, baking powder, salt, bicarbonate of soda, flour, talcum powder, plaster of Paris, onion powder, corn starch, alum, Epson salts and chalk.
3. Teams will be provided with the following materials to test the powders: water, vinegar, iodine solution, magnifying lens, black paper, aluminum foil, a candle, and a clothespin. They may also use their senses of sight, smell, and touch.

Tasting will not be allowed and will result in immediate disqualification.

Contestants will not be allowed to bring other materials.

Suggested Reading for K-5 Students:

Mystery Powders -- school texts and/or kits (for example: Science and Technology for Children, Carolina Biological)

Specific Rules for Grades 6-8

1. Teams must correctly identify 5-10 liquids and/or solids in the shortest amount of time. The unknowns will be taken from the following list: table salt, sugar, vinegar, lemon juice, flour, zinc, plaster of Paris, tin, rubbing alcohol, corn starch, ammonia, baking soda, iron, soap powder, limestone, sand, sulfur, and salts (hydroxide, sulfate, or nitrate) of the following: strontium, lithium, calcium, copper, sodium, potassium, aluminum, and magnesium.
2. Teams will be provided with the following materials to test the unknowns: small test plates, vials, dishes or plastic cups for mixing and testing, spatula, eye dropper, stirring rod, paper towels, magnet, dropper bottles of iodine and hydrochloric acid, litmus paper, water, a nichrome loop for flame test and a flame source. Contestants may not bring any other devices or equipment for testing or observing.
3. Each team may use any test of solubility, acidity, magnetic property, color, density, or odor.

Any contestants observed tasting, feeling, or handling any of the unknowns or using equipment in a hazardous manner will be disqualified.

Grades 9-12

1. Teams must identify the solutes in five to ten numbered vials in the shortest period of time, on the basis of their reaction with each other.
2. Teams will be provided the vials containing unknown aqueous solution, a list of formulas for the solutes in these solution vials, a dropper pipette, wash water, a microchem tray, and a report form. Four of the unknown vials will contain standard reagents: 6M HCl, 6M H₂SO₄, 6M NH₄OH, and 6M NaOH. Each of the other six unknown vials will contain an ionic solute consisting of cations from the following list: Al⁺³, Ag⁺¹, Ba⁺², Ca⁺², Cu⁺¹, Fe⁺³, Sn⁺⁴, Zn⁺², Ni⁺², Cr⁺³. Suspected carcinogens are unlikely to be included in the unknown samples.
3. Check MSDS sheets with the help of your teacher. All cations will be in solution as either nitrates, chlorides, or sulfates. In the set of unknowns given to a teacher there will be at least one containing a colored solution. No complex ions will be used.
4. Each team will use the evidence of solution color or odor and the results of mixing small amounts of unknown solutions with each other. Precipitate formation, gas evolution, and heating effects would be encountered as useful evidence most frequently. No other reagents, test paper, or instruments will be provided or permitted.

Contestants observed touching or tasting the unknowns will be disqualified.