

FORENSICS DRAFT RULES 17

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

A TEAM OF UP TO: 2

EYE PROTECTION: 2

APPROXIMATE TIME: 50 minutes

2. EVENT PARAMETERS:

a. Students may bring only these items:

- i. Test tubes (brushes & racks), or any devices in which they can perform the tests
- ii. Droppers
- iii. Funnel(s) and filter paper
- iv. pH or litmus paper
- v. spatulas, plastic spoons, and/or stirring rods
- vi. 9-volt or less conductivity tester (no testers will be allowed that run on AC current.
- vii. Thermometer
- viii. Flame test equipment (nichrome wire, cobalt blue glass etc.)
- ix. Slides & cover slips
- x. Hand lens
- xi. Writing instruments
- xii. A pencil and ruler (for chromatograms)
- xiii. Paper towels
- xiv. Metal tongs
- xv. Each team may bring five 8.5" by 11" sheets of paper that contain information on both sides in any for and from any source. The sheets may not be contained in sheet protectors or have any annotations affixed but they may be laminated.

xvi. Two dedicated calculators of any type

NOTE: Students not bringing these items will be at a disadvantage. The supervisor will not provide them

b. Supervisor will provide:

- i. Iodine reagent (I₂ dissolved in KI solution)
- ii. 2M HCl
- iii. 2M NaOH
- iv. Benedict's solution
- v. A hot water bath
- vi. A Bunsen burner or equivalent BTU heat source to perform flame test
- vii. A waste container
- viii. Chromatography materials (e.g., beakers, Petri dishes, etc.)
- ix. A wash bottle with distilled water

c. The supervisor may provide:

- i. Other equipment(e.g., a microscope, probes, etc.)
- ii. Candle & Matches of fibers are given
- iii. Differential density solutions or other method of determining density of polymers if plastics given
- iv. Reagents to perform other tests.

d. Students 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 a host requires a specific type they must notify teams. Shoulder length hair or longer, must be tied back. Students who unsafely remove their safety clothing/goggles or are observed handling any of the material or equipment in an unsafe manner will be penalized or disqualified from the event.

3. THE COMPETITION:

Level	# Part a samples	# Part b samples	Part c chromatograms	Part d	Part e
Regional	3-8	5-9	1 type + Mass Spectra	1-2 topics	Required
State	6-10	6-12	1-2 types + Mass Spectra	1-3 topics	Required
Nationals	10-14	10-18	1-3 types + Mass Spectra	3-5 topics	Required

- a. Qualitative Analysis: Substances to identify: sodium acetate, sodium chloride, sodium hydrogen carbonate, sodium carbonate, lithium chloride, potassium chloride, calcium nitrate, calcium sulfate, calcium carbonate, cornstarch, glucose, sucrose, magnesium sulfate, boric acid, and ammonium chloride (there will be no mixtures). All teams will have the same set of solids to identify.
- b. Polymers: Students may be asked to identify:
 - i. Plastics: PETE, HDPE, non-expanded PS, LDPE, PP, PVC, PMMA, PC – students may not perform any burn tests on these polymers, but the supervisor may provide burn test results on these plastics.
 - ii. Fibers: cotton, wool, silk, linen, nylon, spandex, polyester – burn test will be permitted on the fibers.
 - iii. Hair: Human, bat, cow, squirrel, and horse hair – students will need to know hair structure including medulla, cortex, cuticle, and root.
- c. Chromatography/Spectroscopy: Student will be expected to separate components using paper chromatography, TLC, and/or analyze mass spectra. Students may be expected to measure R_fs.
- d. Crime Scene Physical Evidence:
 - i. Fingerprint Analysis: Students will be expected to know the 8 specific fingerprint patterns (plain arch, loop whorl). Student should also be familiar with the common fingerprint development techniques of dusting, iodine fuming, ninhydrin, and cyanoacrylate fuming. Students should understand terminology such as bifurcation, ridges, island, enclosure, loop whorl, and arch. Student should be able to answer questions about skin layers and how fingerprints are formed. Students may be asked questions on the different methods of detecting fingerprints and the chemistry behind each of these methods.
 - ii. DNA: Students may be asked to compare DNA chromatograms/electropherograms from materials found at the scene to of the suspects. Students will be expected to know how DNA is copied. See http://nobelprize.org/educational_games/chemistry/per.index.html
 - iii. Glass Analysis: Students may be asked to use index of refraction to determine the type of a glass found broken at a crime scene. They may be asked to analyze which hole or fractures occurred before others based on a piece of glass available for examination or a picture of a piece of glass.
 - iv. Entomology: Students may be asked to identify how long an animal has been dead based on the type of insects found on the body at the scene.
 - v. Spatters: Students may be asked to analyze actual spatters or photographs or spatters to determine the angle and velocity with which the liquid approached the solid object bearing the spatter & the spatter origin direction.
 - vi. Seeds and Pollen: Students may be asked to compare pictures of seeds/pollen found at the scene with either seeds/pollen found on the suspects or seeds/pollen from different country regions.
 - vii. Tracks and Soil: Students may be asked to match tire tracks or footprints found at the scene to tires or shoes of the suspect. Students may be given the composition of soil found at the scene or on the suspects and asked to determine if this implicates any of the suspects.
 - viii. Blood: Students may be asked to identify the ABO blood type using artificial blood (event supervisor required to provide instructions on how blood typing system works) or students may be asked to identify if a blood sample, either prepared microscope slide or pictures of microscope slide, is human, avian, mammalian, or reptilian/amphibian.
 - ix. Bullet striations: Students may be asked to match the striations on bullets or casings found at the crime scene and fired from a given gun.
- e. Analysis of the Crime: Students will be asked to write an analysis of the crime scene explaining not only which pieces of evidence implicate which suspect and why the suspect(s) was (were) chosen as the culprit(s), but also why the other suspects were not chosen. They will also answer any other crime scene analysis questions posed by the event supervisor.
- f. The collected evidence and other data given could be used in a mock crime scene.

4. SCORING:

- a. Team with the highest score wins. Time will not be used for scoring.

- b. The score will be composed of the following elements (percentages given are approximate): Part 3.a. 20% Part 3.b. 20% Part3.c. 15% Part 3.d. 15% and 3.e. 30%
- c. Ties will be broken by the highest score on the analysis of the crime scene, which includes the reasons why certain suspects have been eliminated or others remain in the pool of possible criminals.
- d. A 10% penalty may be given if the area is not cleaned up as designated by the event supervisor.