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Testing Protocols for AirClean Systems TeachAide™ Ductless Fume Hood

Tests Performed

1. Dilution of concentrated sulfuric acid and hydrochloric acid
2. Evolution of ammonia gas
3. Evolution of chlorine and bromine gas
4. Production of iodine vapor
5. Production of smoke and ash from heating potassium chlorate (liquefaction) and gummy bear (sugar)
6. Testing the smell of smoke of potassium chlorate (liquefaction) and gummy bear (sugar) reaction in a conventional fume hood versus the ductless fume hood
7. Testing of smoke and stink bomb (Magic Store type) (large quantities of smoke and smelly gas produced)
8. Sugar + concentrated sulfuric acid reaction (production of steam, and sulfurous gases)
9. Production of acetylene gas (toxic and odor)
10. Production of nitrogen oxide gases (toxic and odor)
11. Burning of magnesium ribbon
12. Production of sulfur dioxide gas - burning of sulfur
13. Solubility tests (using organic solvents such as cyclohexene)
14. Flame tests of metal salts dissolved in methanol

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These reactions generated toxic, odiferous, color, and colorless gases and/or smoke that could perceivably be generated in a school science laboratory in either an inorganic or organic chemistry course. Some of these reactions would not be done in courses today because of safety issues. However, my task was to test the filters and operation of the TeachAide Ductless Fume Hood. Large quantities of smoke were generated to determine if the filters would absorb the smoke without it being released into the laboratory due to leakage of the hood. Reactions were done that produced organic gases (acetylene) as some schools teach an organic chemistry course. Different types of filters were needed to absorb ammonia, organic gases, and particulate matter such as smoke - which AirClean Systems developed whenever indications of failure of the filters occurred.

Large quantities of smoke were generated in the Gummy Bear Experiment in both the conventional installed fume hood and the TeachAide Ductless Fume Hood. Invariably, some leakage of smoke occurred in the conventional fume hood into the laboratory. Neither smell nor visibility of a gas (which would have indicated a leakage of the gas into the laboratory) occurred when the same experiment was done in the TeachAide Ductless Fume Hood.

The advantages of the TeachAide Ductless Fume Hood are:

1. The system automatically shuts down if the filters are full or the hood is not operating correctly. Most often, no one knows how well a conventional hood is operating.
2. When doing demonstrations, the TeachAide hood serves as a safety shield. The teacher has full protection unlike using a safety shield that protects only students. If the teacher in Akron, OH had done the flame tests in this hood, neither the teacher nor the students would have been burned.
3. The teacher has full visibility of students in the laboratory or classroom when doing demonstrations because all four sides of the hood are made of clear polypropylene. Student behavior can be constantly monitored.
4. When a teacher does demonstrations in a conventional fume hood, the location of the fume hood in the laboratory does not permit students to observe the reaction from all locations within the laboratory. When students move around the room to be able to observe the demonstrations, often discipline problems are created.
5. All science classes have the opportunity to use the fume hood. The number of permanently installed chemical fume hoods is most often limited due to expense.
6. It has been my experience that permanently installed chemical fume hoods are not inspected nor ducts cleaned on any regular schedule by Maintenance personnel. A teacher does not know when the hood is operating correctly nor have teachers been trained to make this type of inspection. Devices to make this determination are not available to teachers nor are teachers trained to do these inspections.

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If I were given the choice when a school was being built or renovated to choose the type of chemical fume hood to be used in science laboratories, I would always choose the TeachAide Ductless Fume Hood. I may add that I worked with AirClean Systems to test the TeachAide Ductless Fume Hood without any monetary benefits. I had nothing to gain nor lose by the results obtained in my investigations regarding the performance of the TeachAide Ductless Fume Hood. My interest was in the safety to students and school personnel regarding operation of the ductless chemical fume hood.

Sincerely,

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