



### *CORROSIVE CHEMICALS*

A **corrosive** material is a highly reactive substance that causes obvious damage to living tissue. **Corrosives** act directly, either by chemically destroying the part (oxidation), or indirectly by causing inflammation. Acids and bases are common **corrosive materials**.

## **Corrosive Chemicals – Procedures for Safe Handling and Storage**

Corrosives (liquids, solids, and gases) are chemicals that cause visible destruction or irreversible alterations to living tissue by chemical action at the site of contact. Corrosive effects can occur not only to the skin and eyes, but also to the respiratory tract through inhalation and to the gastrointestinal tract through ingestion. Corrosive liquids have a high potential to cause external injury to the body, while corrosive gases are readily absorbed into the body through skin contact and inhalation. Corrosive solids and their dusts can damage tissue by dissolving rapidly in moisture on the skin or within the respiratory tract when inhaled. In order to minimize these potential hazards, precautionary procedures must be observed when handling corrosives.

## Handling

- Appropriate personal protective equipment (e.g., gloves, fire-resistant or all cotton lab coat, and safety goggles) must be worn when working with corrosive chemicals. A face shield, rubber apron, and rubber booties may also be appropriate depending on the work performed.
- Appropriate protective gloves that are resistant to permeation or penetration from corrosive chemicals must be selected and tested for the absence of pinholes prior to use.
- Eyewashes and safety showers must be readily available in areas where corrosive chemicals are used and stored. In the event of skin or eye contact with a corrosive chemical, the affected area should be immediately flushed with water for 15 minutes. Contaminated clothing should be removed and medical attention sought.
- Corrosive chemicals should be handled in a fume hood to ensure that any possible hazardous or noxious fumes generated are adequately vented.
- When mixing concentrated acids with water, add the acid slowly to the water. Allow the acid to run down the side of a container and mix slowly to avoid violent reactions and splattering. Never add water to acid.
- Appropriate spill clean-up material should be available in areas where corrosive chemicals are used and stored.

- Protective carriers shall be used when transporting corrosive chemicals.

## **Storage**

- Containers and equipment used for storage and processing of corrosive material must be corrosion resistant.
- Corrosive chemicals must be stored below eye level, preferably near the floor to minimize the danger of their falling from cabinets or shelves.
- Acids and caustics (i.e. bases) must be stored separately from each other. Secondary containers or trays must be used to separate acids and bases or other incompatible corrosives within a corrosive cabinet.
- Oxidizing acids must be separated from organic acids and flammable /combustible materials (oxidizing acids are particularly reactive with organics and flammable/combustible materials).
- Acids must be segregated from active metals (e.g., sodium, potassium, and magnesium) and from chemicals that can generate toxic gases (e.g., sodium cyanide and iron sulfide).

Corrosive gas cylinders must be returned for disposal every two years.

## What Is the Scope of This Guideline?

This guideline identifies general safety precautions that should be reviewed and followed when dealing with corrosive chemicals at Brandeis. They represent a significant hazard because skin or eye contact can readily occur from splashes, and their effect on human tissue generally takes place very rapidly.

Examples of corrosives:

- Glycolic acid
- Imidazole
- 4-Methoxybenzylamine
- Sodium hydroxide
- Amines
- Sulfuric acid
- Bromine
- Hydrogen peroxide

Corrosive gases and vapors are also extremely hazardous. Examples which can cause severe irritation and bodily injury include:

- Ammonia
- Hydrogen chloride
- Nitrogen dioxide
- Sulfur dioxide

## How Do I Protect Myself?

Review the material safety data sheet (MSDS) prior to using this material.

### **Eye Protection**

Safety glasses that meet the ANSI Z.87.1 1989 standard should be worn whenever handling corrosive chemicals. Ordinary prescription glasses **WILL NOT** provide adequate protection unless they also meet this standard. Safety glasses should also be equipped with side shields if there is a possibility of flying particles (i.e., glass, plastics). **When there is the potential for significant splash hazards, additional eye/face protection should be worn in the form of goggles or a face shield.**

### **Skin Protection**

Gloves should be worn when handling corrosive chemicals. Nitrile gloves should be adequate for handling most of these in general laboratory settings. An MSDS should be reviewed if handling may involve extended or high exposure to lab personnel to ensure adequate skin protection is provided.

In addition, a lab coat or apron is advised if exposure could involve more than normal handling operations would be expected. No open-toe shoes are allowed.

### **Special Handling**

- **Never store corrosive liquids above eye level.**
- Always add acids or bases to water (and not the reverse).
- Segregate acids and bases in storage.
- When mixing corrosive solids with water, always slowly add the corrosive solid to the water, stirring continuously. Cooling may also be necessary.
- If there is a possibility that you may generate a significant amount of dust, conduct work in a fume hood.
- If the potential exists for explosion or a high thermal reaction, additional shielding should be utilized. This may involve the use of

shielding in a glove box or in the case of a fume hood with the sash in the lowest possible position. Portable shields may also be used for additional protection.

- Store corrosives material away from heat/flames, oxidizers and water sources. Keep containers closed and ensure that manufacturer's labels and warnings remain intact.

### Handling Emergencies Involving Corrosive Chemicals

Anticipate emergency situations, have proper handling equipment in the lab and readily available for spills. Acid and base spill kits are available in the Main Hazardous Waste Accumulation area. Contact the Department of Environmental Health and Safety at ext. 6-4262 or the Hazardous Waste Hotline (Monday/Thursday) at ext. 62561 for access. It is also highly recommended that spill control material/kits be maintained in the lab.

In the event of a spill or adverse reaction, notify lab personnel immediately that an incident has occurred. Do not attempt to handle a large spill/reaction/fire, or one in which you are not trained or equipped for.

Laboratory emergencies should be reported to public safety at ext. 6-3333. Public safety will also contact the Department of Environmental Health and Safety at ext. 6-4262. Communicate the following:

- Location of spill/incident
- Type of material involved and quantity
- Injuries involved
- Fire/explosion
- Your location/contact information (or who to contact for further information)

Notify the principal investigator or designated safety officer as soon as possible.

## Waste Disposal Requirements

Handling and disposal of corrosive chemicals should be done in accordance with lab protocol established by the principal investigator.

**Aqueous solutions between pH 6.0 to 10.0 may be disposed of down the sink.** Contact the Department of Environmental Health and Safety at ext. 6-4262 with any question concerning sink disposal of material other than aqueous solutions described here. The university operates under a discharge permit from the Massachusetts Water Resources Authority and has specific discharge limits.

Disposal requests should be called into the Waste Hotline at ext. 6-2561.

## Decontamination Procedures

Cleanup and decontamination may require the use of neutralizing agents. Review the MSDS for additional guidance and personal protection.



Substance, which, while not corrosive, causes a temporary or reversible inflammation of living tissue (such as eyes, skin, or respiratory organs) by a chemical action at the point of contact. The effects of an irritant may be acute (due to a single high-level exposure) or chronic (due to repeated low-level exposures).

### **Potential Hazards**

Irritants are chemicals that cause reversible inflammatory effects on living tissue by chemical action at the site of contact. A wide variety of organic and inorganic compounds are irritants; thus, skin contact with all laboratory chemicals should be avoided.



Personal Protective Equipment At minimum, safety glasses, lab coat, long pants, and closed toe shoes are to be worn when entering laboratories having hazardous chemicals.

**Additionally:**

- When handling hazardous chemicals or contacting potentially contaminated surfaces, protective gloves are to be worn. For proper selection of glove material, review the chemical-specific SDS.
- Goggles (not safety glasses) are appropriate for processes where splash or spray is foreseeable.
- For hazardous chemicals that are toxic via skin contact/ absorption, additional protective clothing (i.e., face shield, apron, over sleeves) is appropriate where chemical contact with body/skin is foreseeable.



The U.S. Environmental Protection Agency or EPA defines a toxic chemical as any substance, which may be harmful to the environment or hazardous to your health if inhaled, ingested or absorbed through the skin.

## **Toxic Chemicals in Your Home**

Many useful household projects contain toxic chemicals. Common examples include:

- Drain cleaner
- Laundry detergent
- Furniture polish
- Gasoline

- Pesticides
- Ammonia
- Toilet bowl cleaner
- Motor oil
- Rubbing alcohol
- Bleach
- Battery acid

## **Natural Toxic Chemicals**

Many toxic chemicals occur in nature. For example, plants produce toxic chemicals to protect themselves from pests. Animals produce toxins for protection and to capture prey. In other cases, toxic chemicals are simply a by-product of metabolism. Some natural elements and minerals are poisonous. Here are some examples of natural toxic chemicals:

- Mercury
- Snake venom
- Caffeine in coffee, tea, kola and cocoa
- Arsenic
- Ricin from castor beans
- Petroleum
- Hydrogen sulfide
- Chlorine gas
- Smoke

## **Types of Toxins**

Toxins may be categorized into four groups. It's possible for a substance to belong to more than one group.

**Chemical Toxicants** - Chemical toxins include both inorganic substances, such as mercury and carbon monoxide, and organic compounds, such as methyl alcohol.

**Biological Toxins** - Many organisms secrete toxic compounds. Some sources consider pathogenic organisms to be toxins. A good example of a biological toxin is tetanus.

**Physical Toxicants** - These are substances that interfere with biological processes. Examples include asbestos and silica.

**Radiation** - Radiation has a toxic effect on many organisms. Examples include gamma radiation and microwaves.



**Flammable** substances are those gases, liquids and solids that will ignite and continue to burn in air if exposed to a source of ignition. Many **flammable** and combustible liquids and solids are volatile in nature; that is, they evaporate quickly and are continually giving off vapours.

### ***Definitions***

**Combustible:** A liquid with a flash point over 100°F (38°C) is considered **combustible**.

- Examples: diesel fuel, motor oil.
- Hazard: May produce ignitable vapors at elevated temperatures.

**Flammable:** A liquid with a flash point under 100°F is considered **flammable**.

- Examples: gasoline, acetone, toluene, diethyl ether, alcohols.
- Hazard: May produce ignitable vapors at normal ambient temperatures.

### ***Precautions***

- Ensure that all stored containers are in good condition, closed and properly labeled.
- Use flammable liquids and combustible liquids in a fume hood to prevent buildup of ignitable vapor/air mixtures or inhalation of toxic vapors or gases.
- Avoid placing ignition sources (hot materials, flames, or sparking equipment) in the general vicinity of these liquids. If possible, replace open flames by electrical heating.
- Ground equipment likely to produce a static spark.
- Implement additional safety precautions when flammable and combustible liquids are heated to or above their flash points.
- Compressed or liquefied gases present special fire hazards. Refer to the EH&S [Compressed Gas Guidelines](#).

Contact between incompatible chemicals presents a serious fire risk. Proper handling and storage procedures should be followed.

### ***Storage Cabinets***

No more than 10 gallons (37.9L) of flammable liquids may be kept outside of an approved storage cabinet at any time. Flammable and combustible liquid storage cabinets shall meet appropriate NFPA standards and may not be modified in any way. It is not recommended to ventilate storage cabinets. If not ventilated, storage cabinet vent openings shall be sealed with the bungs supplied with the cabinet.

## ***Safety Cans***

Up to 5.3 gallons (20L) of flammable and combustible liquids may be stored in UL or FM listed safety cans. Safety cans must be constructed from metal and come equipped with a flame arrestor and spring-loaded caps on both the filling and pouring spouts to prevent spillage when dropped. The double-perforated metal surface of the flame-arrestor screen prevents flames from entering the container. Safety cans are available for both dispensing products and collecting waste. Safety cans shall not be modified. Many consumer portable fuel containers available at stores do not meet safety can standards.

## ***Refrigerator Storage***

Commercially available, domestic refrigerators contain built-in ignition sources and shall not be used to store flammable liquids or explosive chemicals. Light bulbs, switches, temperature controls, standard plugs, motor-starting relays, thermal-overload devices, and heater strips (for frost control) are all ignition sources.

Anyone who needs a refrigerator to store flammable liquids or explosives should use refrigerators specifically designed and approved for such use. Refrigerators and freezers that have either been specifically designed or modified to store flammable and/or combustible liquids safely shall be labeled as such. Labels are available from EH&S.

# **STUDENT LABORATORY CODE OF CONDUCT**

## **FOR**

### **MBBS STUDENTS**

#### **GENERAL GUIDELINES**

1. Students should behave in a mature and responsible manner at all times in the laboratory or wherever chemicals are stored or handled. All inappropriate behavior is especially prohibited.
2. Students must follow all verbal and written instructions carefully. If you are unsure of the procedure, ask your teacher for help before proceeding.
3. Students should not touch any equipment or chemicals unless specifically instructed to do so.
4. Students must not eat, drink, apply cosmetics, or chew gum in the laboratory. Wash hands thoroughly after participating in any laboratory activities.

5. Students must perform only those experiments authorized by the teacher.
6. Students will receive training related to the locations and operating procedures for all applicable laboratory safety equipment and personal protective equipment (PPE).

## **HANDLING CHEMICALS AND EQUIPMENT**

1. Students must properly dispose of all chemical waste, as directed.
2. Students must never enter or remain in the science laboratory storage rooms or preparation areas unless accompanied by a teacher or a designated college employee.
3. Students must wear **Rahbar Medical & Dental College (RMDC)**-approved overall, eye protection whenever chemicals, heat, or glassware are used by either the teacher or the students in the laboratory. Students should wear appropriate personal apparel at all times in the laboratory and avoid wearing loose or flammable clothing; long hair should be tied back.
4. Students must report any incident (including all spills, breakages, or other releases of hazardous materials) to the teacher immediately—no matter how insignificant it may appear. This should include all injuries such as cuts, burns, breathing problems, or other signs of physical harm. It is encouraged that students also

report incidents that do not result in physical harm, so that lessons can be learned from these “near misses”.

5. Students must never remove chemicals, equipment, or supplies from the laboratory area.
6. Students must carefully examine all equipment before each use and report any broken or defective equipment to the teacher immediately.

## **HEATING SUBSTANCES**

1. Students must never reach over an exposed flame or hot plate, or leave a flame or hot plate unattended.
2. Students must never point a test tube or reaction vessel of any type toward another person.



# **RESPONSE TO VIOLATIONS**

*OF*

## **THE STUDENT LABORATORY CODE OF CONDUCT**

**1st Offense:** Verbal reprimand from the teacher, with a written record of the violation maintained. The teacher will review the rule with the student. If this is a serious violation, which may have caused harm to human health or the environment, the parents or guardians will also be notified.

**2nd Offense:** The student will be suspended from laboratory work immediately and sent to the appropriate grade-level administrative office, with a disciplinary referral from the teacher. A written notification about the consequences for the student will also be sent to the parents or guardians. The student will not be permitted to return to laboratory work for one week, with alternative work assignment(s) to be provided in a supervised setting as determined by the building administration.

**3rd Offense:** The student will be suspended from laboratory work immediately and sent to the appropriate grade-level administrative office, with a disciplinary referral from the teacher. Written notification will also be sent to the parents or guardians, and a mandatory conference will be scheduled with the parents or guardians, teacher, and building administrator. Depending on the result of that conference, the student may be suspended from laboratory operations for the remainder of the college year. If this occurs, the student will be assigned alternative work assignment(s) to be provided in a supervised setting as determined by the building administration. In addition, the student may be required to schedule an alternative laboratory science course to satisfy any state graduation requirements.

## **RAHBAR MEDICAL & DENTAL COLLEGE, LAHORE.**

**DEPARTMENT OF \_\_\_\_\_**

### **❖ Safety Contract**

#### **STUDENT AGREEMENT**

I, \_\_\_\_\_ (student's name), have read and understand the Student Laboratory Code of Conduct set forth above. I realize that I must obey these rules to ensure my own safety and that of my fellow students and teachers. I will cooperate fully with my teachers and fellow students to maintain a safe working environment in the laboratory. I am aware that violations of this safety code will result in disciplinary action as specified in the Code.

\_\_\_\_\_  
**STUDENT SIGNATURE**

**DATE** \_\_\_ / \_\_\_ / \_\_\_

#### **PARENT/GUARDIAN ACKNOWLEDGMENT**

Note to Parent/Guardian: We believe you should be informed regarding our school's efforts to create and maintain a safe science classroom and laboratory environment. Safety awareness involves the cooperation of parents or guardians, students, and teachers. Please read the Student Laboratory

Code of Conduct, which details the safety concerns and expected student behaviors in the laboratory. No student will be permitted to perform laboratory activities unless both the student and at least one parent or guardian sign the Code and return a signed copy to their teacher.

By signing below you indicate that you have read this Code of Conduct, are aware of the measures taken to ensure the safety of your child in the science laboratory, and will encourage your child to uphold the agreement to follow these rules and procedures.

---

**PARENT OR GUARDIAN SIGNATURE**

**DATE** \_\_\_ / \_\_\_ / \_\_\_