

Safe Science: Be Protected!

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HAVING A BLAST! CHEMICALS YOU DO NOT WANT TO INVITE TO THE PARTY

I. ALL THE NEWS THAT IS FIT TO PRINT!

Headlines in the press:

“Teacher is severely injured opening a bottle of Picric Acid!”

“Students expose to mercury in school science laboratory diagnosed with blood poisoning.”

“Several students are blinded by exploding sodium in a high school science demonstration.”

These are all too frequent headlines seen in the press these days. Unfortunately, although the word is now out on the street about hazardous chemicals and action is being taken in schools across the country, there are still pockets of “chemical craziness” where these dangers loom.

To date, there is no one central location where science teachers can secure a list of hazardous chemicals which are present an unacceptable risk as being part of a high school or middle school science inventory. Other hazardous chemicals require special precautions, storage and handling.

II. MSDS – A LIFE SAVER!

At present, the best resource available for information on hazardous chemicals is the Material Safety Data Sheets or MSDS. They are exceptional sources of information which are required by law for the user of hazardous chemicals to have on site. Required information includes the following list:

- Company Information
- Hazardous Ingredients
- Physical Data
- Fire and Explosion Hazard Data
- Health Hazard Data
- Reactivity (Instability) Data
- Spill or Leak Procedures
- Special Protection Information
- Special Precautions

The Occupational Safety and Health Administration or OSHA specifies the information to be included on an MSDS, but does not prescribe the precise format for an MSDS.

III. **WHERE DO I BEGIN?**

Before decisions are made on the management of science laboratory chemicals, there needs to be knowledge of exactly what is located in the chemical storeroom. This is where the road begins in taking care of the "chemical problem" in science laboratories. An inventory needs to be taken to determine the types and quantities of laboratory chemicals. Use extreme caution in handling chemical containers found in the storeroom, cabinets, and other places. Old chemicals can be unstable and explosive over time.

Once an inventory is taken, decisions need to be made on which to keep and which to discard. Criteria such as toxicity, carcinogenicity, curriculum requirements, ventilation requirements, cost of disposal, etc. need to be taken into consideration.

Guidelines need to be developed and put in place for purchase, amount, storage, use and disposal of chemicals.

IV. **FROM CRADLE TO GRAVE!**

One thing to remember is that school districts own chemicals from cradle (point of purchase) to grave (final resting place). Removal and disposal of hazardous laboratory chemicals can be very expensive. Nationwide, disposal costs for school chemistry laboratory cleanouts have been estimated to cost between \$500 to \$80,000. Depending on the chemical, disposal can be as simple as pouring it down the drain to having a professional hazardous waste contractor remove the item. Consult the MSDS on disposal and be responsible in decision making.

V. **EXCLUSIVE BUT NOT ALL INCLUSIVE!**

The following is a partial list of hazardous chemicals by category. They have been identified by different federal and state safety related departments or divisions. They tend to be common chemicals found still found in some high schools and even middle schools. All should be removed and disposed of in a legal and environmentally safe way.

A. Explosives (Chemicals which are unstable and capable of rapid and violent energy release.):

1. Ammonium dichromate $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
2. Ammonium Nitrate NH_4NO_3
3. Benzoyl Peroxide $(\text{C}_6\text{H}_5\text{CO})_2\text{O}_2$
4. Carbon Disulfide (CS_2)
5. Diisopropyl Ether $((\text{CH}_3)_2\text{CH})_2\text{O}$
6. Ethyl Ether $\text{C}_4\text{H}_{10}\text{O}$
7. Formic Acid HCOOH
8. Picric Acid $2,4,6\text{-(NO}_2)_3\text{C}_6\text{H}_2\text{OH}$

9. Perchloric Acid HClO_4

10. Potassium Metal K

11. Sodium Metal Na

12. Lithium Metal Li

B. Highly Toxic Materials (Chemicals which can cause severe illness or death when inhaled, absorbed or ingested in small amounts):

1. Barium Hydroxide

2. Carbon Tetrachloride

3. Chlorine

4. Mercury

5. Mercuric Chloride

6. Mercuric Nitrate

7. Mercuric Oxide

8. Phosphorous

9. Potassium Cyanide

10. Silver Cyanide

11. Sodium Cyanide

C. Carcinogens (Cancer causing chemicals in mammals):

1. Arsenic Powder

2. Asbestos

3. Benzene

4. Chromium Powder

5. Chromium (VI) Oxide

6. Lead Arsenate

(Probable Carcinogens)

1. Nickel Powder

2. Acetamide

3. Formaldehyde

4. Lead (II) Acetate

5. Nichol (II) Acetate

D. Unstable and/or Hazardous Chemicals Recommended for Removal

1. Beryllium Chloride

2. Carbon Disulfide

3. Chromic Acid

4. Dimethyl Ether

5. Formaldehyde

6. Hydrocyanic Acid

7. Hydrofluoric Acid

8. Metallic Peroxides of Barium and Calcium

9. Perchloric Acid
10. Phenol
11. Picric Acid
12. Potassium Cyanide
13. Sodium Cyanide
14. White Phosphorous

VI. WAY TO GO!

With all other remaining hazardous chemicals, prudent practice is the way to go. Appropriate storage, labeling, inventory, ventilation, personal protective equipment, disposal, spills, engineering controls, fume hoods, safety training programs and more, all need to be addressed prior to working with hazardous chemicals.

Science can still be fun and safe at the same time. Plan ahead and use your head!

LIVE LONG AND PROSPER SAFELY!

RESOURCES:

National Clearinghouse for Educational Facilities:

http://www.edfacilities.org/rl/hazardous_materials.cfm

Occupational Safety and Health Administration: <http://www.osha.gov>