Arson Resources:

1. Ashes to Ashes Arson Lab
   a. By examining evaporation patterns, students will determine which chemical was used as an accelerant in a school fire and match the accelerant to a possible suspect. They will compare the samples by first graphing the temperature change of each sample as it evaporates and then compare the graphs of each sample to the crime scene.
   b. Page 2 – 3 of Arson Resources file

2. Burn Test Lab
   a. The purpose of this lab is to observe the burn properties of various fabrics and use the results to identify each fabric sample.
   b. Page 4 – 5 of Arson Resource file
Smoke was detected at Bettie Weaver Elementary School in the early morning hours of Saturday November 12, 2011. The fire quickly became a blazing inferno. Firefighters responded quickly, but it was too late. The school structure collapsed and burned. After the fire burned itself out, investigators searched the scene to determine the point of origin of the fire. Traces of an identified chemical residue were discovered in the main office and in several classrooms. Samples were collected and sent to the lab for analysis.

Several people were identified possible suspects:

1. Barney Weber, a member of the custodial staff, was recently suspended for going through teachers’ desks and eating their candy. He was later fired after it was later discovered that he had pornography on his school computer.
2. Sarah Smith, a teacher, was unhappy with the administration for bumping her from 6th grade (which she had taught for the previous 12 years) to first grade.
3. George Jones placed the original call to 911 and lives in the neighborhood. He calls the school regularly to complain about students cutting across his back yard to get to school.
4. Abby Sciuto, a forensic chemist and an angry parent of a 3rd grader who was recently suspended for selling Ritalin to other students at the school.

Purpose: By examining evaporation patterns, you will determine which chemical was used as an accelerant in the fire and match the accelerant to a possible suspect. You will compare the samples by first graphing the temperature change of each sample as it evaporates and then compare the graphs of each sample to the crime scene.

Safety Precautions:

1. Goggles must be worn at all times throughout this experiment.
2. The compounds used in this experiment are flammable and poisonous. Avoid inhaling their vapors. Avoid touching them to your skin and clothing. Do not use any heat sources or open flames around the chemicals.

Procedure:

1. Obtain a set of 5 test tubes containing the sample from the crime scene (CS) and samples (S1, S2, S3, S4) taken from the homes of each of the suspects.
2. Wrap the bottom of the temperature probe tightly with a small piece of filter paper and secure the paper with a plastic band.
3. Plug the temperature probe into the Vernier Labquest as demonstrated by the teacher.
4. Place the temperature probe into the test tube containing ‘S1’. Leave the probe in the liquid for at least 30 seconds.
5. Change the time setting, as demonstrated by the teacher, to collect data for 240 seconds.
6. Click the green arrow with the stylus and carefully remove the temperature probe from the test tube.
7. Set the temperature probe on the counter so that the end of the probe with the filter paper is hanging off of the counter and not touching anything.
8. When the time ends, sketch the graph into your notebook and record the maximum ($T_{max}$) and minimum ($T_{min}$) temperatures reached.
9. Remove the rubber band and filter paper and discard.
10. Repeat steps 2-9 for samples S2-S4 and CS.
**Data Table:**

<table>
<thead>
<tr>
<th>Sample</th>
<th>$T_{\text{max}}$ (°C)</th>
<th>$T_{\text{min}}$ (°C)</th>
<th>Change in Temp ($T_{\text{max}} - T_{\text{min}}$)</th>
<th>Cooling Rate Graph Match ?</th>
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<tbody>
<tr>
<td>S1</td>
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<td>CS</td>
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<td>N/A</td>
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</table>

**Results and Conclusion:**

In paragraph form, summarize the purpose of the lab and what you did (the procedure). Summarize the results of the lab by describing the graphs and the comparing the shapes of the graphs and the maximum/minimum temperatures of the suspect samples and the crime scene sample. Do any of the samples appear to match the accelerant found at the crime scene? Are their any slight differences between the sample that appears to ‘match’ and the crime scene sample? Explain and think of possible reasons to account for any discrepancies.

*(Remember- write the conclusion in past passive tense and write objectively, do not use 1st person.)*
Observing the Burn Properties of Different Fabrics

**Background:** Burn properties (flame color, smoke, odor, ash) are very useful in identifying different substances at the scene of a fire. Determining the fiber content of a substance is not an exact science since more a more fabrics are a combination of fibers. If a fabric is pure, fiber content can usually be determined by performing a ‘burn test’.

**Purpose:** The purpose of this lab is to observe the burn properties of various fabrics and use the results to identify each fabric sample.

**Key Information:**

**Acetate**- Burns and melts under the flame, sizzles, yellow flame, burns and melts after flame is removed. Leaves a brittle black bead. Smells like vinegar.

**Acrylic**- Melts under the flame and keeps burning after the flame is removed. Leaves a brittle black bead. Has no smell.

**Cotton**- Burns quickly with a yellow flame and continues burning after flame is removed. Leaves soft gray ash. Smells like burning paper.

**Nylon**- Melts and burns slowly. Shrinks away from the flame. Sputtering flame, white smoke, self-extinguishing when removed from flame. Flame is even with a blue base and orange tip. Leaves a hard gray bead. Smells like celery.


**Rayon**- Burns quickly with a yellow flame and continues burning after flame is removed. Leaves soft gray ash. Smells like burning paper.

**Silk**- Sizzles in the flame and burns slowly. Curls away from flame. Burns in short jumps. Self-extinguishing when flame is removed. Leaves a crushable black ash. Smells like burning hair or feathers.

**Wool**- Sizzles in the flame and burns slowly. Curls away from the flame. Self-extinguishing when flame is removed. Orange flame, no smoke, burns in short jumps. Leaves a crushable black ash. Smells like burning hair or feathers.

**Materials:**

Fabric Samples A-H Forceps or crucible tongs Candle Matches
Scissors Petri dish (for ashes)
Procedure:

1. Cut a small piece off of each of the fabric samples.
2. Using the forceps or crucible tongs, pick up a fabric sample and slowly bring it close to the flame. Observe how the fabric samples behave close to the flame.
3. Hold the fabric sample in the flame for a second or two. Observe whether it ignites quickly or slowly, the color if the flame, smoke and odor.
4. Place the burned sample in the petri dish and observe the ash. Record your observations.
5. Repeat for each of the fabric samples.
6. Use your observations and the key information above to identify each fabric sample.

Data Table:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Behavior Near Flame</th>
<th>Behavior in Flame</th>
<th>Behavior Removed from Flame</th>
<th>Odor</th>
<th>Appearance of Ash or Residue</th>
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</thead>
<tbody>
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Conclusion:

Write a conclusion discussing the identity of each of the fabric samples and justify your answers using observations.