

CHEMICAL HYGIENE PLAN (CHP)

A SAFETY TRAINING MANUAL

For
Colby College
Chemistry Department Students and Employees
Updated:
January 11, 2010

COLBY EMERGENCIES:
X4911

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The Chemical Hygiene Officer, Brenda Fekete, last edited this manual in 2010.
Department of Chemistry
Colby College
X5768
Keyes 310

INTRODUCTION

This training manual is for the faculty, staff, research students and student employees of the Chemistry Department. This manual is in compliance with 29 CFR.1960.34/29 CFR.1450 and will be updated annually by the chemical hygiene officer. The chemical hygiene officer and the Director of Colby Safety, to insure that the information in this manual is being followed, will conduct an annual compliance inspection of the chemistry department.

This manual is specific for Colby College and the Department of Chemistry. Included is the specific information you should know to work safely in the Science Division. You should be able to identify WHO is responsible, WHAT is hazardous, WHERE information and safety equipment is located and HOW you should operate on a routine and emergency basis.

After reading this manual, you are required to complete the Colby College Laboratory Safety Training Acknowledgement Form. The signing of this form is proof of safety training in the chemistry department and that you agree to the safety issues outlined on the form. A copy of this form is kept in K310. A copy of this form is included below.

If you ever have questions concerning any safety issues in the Chemistry Department, please call Brenda Fekete (x5768), Keyes Rm. 310, the Chemical Hygiene Officer.

COLBY COLLEGE LABORATORY SAFETY TRAINING ACKNOWLEDGEMENT

By signing this Safety Training Acknowledgement, I, _____
(Printed Name)

confirm that:

- I have read and understand the Chemistry Department's Laboratory Safety Manual.
- I will follow all safety rules found in the Chemistry Department's Laboratory Safety Manual, including, but not limited to, proper protective equipment, chemical handling, emergency response, proper attire, hazardous waste handling, no food or drink in labs, and working after hours.
- I will report any safety hazard to my instructor/professor/Brenda Fekete immediately.
- I will report any chemical spill to my instructor/professor/Brenda Fekete immediately.
- I understand that failure to follow the practices contained in the Chemistry Department's Laboratory Safety Manual could result in a downward grade adjustment and/or disciplinary action up to and including dismissal from Colby.
- I understand that failure to follow the practices contained in the Chemistry Department's Laboratory Safety Manual could result in serious injury, or even death to a classmate or myself.

Signature: _____

Date: _____

SECTION 1

WHO

DOOR SIGNS

Outside of each laboratory door there is a list of the contact person(s) for that room and symbols showing the hazards located in that room. Behind each cover sheet is a list of specific hazards (SOP) that are found in that room (refer to page 6). Such hazards may include: high electrical/magnetic fields, vacuums, UV radiation, gas cylinders, hazardous chemicals, etc. **Please be familiar with the hazards in your lab.** Please be familiar with the following hazard symbols that may be present on a door sign:



In the case of an emergency, please contact the person responsible for the lab (refer to the door sign). If none of the faculty or staff can be reached, please contact the Safety Director (x5504) or Colby Security (x4911).

Inside each of the laboratories is a yellow sign that displays the EMERGENCY phone extension and several tips to insure a safe working environment. Please be familiar with and follow these safety tips at all times.

LAB SAFETY INFORMATION

IN CASE OF EMERGENCY, DIAL

4911

Campus phones are available in each hallway and outside the chemical storage rooms.

MSDS (MATERIAL SAFETY DATA SHEETS) AND THE CHEMICAL HYGIENE PLAN ARE FOUND IN THE 3RD FLOOR HALLWAY.

Please be aware of:

- **Never work alone. Use a buddy system.**
- **No food, gum or drink in lab at any time.**
- **Wear shoes (no sandals, open toed shoes or bare feet).**
- **Wear goggles at all times. Contact lenses are not recommended.**
- **Use other protective clothing and equipment when necessary (gloves, aprons, etc.).**
- **Do not wear headphones in the lab.**
- **Know the locations of the nearest eyewash, shower, fire blanket and extinguisher, first aid kit, spill cart and gas shutoffs.**
- **Keep work areas neat. Store chemicals in their proper place. Sort by hazard. Do not use a bench top, the floor or a hood for storage of chemicals.**
- **Understand the hazards specific to your laboratory. Be familiar with the chemicals that you use.**
- **Report any injury or spill to your immediate supervisor.**

Please contact Brenda Fekete (x5768, e-mail: blfekete) if you have any questions or need to file an accident or spill report.

Laboratory Specific Standard Operating Procedure Information

BUILDING: Keyes, Department of Chemistry

ROOM: _____

DATE: _____

The following information is provided to aid emergency responders:

CHEMICAL STORAGE:

HAZARD:

LOCATION:

_____ **ACIDS-CORROSIVES:**
(Hazard code – white)

_____ **BASES-CORROSIVES:**
(Hazard code – white)

_____ **(SUSPECT) CARCINOGENS**
TERATOGENS/MUTAGENS
POISONS:
(Hazard code – blue)

_____ **FLAMMABLE SOLIDS/LIQUIDS:**
(Hazard code – red)

_____ **OXIDIZERS:**
(Hazard code – yellow)

_____ **HIGHLY REACTIVE/INCOMPATIBLE/
ACUTELY HAZARDOUS:**
(Hazard code – orange)

SPECIAL HAZARDS:

_____ LASERS	_____ MICROWAVES
_____ RADIOACTIVITY	_____ X-RAY
_____ STRONG MAGNETIC FIELD	_____ BIOHAZARD
_____ HIGH VOLTAGE ELECTRICITY	_____ OTHER: _____
_____ COMPRESSED GAS: ___ He ___ N ₂ ___ O ₂ ___ Ar ___ CO ₂ ___ H ₂ _____ liquid N ₂ ___ other:	

SAFETY:

_____ **CHEMICAL SPILL KIT LOCATION:**

_____ **MERCURY SPILL KIT LOCATION:**

_____ **FIRE EXTINGUISHER(S) LOCATION:**

_____ **NEAREST SATELLITE WASTE ACCUMULATION AREA:**

_____ **OTHERS:**

CONTACT PERSON

If the designated person(s) cannot be reached, call the EMERGENCY NUMBER x4911 or Bruce McDougal, Director of Safety, x5504 or 453-4815.

406 A/B Darkroom

Prof. Julie Millard x5757, 437-2896

Kevin Rice x5763, 512-2550

406 Physical Organic Computational Lab

Prof. Dasan Thamattoor x 5765, 861-7442, 649-1177

409 NonMajors/Inorganic Lab and 409A Prep Room

Prof. Rebecca Conry x5764, 872-0928, 313-3754

Prof. Julie Millard x5757, 437-2896

Brenda Fekete x5768, 495-2117, 215-6644

Lisa Miller x5752, 872-2930

405 General Chemistry Lab and 405A Prep Room

Prof. Rebecca Conry x5764, 872-0928, 313-3754

Prof. Julie Millard x5757, 437-2896

Lisa Miller x5752, 872-2930

Brenda Fekete x5768, 495-2117, 215-6644

309 Biochemistry Research Lab

Kevin Rice x5763, 512-2550

Tara Kraus x5766, 505-720-5351

307 X-Ray Crystallography Room

Prof. Rebecca Conry x5764, 872-0928, 313-3754

Chuck Jones x5875, 649-4338, 465-7075

305 Organic Chemistry Lab

Prof. Dasan Thamattoor x5765

Prof. Jeff Katz x5754, 861-8258

Edmund Klinkerch x5762, 514-0462

305A Biochemistry/Organic Chemistry Prep Lab

Prof. Dasan Thamattoor x 5765, 861-7442, 649-1177

Prof. Jeff Katz x5754, 861-8258

Edmund Klinkerch x5762, 514-0462

Brenda Fekete x5768, 495-2117, 215-6644

303 Biochemistry Lab

Prof. Julie Millard x5757, 437-2896

Kevin Rice x5763, 512-2550

Brenda Fekete x5768, 495-2117, 215-6644

305C Cold Room

Prof. Julie Millard x5757, 437-2896

Brenda Fekete x5768, 495-2117, 215-6644

Chuck Jones x5875, 649-4338, 465-7075

303A Radioisotope Lab

Prof. Julie Millard x5757, 437-2896

Kevin Rice x5763, 512-2550

Brenda Fekete x5768, 495-2117, 215-6644

303C Biochemistry Research Lab and “Hazardous Materials Hood”

Prof. Julie Millard x5757, 437-2896
Kevin Rice x5763, 512-2550
Brenda Fekete x5768, 495-2117, 215-6644

303B Student Office Room

Prof. Julie Millard x5757, 437-2896

202 Inorganic Research Lab

Prof. Rebecca Conry x5764, 872-0928, 313-3754

204 Physical Organic Research Lab

Prof. Dasan Thamattoor x 5765, 861-7442, 649-1177

209 Photochemistry Research Lab

Prof. Whitney King x5755, 873-6154, 649-9674

210 Organic Research Lab

Prof. Jeff Katz x5754, 861-8258

214 Physical Chemistry Research Lab

Prof. Tom Shattuck x5759, 872-2956

207 Clean Room

Prof. Tom Shattuck x5759, 872-2956
Prof. Whitney King x5755, 873-6154, 649-9674

205 Physical Chemistry and Quantitative Analysis Lab

Prof. Tom Shattuck x5759, 872-2956
Prof. Whitney King x5755, 873-6154, 649-9674

203 Instrumentation Lab

Prof. Whitney King x5755, 873-6154, 649-9674
Prof. Tom Shattuck x5759, 872-2956
Chuck Jones x5875, 649-4338, 465-7075

206 Physical Organic Research Lab

Prof. Dasan Thamattoor x 5765, 861-7442, 649-1177

208 NMR Room

Chuck Jones x5875, 649-4338, 465-7075
Prof. Tom Shattuck x5759, 872-2956

105A Lecture Hall Prep Room

Prof. Rebecca Conry x5764, 872-0928, 313-3754
Prof. Julie Millard x5757, 437-2896
Prof. Whitney King x5755, 873-6154, 649-9674
Prof. Tom Shattuck x5759, 872-2956
Brenda Fekete x5768, 495-2117, 215-6644

Chemical Storage Room 4

Brenda Fekete x5768, 495-2117, 215-6644

Outside Flammable Storage Room

Brenda Fekete x5768, 495-2117, 215-6644

Receiving Room, Keyes Rm. 6

Amy Poulin X5750
Brenda Fekete x5768, 495-2117, 215-6644

SECTION 2

WHAT

HAZARDOUS CHEMICAL LOCATION

Chemicals are stored in most labs and in the basement and outside storage rooms. The hazard classes are posted on each cabinet or storage room door. The Chemistry Department at Colby uses the NFPA (NATIONAL FIRE PROTECTION ASSOCIATION) color coding system to classify its hazardous materials. This system is also used by the Waterville Fire Department, as well as many chemical companies. The hazard classes are listed below.

WHITE (Corrosive)	ACID
WHITE (Corrosive)	BASE
RED	FLAMMABLE LIQUID/SOLID
ORANGE	REACTIVE
YELLOW	OXIDIZER
BLUE	TOXIC/ CARCINOGEN / MUTAGEN
GRAY	GENERAL STORAGE

The general chemical storage areas are listed below. Please make sure that all of these areas **ARE LOCKED** before and after entry. These rooms are under Key Card access and only faculty, staff and students that have completed departmental safety training are allowed access. A list of trained personnel is updated through the Security Office every semester.

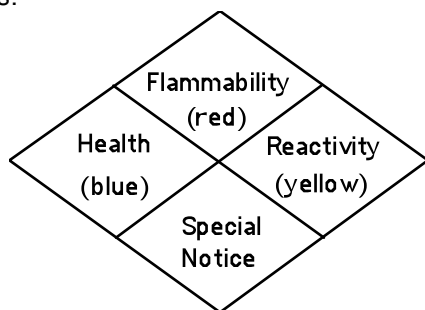
KEYES ROOM 4	WHITE, ORANGE, YELLOW, BLUE, GRAY
OUTSIDE FLAMMABLE ROOM	RED (LIQUID/SOLID)

Chemicals should always be sorted and stored according to hazard class. Suitable, labeled cabinets are found in each lab. **Never store chemicals on the bench top, on the floor or under a hood. ALL FLAMMABLE MATERIALS MUST BE KEPT IN A PROPERLY LABELED CLOSED FLAMMABLE MATERIALS CABINET. EXCEPTIONS ARE ONE 20L (OR 4 X 5L) CLOSED METAL DOT CAN OF ACETONE OR IN A HOOD DESIGNATED AND PROPERLY LABELED FOR FLAMMABLE STORAGE ONLY (RESULT OF LAB SPACE RESTRICTIONS).** The hazard class for each chemical can be found on the label on the bottle or on the MSDS sheet.

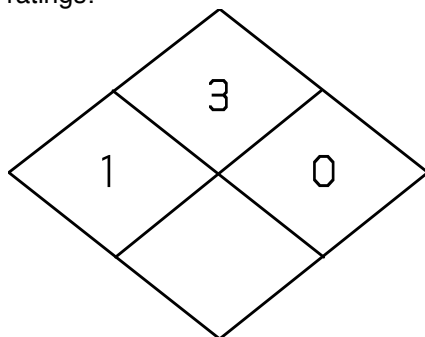
NFPA LABELS

The Hazard Communication Standard gives workers the right to know the hazards to which they are exposed. Each MSDS sheet includes the name of the chemical (or components of a mixture), common names, physical and chemical characteristics, fire and explosion hazard data, reactivity data, health hazards, waste disposal, incompatibility information, toxicological data and precautions for safe handling of that substance. A comprehensive collection of MSDS for all chemicals is located in the third floor corridor of Keyes. On-line sites are also available and easy to use.

Stock bottles of chemicals may also contain safety information. This includes chemical name, manufacturer, health, flammability and reactivity hazards. The label also includes specific hazards unique to that chemical (oxidizer, water reactive, etc.). The diamond label on some bottles indicates these hazards:



The numerals in the boxes of the diamond indicate the severity of the hazard with “0” indicating little or no hazard and “4” indicating severe hazard. For example, acetone (the major component in nail polish remover) has the ratings:



That is, the health rating of 1 means acetone can cause some irritation, but only minor residual injury. The fire rating of 3 means acetone is flammable (flash point < 140°F). The reactivity rating of 0 indicates that acetone is stable under a variety of conditions, including exposure to water.

Every bottle that contains a dilution or chemical solution (use the chemical of greatest concentration or the most dangerous) must have a NFPA label on it. This includes the transfer of any liquid or solid from a larger to a smaller container. NFPA information for some commonly used chemical compounds can be referenced in appendix B. The MSDS sheet is a valuable source of NFPA information. Every teaching lab contains large posters that contain the NFPA codes for many chemical commonly used in a teaching or research laboratory. Please use these materials to locate the NFPA code needed. If the code cannot be found using any of these sources, please label the container with a NFPA label and write “**not listed**” on the label. This will avoid any monetary penalties issued by the EPA/OSHA. **Use NFPA safety “squirt” bottles correctly.** Never relabel and use them for different chemicals. Please contact the Chemical Hygiene Officer for the correct bottle. We stock deionized water, soap, acetone, methanol, ethanol, isopropanol, chloroform, methylene chloride and toluene bottles. The relabeling of such bottles also carries a hefty fine.

SECTION 3

WHERE

LOCATIONS

Chemical Hygiene Plan	Safety Office, Roberts (1 st floor) 3 rd Floor Corridor of Keyes Building
MSDS Sheets	3 rd Floor Corridor of Keyes Building
Chemical Hygiene Officer	K310, Brenda L. Fekete (x5768)
Accident and Spill Report Forms	Secretary's Office (File Cabinet)
Spill Carts (green and white labels)*	4 th Floor Janitor's Closet K305: in cabinet on wall to right on entry Rm. 203, under 1 st hood to right on entry 105A: in cabinet in hallway outside 105A Inside and Outside of Rm 4: in cabinet OS Flammable Room

Note: Teaching labs have 500g (ea) sodium carbonate/citric acid under a hood for quick access in the case of a small quantity acid/base spill.

Acid Spill Cart (large spills)*	Outside of Rm. 4 under spill cabinet in Keyes Basement on Hand Cart
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***Special Note:** If you use the spill cart, please contact the Chemical Hygiene Officer directly. That way depleted materials can be replaced and made available for another spill. Thank you.

Ethidium Bromide Spill Kit	Under Hazard hood in 303C Under hood in 303 SAA cabinet and Under hood in 309 SAA cabinet
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Mercury Spill Kit (large volume)**	Spill carts/cabinets in 4 th Floor Janitor's Closet, K305, Rm. 202, Rm. 203, Rm. 105A, Keyes Rm.4 - Hazardous Waste Room (basement)
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*****Note:** Each of the major teaching labs, prep labs and spill control carts/cabinets has a small, portable, mercury spill kit and a waste container (in SAA) designated for mercury waste and broken thermometers. DO NOT PUT MERCURY WASTE IN THE TOXIC/HEAVY METALS WASTE CONTAINER.

Respirators	Only faculty/staff members have a respirator that is tested monthly during the academic year for proper fit and function.
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Campus Phone	floor hallways Basement of Keyes next to Rm 4
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Satellite Accumulation Areas (Hazardous Waste Area)	Rm. 409, 305, 309, 303, 202, 204, 210, 205, 203, darkroom (406A), 203 (ICP)
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Designated Areas: The fume hood in 303C is the designated area for work with ethidium bromide and acrylamide powders. The personal protection required is gloves, mask and goggles. All other standard operating procedures apply. Please note that there is NO gum chewing allowed. A spill kit for ethidium bromide is located under the hood. Use the SAA in the Rm. 303 and 309 to collect ethidium bromide waste (in proper container...solid is sorted from liquid).

SECTION 4

HOW

STANDARD OPERATING PROCEDURES

A. GENERAL RULES

1. **Never work alone in the chemical laboratory.** Day or night, someone should also be in close proximity and know that you are working in the lab. When working with any chemical substance, this should always include a partner within earshot (faculty/staff member or a student with a background in chemistry is preferred). Within earshot is considered to be in the same building, on the same floor and where it would be feasible that the partner, in the case of an emergency, could hear the student call for help. If a student wishes to study and/or work on a computer in a laboratory where no chemical substance is involved, the student may do so at any hour of the day without a partner, but the student must abide by the basic safety rules outlined in the CHP (goggles if the lab houses a working hood, closed toed shoes, no I-pod in ears or excessively loud music, and no food or drink). This does not pertain to students that are studying while working in the lab; such requires a partner.
2. **NOTE:** Security **MUST** be called to assure one's safety in the building **during rare circumstances** when a partner is not available between 9:00 pm and 6:00 am. (ex. Short trips, **MAXIMUM OF 20 MINUTES**, to the lab in the middle of the night to quickly check on a reaction.) All students working in a laboratory after hours without a partner must be authorized and given permission by a faculty member. Security **must** then be notified when you leave the building. The dispatcher will note the time of the call, room number/building and require either the laboratory lab phone number or the student cell phone number. If more than 20 minutes is required, the student must call the dispatcher at the 20 minute mark and let the dispatcher know how much time will be required. If the dispatcher has not heard from the student at the 20 minute mark, they will call the given lab or cell phone number to check the status of the situation. If the student has left the lab without calling security, disciplinary action and after hours work privileges will be lost. Any student found working in a laboratory after hours who has not called security will be immediately asked to leave the building and the departmental chair will be notified.
3. Appropriate eye protection **must be worn at all times**. This includes while working at a computer that is part of a working laboratory. **If there is a hood in your lab, you MUST have goggles on at all times.** The wearing of contact lenses is not recommended.
4. Eating, drinking, chewing gum, applying make up and smoking are prohibited in any lab or storage area. Never store food in laboratory refrigerators. Do not place food wrappers and/or empty drinking cups in the trash containers inside the laboratory. Use hallway trash bins.
5. Unauthorized experiments are not allowed.
6. A business-like attitude should be maintained at all times. Loud music, I-pod headphones, etc. can prevent you from being aware of emergencies around you. wear
7. Know the location of all the safety equipment and how to operate it.
8. Refer to labels for any information about the chemicals that you are handling.
9. Use the MSDS to become familiar with the hazards associated with any chemicals that you will be handling. Also know how to dispose of that chemical properly.
10. Use the appropriate protective equipment and safeguards for any chemical that you are using.
11. Know how and where to properly store a chemical when not in use. Separate chemicals according to hazard class.
12. Use appropriate carts, carriers and personal protection when transporting chemicals.

13. Use appropriate carts for transporting gas cylinders. Use the chain to support the gas cylinder on the cart. Be sure that gas cylinders are stored in an upright position and secured.
14. Follow all precautions given by the instructor or supervisor.
15. All secondary bottles must be labeled (NFPA labels must be included).
16. Contact the Chemical Hygiene Officer in the case of any injury or any chemical spill (accident and spill reports are required).

B. PERSONAL HYGIENE

1. Wash promptly whenever a chemical has come in contact with the skin and notify the appropriate supervisor.
2. Wash thoroughly before leaving a laboratory.
3. Use chemicals with caution. (Refer to the MSDS Sheet for chemical information).
4. Do not use mouth suction to pipette anything including water. Always use a safety bulb.
5. Avoid inhalation of chemicals. Do not "sniff" to test a chemical. Use the fume hoods when necessary.
6. Keep powders covered; and work with volatile liquids, flammable solids, and odiferous chemicals under a fume hood. Dispose of chemicals properly. (Refer to the MSDS Sheet for disposal information). **Do not put powdered chemical waste in trashcans.**

C. PROTECTIVE CLOTHING, EQUIPMENT AND MEASURES

1. Personal protection equipment **for use with all chemicals** consists of goggles. For any chemical in hazard group **BLUE** (as designated on the label) or specifically labeled HIGHLY TOXIC, appropriate gloves and the use of a fume hood are also necessary.
2. Eye goggles must meet the requirements of the American National Standards Institute (ANSI) Z87.1 and must be worn at all times. **EYE WEAR MUST BE WORN AT ALL TIMES IN ANY LABORATORY THAT HAS A FUME HOOD. THIS ALSO INCLUDES TIMES WHEN NOT ACTIVELY ENGAGED IN EXPERIMENTATION (WHILE READING, WORKING ON COMPUTERS, ETC.)** Contact lenses are not recommended.
3. Use UV protective and laser goggles when necessary.
4. Face shields are available if deemed necessary.
5. Wear gloves resistant to any corrosive chemical and any material that is a contact hazard. Be aware of allergies to latex gloves. We also stock vinyl and nitrile gloves. A quick dip of the glove in any solvent will show its ability to protect your skin. If vinyl melts, use nitrile and visa versa. Butyl gloves can be ordered when using harsher solvents.
6. The chemistry department has a large stock of gloves and we encourage students to use them. **TO AVOID CONTAMINATION AND TO ENSURE THE SAFETY OF OTHERS, PLEASE MAKE SURE THAT YOU REMOVE YOUR GLOVES BEFORE HANDLING DOOR KNOBS, INSTRUMENTATION, COMPUTERS, ETC AND PUT ON A FRESH PAIR WHEN YOU RETURN TO YOUR WORK. DO NOT DISPOSE OF THE GLOVES IN THE HALLWAY TRASH CANS. USE LABORATORY RECEPTACLES ONLY.**
7. Use fume hoods when working with any volatile, flammable, odiferous or highly toxic material. Be sure that the hood is functioning properly (hood monitors show green light/no audible alarm). Hood sashes must be at the proper height (labeled on the outside of the hood) to maintain the required face velocity (100 ft/min).
8. Lab coats or aprons are suggested. Do not wear loose fitting clothing and hanging jewelry to lab.
9. Wear proper footwear. No bare feet, open toed shoes, sandals or high-heeled shoes are allowed.
10. Tie long hair back when working in lab.
11. Carefully inspect all equipment before using.
12. Add boiling chips to solutions before boiling.

13. Know the location of your nearest fire extinguisher and emergency spill kit. Never add water to a chemical or an electrical fire.

D. HOUSEKEEPING

1. Use of extension cords is not recommended.
2. Access to emergency equipment, showers, eyewashes, and exits should never be blocked.
3. All chemical containers **must** be labeled. NFPA code labels are available from the Chemical Hygiene Officer.
4. Keep all work areas, hoods and bench tops clear of clutter. Put things back into proper storage when not in use.
5. All chemicals must be disposed of or stored properly. Use the label or MSDS Sheet to identify the hazard group. Do not pour flammables, organics or toxic chemicals down the sink. Do not dispose of any chemical, no matter how small of an amount, in the garbage can.
 - a. Know how to properly dispose of your chemical waste. Use the MSDS Sheet to find disposal information. **Note any incompatibilities** that can affect waste disposal.
 - b. Use The Satellite Accumulation Area closest to your lab. Know how to use the SAA properly. Each SAA is monitored weekly, and full containers will be taken to the Hazardous Waste Room (by the Chemical Hygiene Officer). If a container is full, leaking or needs to be disposed of, please contact the Chemical Hygiene Officer immediately for disposal and a new container.
6. Promptly clean up all spills. Know the location of the spill cart closest to your work. Complete a Spill report form and contact the Chemical Hygiene Officer.
7. Place broken glassware in the designated containers, never in the general trash.
8. Place broken mercury thermometers in the designated containers. Use the mercury spill kit when necessary. Remember to treat the gloves, etc. contaminated by mercury as hazardous waste. Only non-mercury thermometers (have green, red or blue liquid in the thermometer) can be disposed of in glass waste boxes.
9. Never store food in any refrigerator designated for chemical storage.
10. Dispose of all chemical solid waste (filter paper, silica gel, alumina, TLC plate) in a designated solid waste container.
11. Use the chemical inventory sheets found in the chemical storage areas and in the prep areas (or leave a note!) when moving a chemical to another location. Please return the chemical to its proper place when it is no longer needed.

DO NOT REMOVE ANY ITEMS FROM THE TEACHING LABORATORIES. IT OFTEN INTERFERES WITH THE TEACHING OF LABORATORY COURSES WHEN CHEMICALS AND EQUIPMENT ARE TAKEN FROM ROOMS 409, 405, 305 AND 205 PREP ROOMS.

E. PROCEDURE SPECIFIC SAFETY PROCEDURES

1. Glassware
 - a. Beware of hot glassware. Use beaker tongs, test tube clamps, hot pads or towels when glassware is too hot to handle. If a burn occurs, soak the burned area in an ice bath for at least 15 minutes and notify the instructor.
 - b. Use water or glycerin as a lubricant for glass when inserting into a stopper or rubber tubing. Use a towel to protect hands. A dropper bottle containing glycerin should be found in all the teaching labs. If not, please tell the Chemical Hygiene Officer.

2. Flammables: **RED**
 - a. A flammable liquid is defined as having a flashpoint below 120°F. A flammable liquid or solid is identified on the label as belonging to hazard group **RED**.
 - b. All flammable liquids and solids should be stored in flammable cabinets, in the outside storage area or in explosion proof refrigerators designated for chemical storage only. **NEVER store glass or plastic bottles of flammable solvents on the floor. EXCEPTIONS ARE ONE 20L (OR 4 X 5L) CLOSED METAL DOT CAN OF ACETONE OR IN A HOOD DESIGNATED AND PROPERLY LABELED FOR FLAMMABLE STORAGE ONLY (RESULT OF LAB SPACE RESTRICTIONS).**
 - c. Flammable liquids should be kept in the appropriate safety cans/containers.
 - d. Grounding wires are available in the outside storage room. These are to be used when a flammable liquid is being transferred from one metal container to another. Clamp the grounding wire that is connected to the metal shelf to your drum, then use the free grounding wire to connect the drum to the container that you are filling.
 - e. An explosion proof refrigerator freezer is available for temperature sensitive flammable materials in the outside flammables storage room.

3. Corrosives: **WHITE**
 - a. Always add acid to water when diluting an acid.
 - b. If an acid or base is splashed on the skin, immediately wash the area for at least 15 minutes and notify the instructor.
 - c. If a spill occurs, neutralize the acid or base with sodium (bi)carbonate or citric acid, respectively, and rinse thoroughly. Sodium (bi)carbonate and citric acid may be found under a hood in Rm. 405, 409, 305, 303 and 205, and in the spill carts.
 - d. An acid or base should not be disposed of down the drain unless the pH is between 2-12. Flush with plenty of cool water.

- IN AN EFFORT TO REDUCE HAZARDOUS WASTE, ACIDS AND BASES MAY BE NEUTRALIZED AND DISPOSED OF DOWN THE DRAIN USING A LARGE QUANTITY OF COLD WATER IF THE NETRALIZATION IS WRITTEN INTO THE LABORATORY PROCEDURE.**

4. Highly Toxic Chemicals: **BLUE**
 - a. To protect yourself and others around you, please refer to the MSDS sheet for any chemical labeled as **BLUE** (TOXIC). Use proper personal protection equipment.
 - b. The designated area for the use of ethidium bromide and acrylamide powders is the designated fume hood in Keyes Room 303C. It is properly labeled for the use of highly toxic and mutagenic chemicals. Use proper personal protection and standard operating procedures. A spill kit for ethidium bromide may be found under this hood.

5. Reactives: **YELLOW** and **ORANGE**
 - a. Please pay particular attention to the incompatibilities and the waste disposal guidelines for reactive materials. (MSDS Sheets)
 - b. Handle these chemicals with proper safety precautions including segregation in storage. Never mix with any other chemicals (even in very small amounts) without prior approval from the instructor.

F. SPILLS AND ACCIDENTS

PLEASE REMEMBER THAT STUDENTS ARE TRAINED TO HELP IN SPILL CONTROL ONLY IF THEY FEEL CONFIDENT AND COMFORTABLE WITH THE SITUATION. THEY ARE TO ASSESS THE SITUATION, SEEK HELP (DOOR LABELS HAVE EMERGENCY NUMBERS, ETC), CLEAR THE AREA AND HELP OUT WHERE NEEDED (RETRIEVE THE SPILL CART, MAKE EMERGENCY PHONE CALLS, ETC). STUDENTS ARE NOT TRAINED AND ARE NEVER TO USE RESPIRATORS (TRAINED FACULTY ONLY). PLEASE DO NOT LEAVE THE AREA WITHOUT REPORTING THE ACCIDENT TO A FACULTY MEMBER OR A SAFETY OR SECURITY OFFICER.

1. Liquid spills
 - a. Flammable: alert others near by that all flames must be extinguished. Use a fire blanket or a CO₂ fire extinguisher.
 - b. Contain the spill by using paper towels, etc. or the pillows and “snakes” found in the 305, Keyes Rm. 4 and Outside Flammables Storage Room spill carts.
 - c. Clean spill with the appropriate absorbent (polysorb, vermiculite) while wearing gloves, goggles (and respirator if properly trained and fitted). Located in each spill cart is a Ziploc bag labeled polysorb and/or vermiculite. Sprinkle the absorbent over the spill, allow to absorb, sweep up with dustpan and broom, and place in a clean Ziploc bag. Seal the Ziploc bag and place the bag in the metal can provided. Please label (labels/markers provided in spill cart) the can with the name of the chemical spilled. The can should be brought to the Chemical Hygiene Officer. Spill carts are located in the 4th floor janitor’s closet, Keyes 305, Rm. 203 (Instrumental Lab) under the first hood, outside of Keyes Rm. 105A, OS Flammables Room, and outside and inside of Rm. 4. All cleanup materials should be labeled as hazardous waste. Please use the card inside the spill cart to identify the cleanup materials used. Give it to the Chemical Hygiene Officer so that the materials can be replaced ASAP.
 - d. Acid: a special acid spill cart is located outside of Keyes Rm. 4. This “garbage can” contains large amounts of acid neutralizer (base) for larger spills. Follow the above procedure for spill containment.
 - e. If the spill is sufficiently large or toxic, the instructor will determine if an evacuation is necessary. Bruce McDougal, Director of Safety, should be immediately notified.
 - f. Fill out an Spill Report (Secretary’s Office and notify the Chemical Hygiene Officer).
2. Solid Spills
 - a. Take precaution against dust. Sweep up the material while wearing gloves, goggles and a dust mask. In each spill cart there are Ziploc bags and labels/markers
 - b. Place waste (including any broken jars) in the Ziploc bag. Seal the bag and place in a safe place (hood, etc.). Please identify the spilled material and alert the Chemical Safety Officer so that the used materials may be replaced ASAP.
 - c. If the substance is an oxidizer (hazard **YELLOW**), keep the material away from any combustibles including paper.
 - d. Notify the Chemical Hygiene Officer and file a Spill Report.

3. Mercury

***** MOST MERCURY THERMOMETERS IN THE TEACHING LABORATORIES HAVE BEEN REPLACED WITH NONTOXIC/SAFE THERMOMETERS. THESE THERMOMETERS CONTAIN A BRIGHT BLUE, RED OR GREEN ORGANIC LIQUID. WHEN BROKEN, THIS COLORED LIQUID MAY BE RINSED DOWN THE SINK WITH LOTS OF WATER AND THE GLASS PUT INTO A PROPER GLASS DISPOSAL BOX.**

PLEASE FOLLOW THE FOLLOWING INSTRUCTIONS FOR MERCURY CONTAINING THERMOMETERS:

- a. All mercury spills should be picked up using a mercury spill kit. (Refer to page 11).
Please wear proper personal protection equipment: goggles, gloves, aprons, etc.
- b. Take precaution that all mercury has been cleaned up. Use the mercury spill kit directions carefully (inside kit). Remember that mercury contaminated gloves, etc. are also treated as hazardous waste.
- c. Broken mercury thermometers must be put into the proper mercury disposal container in the SAA areas. Please take precautions if you must break the thermometer to fit into the container. All mercury should be under the water in the container. **DO NOT PUT MERCURY IN THE TOXIC METAL WASTE.**

4. Gas Leaks

- a. In the case of a natural gas leak (remember-you cannot always detect a leak by smell!), immediately contact the person responsible for the lab.

G. SATELLITE ACCUMULATION AREAS FOR HAZARDOUS WASTE

1. Please know how to properly dispose of your hazardous waste. MSDS Sheets are a great resource. Each SAA has reminder sheets for waste identification and separation. An incompatibility sheet is also included (use another SAA when incompatible).
2. Any of the departmental Satellite Accumulation Areas may be used, if they are used properly. Please use a permanent marker to write the chemical name of the waste clearly and legibly on the jug. Do not use chemical formulas and/or abbreviations. Use a funnel. Solvent spillage often smears and removes the permanent marker from the jug.
3. Please make sure that the lid is put back on to the container and the container is put into the proper secondary containment vessel. (Acids away from bases, flammables away from oxidizers, etc.)
4. Appendix A includes important information concerning waste categories.

H. DISPOSAL OF SHARPS

1. All needles should be disposed of properly in the sharps containers found in every lab and prep room. These red containers are labeled as "sharps only" and have a special top that prevents the removal of any needle once it has been capped and put into the container. The containers are not labeled as hazardous or biological waste. Syringes can be disposed of in the trash. Any syringe or needle that has come in contact with any biohazardous material (blood, body fluids, microbiological) or toxic chemical waste must be disposed of in a sharps container that is labeled for hazardous waste.
Please see the Chemical Hygiene Officer if you need a hazardous waste sharps container.
2. Plastic pipette tips should be collected and disposed of in the glass disposal boxes found in each of the labs and prep areas. These items do present a hazard when put into the normal trash can.

I. WHAT TO DO IN THE CASE OF AN ACCIDENT

1. Contact to eyes and or skin
 - a. Splash: use the eyewash (keep eye open) or shower (remove clothing) for at least 15 minutes as instructed.
 - b. Inhalation: immediately remove the victim to fresh air using appropriate precautions.
 - c. Burns: Soak in an ice water bath for at least 15 minutes.
2. In the case of all injuries, accidents and near accidents, alert the instructor/supervisor, (even the minor ones).
3. **Each laboratory is equipped with a first aid kit.** However, use the first aid kit and immediately report to your instructor. Your instructor will determine if you need to report to the health center.
4. The victim should be escorted (never go alone) to the Health Center or Hospital with information about the chemical (s) that have caused the injury (MSDS).
5. Report all accidents and near accidents to the Chemical Hygiene Officer and file an Accident Report. This allows accidents to be put on file in the case of any safety investigation or the need for further medical assistance.

EMERGENCY RESPONSE PROCEDURE

- A. Always prepare before working in the lab. Know the location of the nearest spill cart, fire extinguisher and blanket, first aid kits, gas shutoffs, other safety equipment and phone.
- B. Never work alone! Always use the buddy system as explained by your supervisor.
- C. Know the chemicals that you are working with. Read the MSDS! MSDS can be found on the 3rd Floor.
- D. Fire Emergency Response: **ONLY TRAINED FIRE FIGHTERS FIGHT FIRES**. In the event of a fire alarm, immediately stabilize any on going chemical reaction and exit the building as quickly as possible. Congregate with other building occupants at a safe distance from the building. Do not leave the area.

E. In the case of an emergency:

1. **Notify your instructor/supervisor if not in immediate danger. Phone numbers for people responsible for the room are listed on the door labels outside of each lab.**
 - a. **Know how to handle skin and eye contact, inhalation hazards and burns (refer to page 17 of this manual).**
 - b. **Never attempt to handle an emergency or a spill by yourself. Always find a partner.**
 - c. **Never attempt to handle a situation that makes you feel uncomfortable. Please evacuate the area and call for immediate assistance (use information on door signs).**
2. **If you are in immediate danger and need immediate help or evacuation, call EMER x4911. Pull the fire alarm if evacuation is necessary. Locate the members of your lab group outside at a prearranged meeting space.**
3. **Call Safety Director, Bruce McDougal, at x5504 or 453-4815.**

APPENDIX A

WASTE CATEGORIES

Listed below are federally regulated wastes). Use the proper waste disposal container. If incompatibilities are apparent, use a different SAA, or see the Chemical Hygiene Officer for a new container. Label the container with the entire chemical name (please do not use chemical formulas or abbreviations) with a permanent marker. The amount and/or concentration is not necessary.

A. FLAMMABLES

1. All **flammables** with flashpoints under 140°F are considered hazardous waste.
DO NOT MIX WITH OXIDIZERS.

B. ORGANICS

1. acyl halides, anhydrides, sulfonyl halides. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
2. halogenated organics
3. oxidizers and in/organic peroxides. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
ex. perchloric acid, benzoyl peroxide, amyl nitrate.
4. organic liquids with pH < 7 and flash point < 140°F
ex. mercaptans, furans, ethers, thiols, and formic acid
5. organic acids
ex. propionic, butyric, maleic
6. alkaline organic liquids with pH > 7 and flash point < 140°F
ex. amines, oxides, diethylamine
7. neutrals
ex. alkanes, aromatics, alcohols

C. INORGANICS

1. reaction hazards - acid generating salts and liquids. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
ex. stannic chloride, thionyl chloride, aluminum chloride anhydrous
2. flammable metals, reactive flammable liquids, pyrophorics, and di and tri nitro compounds. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
ex. aluminum powder, collodion, white and red phosphorus
3. water reactives. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
ex. sodium lithium aluminum hydride, sodium borohydride, calcium
4. oxidizers. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
ex. potassium or sodium peroxide, hydrogen peroxide
5. acids, oxidizing. DO NOT MIX CHEMICALS WITHIN THIS CATEGORY
ex. HNO₃, HClO₄, H₂SO₄ (conc.)
6. other inorganic acids and bases - if no other hazardous component present, neutralize to between pH 2 - 12 and dispose down the drain with plenty of water.

APPENDIX A: WASTE CATEGORIES

APPENDIX B: NFPA LABEL CODES

APPENDIX C: PEROXIDIZABLE CHEMICAL CONTROL PROGRAM

COLBY COLLEGE
PEROXIDIZABLE CHEMICAL CONTROL PROGRAM

Adopted June 16, 2008

Purpose: The purpose of this program is to eliminate the accumulation of a class of chemicals which, when a certain shelf life is exceeded, form explosive peroxide crystals. These chemicals not only place individuals and facilities at risk, the disposal of them, upon crystallization, require excessive monetary and other resources. The general idea is to provide the Chemistry and Biology department chemical ordering personnel (usually the department secretary) with a list of the chemicals of concern. Whenever any chemical on the list is ordered, the Secretary will alert the Safety Coordinator who will contact the faculty member ordering the chemical. He/she will receive notice that they are ordering a peroxidizable chemical that has a limited shelf life. This notice will be in the form of an e-mail from the Chemical Hygiene Officer and the Director of Safety will be cc:'d on that notice. If the faculty member cannot or chooses not to substitute another chemical, the order will be placed. Upon receipt, the secretary will notify the Chemical Hygiene Officer who will place a label on the container that details the date received, the name of the faculty member who ordered it, the number of months the material will be allowed to stay in inventory, and the date the container was opened. Any container that is past the disposal date will be added to the next hazardous waste shipment.

Training: The Director of Safety will be responsible for the dissemination of this program to all applicable Chemistry and Biology faculty and staff. Training will be included in the annual Hazardous Waste training session. Any new faculty or staff brought in during the year will be given this training within two weeks of the start of their employment. The program will be updated at least annually or whenever there is a peroxidizable chemical added to the list.

Applicable Chemicals: There are three classes of peroxidizable chemicals at Colby:

- **Class A** – These are chemicals that form explosive levels of peroxides without concentration. These chemicals *may be stored up to six months* in the flammable materials storage room at Keyes. They will be shipped as hazardous waste at the next hazardous waste shipment date after expiration.
- **Class B** – These are chemicals that form explosive levels of peroxides on concentration. These chemicals *may be stored up to one year* in the flammable materials storage room at Keyes. They will be shipped as hazardous waste at the next hazardous waste shipment date after expiration.
- **Class C** – These are chemicals that may autopolymerize as a result of peroxide accumulation. These chemicals *may be stored up to two years*. They will be shipped as hazardous waste at the next hazardous waste shipment date after expiration.

Compounds of the following types are known to form peroxides (contains a peroxy (O-O) unit, a chemical formula of O₂²⁻:

- A. Aldehydes.
- B. Ethers, especially cyclic ethers, and those derived from primary and secondary alcohols.
- C. Compounds containing benzylic hydrogen atoms, especially if the hydrogen atoms are on tertiary carbon atoms, e.g. cumene.
- D. Compounds containing the allylic structure, including most alkenes.
- E. Ketones, especially cyclic ketones.
- F. Vinyl and vinylidene compounds.

Class A Chemical List:

Butadiene (liquid)	Chloroprene (liquid)	Divinylacetylene
Isopropyl Ether	Tetrafluoroethylene	Vinylidene chloride

Class B Chemical List:

Acetal	Acetaldehyde	Benzyl Alcohol
2-Butanol	Cumene	
2-Cyclohexen-1-ol	Cyclohexene	Decahydronaphthalene
Diacetylene	Dicyclopentadiene	Diethyl ether
Diethylene glycol dimethyl ether (diglyme)		
Dioxanes		
Ethylene glycol dimethyl ether (glyme)		Furan
4-Heptanol		
2-Hexanol	Methylacetylene	3-Methyl-1-butanol
Methylcyclopentane	Methyl isobutyl ketone	4-Methyl-2-pentanol
2-Pentanol	4-Penten-1-ol	1-Phenylethanol
2-Phenylethanol	2-Propanol	Tetrahydrofuran
Tetrahydronaphthalene	Vinyl ethers	Other secondary alcohols

Class C Chemical List:

Acrylic Acid	Acrylonitrile	Chloroprene
Chlorotrifluoroethylene	Methyl methacrylate	Styrene
Tetrafluoroethylene	Vinyl acetate	Vinyl acetylene (gas)
Vinyl chloride (gas)	Vinyl pyridine	Vinylidene chloride

Factors that affect the rate of peroxide formation: exposure to air, light and heat, and contamination from metals.

Peroxide crystals may form on the container plug or threads of the lid. When twisted, detonation can occur. Never open a liquid organic peroxide or peroxide forming chemical if crystals or a precipitate are present.

Considerations:

1. Purchase peroxide forming chemicals with peroxide inhibitor (ex. BHT) whenever possible.
2. Order quantities that can be used within expiration and disposal time limits.
3. Store all peroxide forming chemicals away from sunlight.
4. Use explosion proof refrigeration if flammable.
5. Do not distill, evaporate or concentrate a peroxide forming chemical until tested for the presence of peroxides.
6. NEVER TOUCH OR MOVE a suspect bottle. Call the safety Director immediately for disposal of any peroxide forming chemical with whitish crystals or that has exceeded the expiration date.

Label:

WARNING: MAY FORM EXPLOSIVE PEROXIDES

Store in a tightly closed original container. Avoid exposure to light, air, and heat. If crystals, discoloration, or layering are visible, contact the Safety office immediately! Check for peroxides before distilling or concentrating.

THIS CHEMICAL HAS A LIMITED SHELF LIFE

Container received on: _____ Container opened on: _____

Chemical Ordered by: _____
(Name Of Faculty Member)

Test or dispose of _____ months after receipt

Consult PEROXIDIZABLE CHEMICAL CONTROL PROGRAM for storage limits.

The Safety office at Colby College administers this program. Any questions may be directed to the Director of Safety at extension 5504 (e-mail: bamcdoug@colby.edu).

APPENDIX D: LAB SUPERVISION POLICY

Colby College, Department of Chemistry Lab Supervision Policy

Adopted November 24, 2008

Purpose: Emergencies sometimes arise that require an instructor to leave an active laboratory section. The following policy was established to govern such circumstances and to ensure the safety of our students.

1. If an instructor (the faculty or teaching staff member that is assigned to the laboratory section) must leave the building or is not readily available to the students in a laboratory, another faculty or teaching staff member must be contacted to cover the laboratory. This policy covers all 100 and 200 level courses and 300 level courses that include non-chemistry (not safety trained by the department) majors. Course laboratories that service only students that are safety trained by the department are not subject to this policy.
 - a. Student assistants do not qualify to cover a laboratory section in the absence of the faculty or teaching staff member.
 - b. Instructors often work with students in the Instrument lab (Keyes 203). The instructor needs to inform the student assistant and the students that they will be in K203. The student assistant must cover the laboratory until the return of the instructor.
 - c. This policy is necessary to the end of the laboratory section, even if the laboratory runs longer than the scheduled time (overtime). This includes clean up time, computer and discussion time. This policy is necessary when not doing wet chemistry if chemicals are readily available anywhere in the lab (bottles on bench tops, reaction in hoods, etc.).
 - d. Students are not to be left unattended in a laboratory to take exams if chemicals are readily available in the room.
 - e. Quick restroom breaks or office trips to “get something” do not require extra coverage. (Notify the student assistant.)
 - f. This policy does not include advanced level laboratories (300-400 level where all students have been safety trained by the department) as long as the students agree to the “buddy system”. However, the instructor must be available until all of the students have finished working. Working in an office on the same floor is allowable as long as the students can easily find the instructor in the case of an emergency. However, the instructor should periodically check the students in the lab.
 - g. This policy does not apply to independent student research for which departmental safety training and the buddy system is always required.