SUPER SLEUTHS 2019

Coach Institute, October 2018

What's the event about this year?

- As usual, unknown powder ID.
- General knowledge of basic lab techniques and procedures.
- Chromatography ID and analysis.
- Fingerprint ID and analysis.

How does a coach (and team) prepare for this event?

What does the coach need to provide?

Spot or reaction plates, cups, or other containers teams can use for testing

Thrifty helpful hint: Bathroom cups, plastic condiment cups can work well!

Something for handling materials – scoopulas or small spatulas.

Helpful hint: Plastic spoons, coffee stirrers wooden craft (popsicle) sticks, small ice-cream spoons can work well.

We will most likely provide wooden craft (popsicle) sticks at tournaments!

What else does the coach provide?

pH paper
Ruler
One Cheat Sheet
Hand Lens
Paper Towels
Writing Instruments

WASH BOTTLE OF DISTILLED OR DEIONIZED WATER.

Be sure to use fresh distilled water and keep it capped. Check pH often, especially before the tournament!

What safety equipment is needed?

Goggles (indirect vent)
Closed toe shoes

Shoulder length (or longer) hair restrained

Aprons, gloves, and lab coats are optional

What are some safety "no-no's" that have been seen at tournaments? What else can be done?

Directly touching powders! Instead, use toothpicks or sticks to observe texture and "streaking."

Tasting chemicals! Just don't!

What will the event leader provide?

I_2 / KI Solution **Check for allergies**

Vinegar

Isopropyl Alcohol

Waste Container

Tips and Tricks for Chemical Evidence - Powders

- Have your students pre-read and research ahead of time properties of the potential unknowns before they start lab practice
- Good quality and clean practice material – well plates and DI water
- Recommended: Start with a Master ID grid (see your manual) and have students work through with each solid slowly.
- Start with physical observations, texture, color, etcetera.

Tips and Tricks for Chemical Evidence

Observe general appearance = powder or crystal.

Color and texture. Carefully observe odors – Wafting

Do not directly touch chemicals!

Safe transfer of Chemicals. Scoop, don't pour!

Tips and Tricks for Chemical Evidence

- Water solubility – Also note what happens while solid dissolves or behavior if solid is insoluble.
- If the solid is insoluble, does it "clump" or disperse? Does it sink or float?
- If the solid is soluble, does the appearance change as it dissolves?

HINTS: In LARGE amounts, a lot of solids are insoluble, so go small and go repeatable!

If the solid comes in large pellets, have students crush as dissolving in water.

Practice amounts with supplies YOU and your students plan to use at tournament!

Tips and tricks for Chemical Evidence

- Check pH of YOUR water before you begin testing solids
- Check pH of solution, even if it seems the solid is insoluble.
- If basic, check both solid and solution with vinegar
- You may also want to check solubility / reactions with rubbing alcohol.
- Your team may come up with other (creative) safe tests – that's OK!

If possible, have your team develop a flowchart OR 1 or 2 distinguishing features for each unknown.

Tips and tricks for Chemical Evidence

Have a plan to distinguish the following:

Baking soda and Baking Powder

Cornstarch and Flour

Crystal and Powdered Sugar

Citric acid and Vitamin C

How do you use your cheat sheets?

** List the Correct Names
of the Unknown on the Cheat Sheet!!**

Different strategies for different types of teams:

- Flowchart
- Powder ID cards
- Tables
- Written Descriptions

Make sure your team knows HOW to use the flowchart, written description, or data tables.

Physical Evidence

Chromatography

- Demonstration of technique, do's and don'ts.
- Practice several times. I suggest "wet erase" black pens and different types of food coloring.
- We will provide chromatography paper.

Physical Evidence - Fingerprints

Focus is on matching prints!

Hand lens would be useful to find small details on fingerprints.

Have students know types of fingerprints (arch, loop, whirl) and include sample pictures of cheat sheet.

Have students know difference between latent and patent prints.

How does the team prepare?

Some teams suggest a “divide and conquer” based approach.

- One team member focuses on the powders.
- The other team member focuses on chromatography and fingerprints.
- Cross train your team members in case one team member can’t make the tournament!

Develop a glossary of key terms related to crime solving: evidence, implicate, exonerate, etc.

What's competition like?

Your teams are given a packet containing:

- Crime story.
- Up to four unknown powders and two to three pens or types of juices.
- Chromatogram of ink or juice from crime scene.
- Pictures of fingerprints.
- We will NOT be providing labeled "knows" for your students to compare the unknowns to!

Underlying framework of crime scene

- Some evidence is transferred from suspect to crime scene.
- Some evidence is transferred from crime scene to suspect.
- Amounts of evidence might be exaggerated!

Crime story will list “knowns” that should be found at crime scene as well as the unknown(s) that your team must ID. The story will also list “knowns” found on each suspect and the unknowns on each suspect that your team must ID.

What's competition like?

Your team will have up to 60 minutes!

Suggestions:

- Read crime story carefully to match unknowns to suspects.
- Your team may want to make notes about suspects and powders and pens.
- Tear apart crime scene story and answer key to make dividing the event easier.
- Divide and conquer approach.

Preparing for the analysis section

Make sure your team READS the questions several times and addresses everything!

The backstory of the crime is important!

- There may be evidence that SHOULD be at a crime scene that doesn’t indicate any suspect.
- Likewise, a suspect may have evidence on him/her with a reasonable explanation.
- Don’t try to force evidence or make up evidence not listed in the story!

Preparing for analysis section

- We tend to go simple for analysis at elementary level.

- If questions ask for "additional evidence," be sure to include reasonable examples based on the story. Example: Matching fingerprints or deeper analysis of powders and pens are good ideas. DNA or evidence not mentioned in the rules is NOT a good idea this year.

HINT: Some evidence is more conclusive and incriminating than others!

Examples of comparing evidence

- Example: The crime features a broken aquarium. We might expect to find SAND at the crime scene. Don’t make up a reason for a suspect have left sand at the crime scene! (B Div Example)
- In the broken aquarium example, as knowns, sodium bicarbonate was also spilled at crime scene. Suspect C takes antacids containing calcium carbonate and sodium bicarbonate.
- Finding sodium bicarbonate at scene or on suspect as an unknown would not necessarily indicate the suspect!

Examples of comparing evidence

B Division Last Year:

Suspect A was indicated by tire treads at crime scene. Suspect B was indicated by fingerprint on a wrench at crime scene.

A had visited B in her workshop before the crime took place.

How would you explain the contradictory evidence?

Other Suggestions for Hands On Activities

- Research the possible unknowns ahead of time.
- Test the potential unknowns ahead of time and determine key identification characteristics.
  If there are discrepancies between theoretical and actual behavior, help team dig deeper to find out why!
- Determine the problematic unknowns for your team and develop quick techniques to identifying those unknowns.

Encourage your team, with safety in mind, to develop their OWN quick techniques!

Practice Crime Scenes

There are several good (and several bad) sources of prior tests from different regionals and states from B/C Divisions. (www.scioly.org)

If you can, it would be good to set up some of these practice tests – especially for B division, usually has similar unknowns - for your teams before your tournament, scaling down for A division and A division unknowns.

The wiki at this website is excellent for powder info and hair/fiber info!

Keep in mind: Types of unknowns can vary, some questions on other tests are NOT fair game.

THANK YOU!

Your feedback is important to me! Before you leave, please answer the following:

1. If you've done Olympiad before, what is one thing that worked well with this event before?

2. If you've done Olympiad before, what is one suggestion for improvement for this event?

3. If you're new to Science Olympiad, what else could we provide to help you with this event?

THANK YOU!

Happy sleuthing to you and your team!