



## SCIENCE CRIME BUSTERS

Read the General Rules in the manuals and on [www.soinc.org](http://www.soinc.org) as they apply to every event.

1. **DESCRIPTION:** Given a scenario and some possible suspects, students will perform a series of tests, which along with other evidence or test results will be used to solve a crime.

**A TEAM OF UP TO:** 2

**APPROXIMATE TIME:** 50 minutes



2. **EVENT PARAMETERS:**

a. **Students** may bring only these items:

- i. **Team Should Provide:** small containers or reaction plates for mixing; something for scooping; pH paper; a magnet; a hand lens; microscope slides and cover slips; forceps or tweezers; writing instruments; a pencil (for chromatograms); and paper towels. No other items are allowed. There is no penalty for not bringing any of these items, but the team may be at a disadvantage. The event leaders will check the kits, confiscate non-allowed items, and have the right to penalize a team up to 10% if additional items are in the kit. No calculators are allowed.
- ii. **Each team member** may bring one 8.5x11 sheet of paper with hand written notes (no photocopies), on either or both sides. The note sheet may be laminated or otherwise protected in a clear covering.

- b. **Supervisor** will provide: Iodine reagent (Iodine dissolved in KI solution), 1M HCl, a method that may be used for differential density on plastics tests, a waste container, chromatography materials, and a wash bottle with distilled water (no more than 250 mL). The supervisor will provide a candle and matches for burn tests on the fiber samples. Flame tests may not be done on the polymers. The supervisor may provide other equipment (such as a microscope, calculators or probes) or reagents to perform additional tests. Supervisor will provide appropriate unknowns from lists below for event.
- c. **Safety Requirements:** Students must wear pants or skirts that cover the legs to the ankles. In addition, students must bring and wear a lab coat or apron that reaches below the knees. Students must wear closed toed shoes and OSHA-approved non-vented or indirect vented chemical splash goggles. Students who fail to meet any of the above safety requirements will not be allowed to participate. Tasting or touching the chemicals will result in disqualification. Gloves are optional. Students who unsafely remove their safety clothing/glasses will be disqualified from the event. Anyone observed handling any of the material or equipment in a hazardous manner will be disqualified.

3. **THE COMPETITION:** There will be 4 parts and then the Analysis of the Crime. The event will consist of evidence from Parts 3a, 3b, and 3c at all competitions and up to 2 parts from the Crime Scene Physical Evidence (part 3d) at Regional, and up to 3 parts from (part 3d) at State and 4 parts from part 3d at Nationals. All competitions will require the Analysis (part 3e). **Questions can only be asked on the evidence areas found at the Crime Scene, so for instance if DNA was not one of the pieces of evidence found at the crime scene, no questions about DNA can be asked.**

a. **Qualitative Analysis:** The unknown common materials will be taken from the following lists.

- i. **Solids:** Anhydrous sodium acetate, \*sand (white), \*calcium carbonate (powdered limestone), vitamin C (**Ascorbic Acid**), \*table salt (NaCl), \*sugar (crystal), \*flour, \*gypsum (calcium sulfate 2H<sub>2</sub>O), \*cornstarch, \*baking soda, \*powdered gelatin, \*powdered Alka-Seltzer®, yeast.
- ii. **Non-Powdered Metals:** aluminum, iron, zinc, magnesium, copper, and tin.
- iii. **Liquids:** lemon juice, rubbing alcohol (isopropyl), household ammonia (3%), water, vinegar, hydrogen peroxide (3%).

At regional competitions, teams will have 12-15 unknowns with one to two mixtures containing two of the solids with \*asterisks. At the state level, teams will have 15-18 unknowns and will have at least two mixtures containing 2-3 of the solids with \*asterisks. At the national level, teams will have 18-20 unknowns with at least two mixtures containing 2-3 of the solids with \*asterisks. The unknowns will be identified by performing tests such as solubility, acidity, magnetic property, color, density (by hefting the sample in its container), and odor. Every team gets the same set of unknowns and the scenario will identify which containers hold the mixtures.

- b. **Polymer Testing/Natural and Man-made Substances:** Students will also demonstrate their skill in identifying and collecting evidence from a variety of sources such as hair (differentiating between human, dog, cat), fibers (general differentiation between animal, vegetable, synthetic), 6 recyclable



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