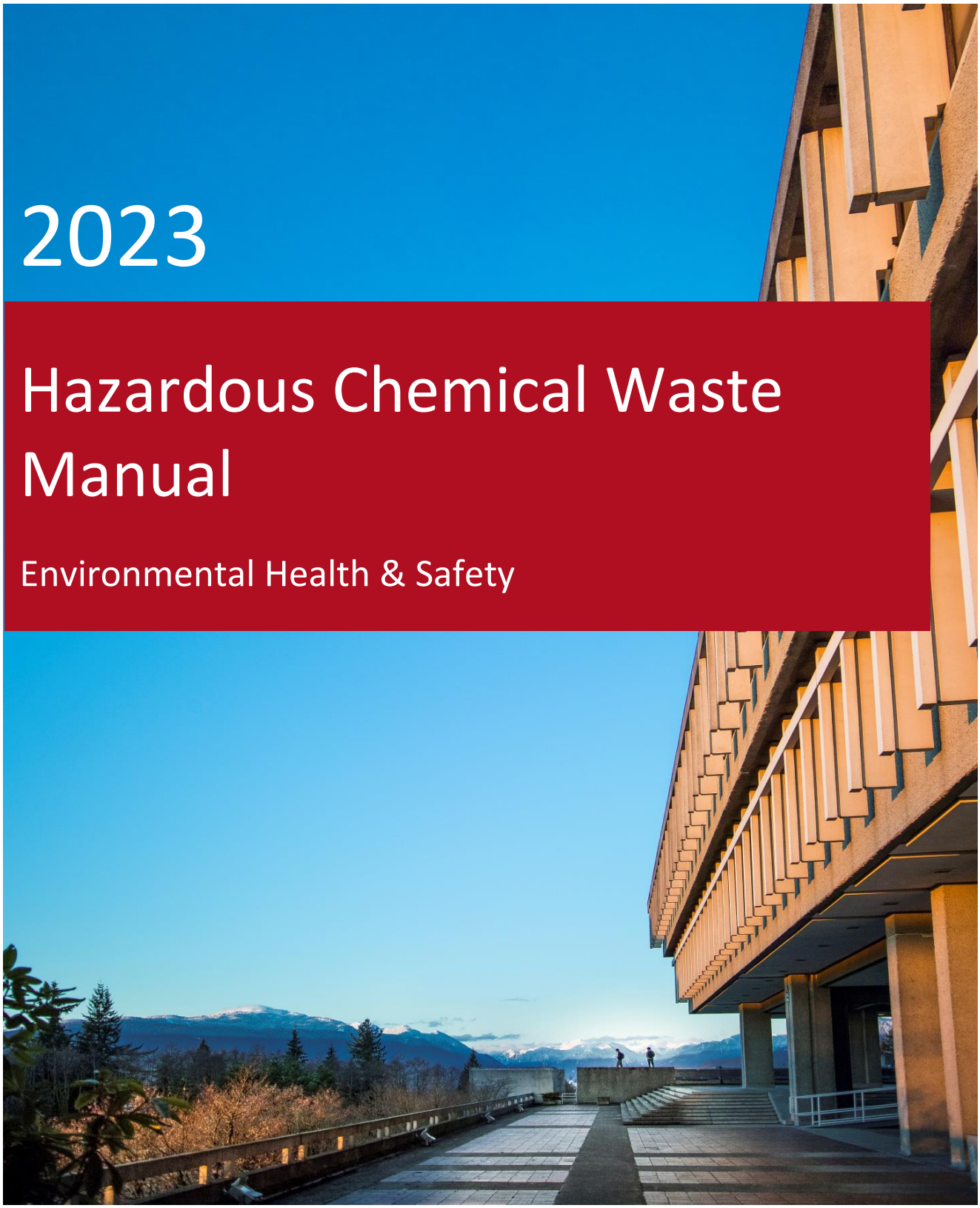
SFU SAFETY & RISK SERVICES
ENVIRONMENTAL HEALTH & SAFETY

2023

Hazardous Chemical Waste Manual

Environmental Health & Safety



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Record of Changes

Date	Revised by	Revision
2023.12.08	Carol Wu	Updated formatting.
2023.10.31	Miles Garcia	Updated formatting, web links, terminology, and regulatory references.

SFU SAFETY & RISK SERVICES
ENVIRONMENTAL HEALTH & SAFETY

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1. Introduction

The handling and disposal of hazardous chemical waste is governed by a wide range of legislative acts and safety regulations. It is Simon Fraser University's (SFU) policy to comply with all legislation to protect human health and the environment.

For SFU, responsible hazardous waste management is not only about meeting legal requirements, but also about being a good institutional citizen and continually striving for improvements that are in line with SFU's goals of sustainability.

Hazardous chemical wastes are generated by the University through research, academic, and operational activities. Environmental Health & Safety (EHS) coordinates the collection, consolidation, and recycling or disposal of hazardous chemical wastes through our qualified waste contractor.

SFU's Hazardous Chemical Waste Manual is intended to ensure that employees and students are properly educated and informed in the handling of hazardous chemical waste, and in the disposal methods required. The manual also outlines the key infrastructure, equipment and resources that are in place to ensure that hazardous chemical waste is managed responsibly, safely, and efficiently.

Stringent hazardous chemical waste legislation at the federal, provincial, and municipal levels encompasses those materials that are intended for reuse, recycling and/or treatment as well as disposal and applies equally to materials in storage or transit before recycling, treatment or disposal. The BC Hazardous Waste Regulation defines hazardous waste as dangerous goods no longer used for their original purpose and which meet the criteria under the current federal Transportation of Dangerous Goods (TDG) Regulations for the following classes:

Class 2 – Compressed Gases
Class 3 – Flammable Liquids
Class 4 – Flammable Solids, Spontaneously Combustible Solids and Water Reactive Substances
- Class 4.1 – Flammable Solids
- Class 4.2 – Substances Liable to Spontaneous Combustion
- Class 4.3 – Water Reactive Substances

Class 5 – Oxidizing Substances
- Class 5.1 – Oxidizers
- Class 5.2 – Organic Peroxides

Class 6 – Toxic and Infectious Substances
- Class 6.1 – Toxic Substances
- Class 6.2 – Infectious Substances

Class 8 – Corrosives
Class 9 – Miscellaneous Products, Substances or Organisms

BC Hazardous Waste Regulation does not cover TDG Class 1 (Explosives) and TDG Class 7 (Radioactive materials) because they are managed under separate comprehensive regulatory regimens.

In addition, BC Hazardous Waste Regulation specifically designates the following items as hazardous waste: biomedical waste, asbestos, waste oil, Polychlorinated Biphenyls (PCBs), waste pest control products and their containers, wastes containing dioxins, wastes containing tetrachloroethylene, wastes containing Polycyclic Aromatic Hydrocarbons (PAHs), and leachable toxic wastes.

SFU uses a broader definition for hazardous chemical waste that includes some types of hazardous chemical waste not included by the BC Hazardous Waste Regulation. In general terms, hazardous chemical waste is defined at SFU as a product or substance that is no longer used for its original purpose and presents a risk or potential risk to human health and/or the environment due to certain characteristics (ignitability, corrosivity, reactivity, toxicity).

2. Scope

This manual details the elements of SFU's Hazardous Chemical Waste management processes to ensure compliance with all relevant Federal, Provincial and Municipal regulations.

2.1 The scope of this manual is limited to hazardous chemical waste generated in SFU laboratories.

2.2 For information about Radioactive waste, see https://www.sfu.ca/srs/work-research-safety/research-safety/radiation-safety/specific-procedures.html

2.3 For information about Biohazardous waste, see https://www.sfu.ca/srs/work-research-safety/research-safety/biosafety/specific-procedures.html

2.4 For information about miscellaneous waste items that are managed by SFU Facilities Services, see: https://www.sfu.ca/fs/projects-initiatives/sustainable-initiatives/waste-reduction.html. Examples include:

- asbestos,
- uncontaminated glassware,
- large volumes of waste oil,
- batteries,
- decommissioned and decontaminated equipment (including computer equipment) and,
- light ballasts.

3. Responsibilities

The safe handling, storage, and disposal of hazardous chemical waste require a collaborative commitment with clear direction from the University Senior Management and compliance by all users of hazardous chemicals. The responsibilities to achieve commitment and compliance are outlined below.

3.1 Deans, Directors and Chairs

Deans, Directors and Chairs are responsible for:

- Ensuring the Hazardous Chemical Waste Manual (the 'Manual') is implemented in all departments/facilities under their authority;
- Monitoring the management of hazardous chemical wastes within their areas of responsibility and recommending measures for improvement, if necessary.

3.2 Principal Investigators, Faculty and Instructors

Principal Investigators, Faculty and Instructors are responsible for:

- Understanding and implementing the Manual, including assessing the risks associated with hazardous chemical wastes in their workplace;
- Ensuring personnel under their supervision understand the elements of the Manual as it relates to their workplace or laboratory;
- Advising personnel under their supervision of the specific hazardous chemical wastes in their workplace or laboratory and required controls (source reduction, engineering, administrative, personal protective equipment (PPE) as required by the Manual to mitigate those hazards;
- Ensuring personnel under their supervision have successfully completed all relevant hazardous chemical waste-related training offered by the University (e.g., Laboratory Safety Training);
- Providing specific training to personnel under their supervision for all hazards and hazardous chemical waste provisions associated with the specific operations of their laboratories, and maintain records of this training;
- Monitoring to ensure personnel under their supervision follow the requirements of the Manual including required controls and procedures relating to hazardous chemical waste;
- When required, take part in and maintain records of audits, inspections, and incident investigations;
- Ensure corrective actions identified in their area of responsibility are implemented.

3.3 Laboratory Managers, Post-Doctoral Fellows, Technicians, Coordinators, and Staff

Laboratory managers, post-docs, technicians, coordinators, and staff are responsible for:

- Understanding the Manual and relevant procedures with respect to specific types of hazardous chemical wastes in their workplace or laboratory;
- Using adequate controls (source reduction, engineering, administrative, PPE) as required by the Manual to mitigate the dangers of specific hazardous chemical wastes in their workplace;
- Ensuring students, volunteers, and visitors understand and follow the Manual and relevant procedures;
- Monitoring the workplace to ensure students, volunteers, and visitors follow the requirements of the Manual.

3.4 Students, Volunteers and Visitors

All individuals who work with hazardous chemicals are responsible for:

- Understanding and following the Manual, relevant procedures, and required controls with respect to specific hazardous chemical wastes in their workplace or laboratory;
- Using the information they receive through education and training to work with hazardous chemical wastes safely and in an environmentally responsible manner;
- Informing their supervisors of their personal training needs and any safety concerns.

3.5 Environmental Health & Safety

The Department of Environmental Health & Safety is responsible for:

- Providing information and guidance to individuals and departments on the management of hazardous chemical wastes at SFU;
- Providing training sessions on hazardous chemical waste management, general laboratory safety, WHMIS and Transportation of Dangerous Goods;
- Maintaining records of all training;
- Conducting periodic audits to ensure compliance with the Manual;
- Managing and overseeing the Hazardous Waste Facility, the Hazardous Waste Disposal Contractors, and Hazardous Waste contract;
- Reviewing the Manual on an annual basis.

4. Hazardous Waste Regulation, Identification and Classification

SFU must abide by all relevant regulations, legislation, standards, and bylaws that pertain to hazardous chemical waste, including, but not limited to:

- BC Hazardous Waste Regulation 2022,
- BC Occupational Health and Safety Regulation,
- Metro Vancouver Sewer Use Bylaw No. 299 Consolidated,
- Metro Vancouver Landfill Banned and Prohibited Materials,
- Federal Transportation of Dangerous Goods,
- Workplace Hazardous Materials Information System (WHMIS).

The adherence to these regulations protects human health, the environment, as well as SFU building, drain and sewer infrastructure.

4.1 Segregation of hazardous and non-hazardous chemical waste

Many lab wastes that do not exhibit any of the hazardous characteristics (ignitability, corrosivity, reactivity, toxicity) can potentially be designated as non-hazardous chemical waste. Waste that is not covered under the current BC Hazardous Waste Regulation, is not restricted or prohibited by the Metro Vancouver bylaws, or controlled under WHMIS can be disposed of via the normal garbage (solids) or sewer (liquids) if not contaminated. Examples include certain salts (e.g., calcium chloride and sodium carbonate), natural products (e.g., sugars and amino acids) and inert materials (e.g., non-contaminated chromatography resins and gels). Appendix A contains a list of non-hazardous chemicals commonly used in the laboratory.

When practical and safe to do so, waste segregation makes economic and environmental sense since it can significantly reduce costs associated with hazardous chemical waste disposal and prevent non-hazardous materials from being sent to secure landfills.

4.2 Hazardous Liquid Waste Restrictions

Metro Vancouver, through its Sewer Use Bylaw No. 299, regulates waste discharges into all sewers in the district. Liquid waste is divided into:

- Prohibited Waste, which may never be disposed down the drains (Table 1); and
- Restricted Waste, which must meet established concentration limits (Table 2) in order to be disposed of through the sewer system.

Prohibited wastes (as shown in Table 1) and wastes which exceed maximum concentrations in Table 2 are treated as Hazardous Chemical Waste. In accordance with the BC Hazardous Waste Regulation, Restricted waste may NOT be diluted for the purpose of meeting the allowable concentration limits (Table 2).

Flammable or Explosive Waste
High Temperature Waste – Any liquid waste at a temperature higher than 65 °C or any waste that will raise the temperature of waste entering a sewage facility to 40 °C or more.
Corrosive Waste – Any waste with a pH of lower than 5.5 or higher than 10.5 or any corrosive properties that may damage drain, building or sewer infrastructure.

Table 1: Prohibited Chemical Waste

Metal Contaminants		Other Contaminants	
Aluminum (50.0 mg/L)	Lead (1.0 mg/L)	Benzene (0.1 mg/L)	
Arsenic (1.0 mg/L)	Manganese (5.0 mg/L)	Total BTEX (Benzene, Toluene, Ethylbenzene, Xylenes) (1.0 mg/L)	
Boron (50.0 mg/L)	Mercury (0.05 mg/L)	Biochemical Oxygen Demand (BOD) (500 mg/L)	
Cadmium (0.20 mg/L)	Molybdenum (1.0 mg/L)	Cyanide (1.0 mg/L)	
Chromium (4.0 mg/L)	Nickel (2.0 mg/L)	Chlorophenols including tetra- & penta-chlorophenols (0.05 mg/L)	
Cobalt (5.0 mg/L)	Selenium (1.0 mg/L)	Polycyclic Aromatic Hydrocarbons (0.05 mg/L)	
Copper (2.0 mg/L)	Silver (1.0 mg/L)	Phenols (1. 0 mg/L)	Sulphate (1500 mg/L)
Iron (10.0 mg/L)	Zinc (3.0 mg/L)	Sulphide (1.0 mg/L)	Suspended Solids (600 mg/L)
		Oil & Grease (hydro-carbons) (15 mg/L)	Total Oil & Grease (150 mg/L)

Table 2: Restricted Chemical Waste

4.3 Hazardous Solid Waste Restrictions

Solid waste that is contaminated with chemicals must be collected and disposed of as hazardous chemical waste. Examples of solid wastes that have a potential to be contaminated with hazardous chemicals includes materials such as gloves (and other PPE), tubing, silica, pipette tips, drying agents, chromatography reagents, and filter papers.

Laboratory chemicals, in solid form, including surplus hazardous chemicals or experimental by-products, are also disposed of as hazardous waste if they exhibit one or more of the following

characteristics: flammability, spontaneously combustible, dangerous when wet, oxidizers, poisonous/toxic, corrosives, environmentally hazardous, or containing polycyclic aromatic hydrocarbons.

4.4 Common SFU Hazardous Chemical Waste Streams

The following table identifies common types of hazardous chemical waste that are generated in laboratories at SFU.

Category of Hazardous Chemical Waste	Chemical Waste Description
Organic solvent waste	Segregated into halogenated and non-halogenated
Aqueous waste	Water based liquid waste that has a pH that falls outside the 5.5-10.5 range, or contains other hazardous contaminants (e.g., heavy metals)
Dry waste with residual contaminants	Any material, but not limited to, plastic bags, empty bottles, plastic containers, paper towel, gloves, pipette tips, filter paper, etc. contaminated with hazardous chemical residue
Surplus chemicals or experimental waste and by-products	Any solid or liquid in an appropriate means of containment, which exhibits one or more of the following characteristics: flammability, spontaneously combustible, dangerous when wet, oxidizers, poisonous/toxic, corrosives, environmentally hazardous, or containing polycyclic aromatic hydrocarbons
Mercury waste	Includes any equipment containing mercury such as thermometers, barometers, blood pressure gauges, flasks of mercury, as well as materials or containers contaminated with mercury
Gas cylinders	Any cylinder used to hold a gas or any container used to hold a liquefied gas at or above atmospheric pressure
Electrophoresis gel waste	Gels containing trace amounts of chemicals (e.g., ethidium bromide, GelRed, SYBR Green contaminated gel waste)
HPLC/GC sample vials	Small vials containing solutions from analysis on gas chromatography (GC) or high-performance liquid chromatography (HPLC) instruments
Sharps	Needles, syringes, blades or laboratory glass capable of causing punctures or cuts

Contaminated glass waste	Contaminated broken and unbroken glass waste and contaminated glass containers
Unknowns	A chemical where the chemical composition characteristics are unknown
Unstable/expired	Chemicals that have decomposed or dried into potentially unstable compounds that may react or become explosive under certain conditions (e.g., ether or other peroxide-forming compounds, picric acid)
Vacuum pump oil	Hydraulic fluids that are no longer required for their intended purpose or that are waste products

Table 3: Common types of chemical waste

5. Chemical Waste Guidelines and Procedures

SFU specific procedures and guidelines are in place for collection, packaging, labeling, storage, pick-up from laboratories, and final disposal. If you or your supervisor is unsure of the proper method of handling a particular type of hazardous chemical waste that is generated in your laboratory, contact EHS at ehrs_sfu@sfu.ca for assistance.

5.1 Hazardous Chemical Waste Collection and Packaging

Hazardous chemical waste must be collected and stored in appropriate containers that are of adequate size and are compatible for collecting that particular waste.

5.1.1 Containers

Solvent waste containers can be obtained through Science Stores (see Figure 1). Alternatively, empty chemical containers may be re-used for waste provided that:

- the waste and the original container material are compatible;
- the original label is defaced; and
- the waste container is clearly labeled with the contents.

To ensure the safety of laboratory personnel, support staff, and hazardous waste contractors, it is important to consider the following when collecting hazardous chemical waste for proper disposal:

- Always refer to the Safety Data Sheets (SDS) of the different chemicals before beginning work to be aware of the specific hazards.
- Check the chemical compatibility of any hazardous chemical waste generated. Do NOT combine incompatible hazardous chemical wastes in the same container to avoid fires, explosions, over-pressurizations and/or spills.

- Check that the waste container is made of a compatible material.
- Ensure your waste container is large enough to safely collect all hazardous waste being generated.
- Use a funnel to avoid contaminating the outside of the container.
- Always wear PPE, work in a fume hood and ensure any reaction is complete before capping waste containers.
- Do not overfill containers. Allow for expansion by filling containers to 75% of total capacity.
- Use vented caps for aqueous waste bottles if it is possible for the hazardous chemical waste to generate gases or vapours while being stored in the laboratory. Refer to Figure 2 below for their proper use on an aqueous waste container. Containers with vented caps should be stored in the fume hood.
- Ensure lids are secured to avoid spillage during transport.
- When packing several smaller containers in single box, use suitable packing material (e.g., vermiculite) to prevent breakage; ensure the use of a sufficiently sturdy outer box.

Figure 1. SFU Solvent waste container

Figure 2. Aqueous waste container with vented cap

Figure 3. Vented caps

5.1.2 Vented Caps

Vented caps (see Figure 3 above) are designed to relieve pressure in aqueous waste containers so that explosive pressure does not build up, while still maintaining the integrity of the waste container against liquid leaks. The cap is designed to SLOWLY vent gas; the cap will not release pressure from an instantaneous reaction. Vented caps are available through Science Stores. EHS recommends using the caps when collecting different aqueous wastes in one container.

5.1.3 Hazardous Waste Labeling

Hazardous waste labels are required for hazardous chemical waste being collected from SFU laboratories. Individual labels are available from EHS, Science Stores and Science Receiving.

Waste Type	Waste Description	Label Type
Halogenated liquid waste	Organic solvents which contain halogen atoms: chlorine (Cl), fluorine (F), bromine (Br) or iodine (I); including, but not limited to: chloroform, dichloromethane (methylene chloride), carbon tetrachloride and chlorobenzene.	Yellow cardstock, affix with wire twist tie or tie-wrap See Figure 4
Non-halogenated flammable liquid waste	Organic solvents that do not contain halogen atoms; including, but not limited to: alcohols (methanol, ethanol, isopropanol), acetone, xylenes, ethyl acetate, hexanes and toluene.	White cardstock, affix with wire twist tie or tie-wrap See Figure 5
Chemical waste	Laboratory chemicals, in solid or liquid form, or materials (e.g., gloves) that come in contact with chemicals, including surplus hazardous chemicals or experimental by-products which exhibit one or more of the following: flammability, spontaneously combustible, dangerous when wet, oxidizers, poisonous/toxic, corrosives, environmentally hazardous, or containing polycyclic aromatic hydrocarbons.	Green self-adhesive See Figure 6
Sharps containers and small bottles	Sharps containers that are full and ready for pick-up, as well as smaller waste containers, bottles and vials that are too small for the standard Chemical Waste Label.	Small green self-adhesive See Figure 7

Table 4: Chemical waste labels

All waste containers and packages must be properly identified according to the following requirements:

1. Any original labels or product identifiers must be removed from waste containers and packages or otherwise defaced.
2. The waste label must be completed in ink and clearly legible.
3. Complete all fields on the label in full (see Figures 4 through 7). When possible, write full chemical name and avoid acronyms, formulas and trade names.
4. Affix the label securely to the waste container or package. Labels for halogenated liquid waste and for non-halogenated liquid waste must be secured using wire twist ties or plastic tie-wraps (cable ties). Labels for chemical wastes are self-adhesive.
5. If the waste container is too small to use a standard chemical waste label, the container must still be clearly labelled so the nature of the contents is easily communicated to others who may have to handle or dispose of the waste. Use the small green self-adhesive chemical waste labels to identify the location and contents of the small waste container.

6. Peroxide forming chemicals which are being collected for disposal must also be labeled as required for peroxide-forming compounds. For more detailed information on peroxide-forming compounds, consult: https://www.sfu.ca/srs/work-research-safety/research-safety/chemical-safety/procedures.html

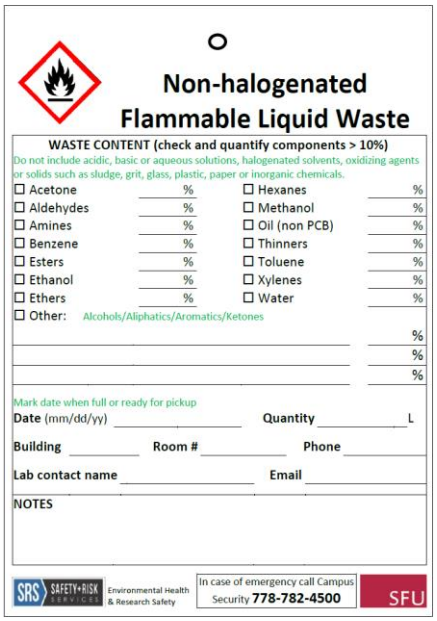

Figure 4. Non-halogenated Flammable Liquid Waste label

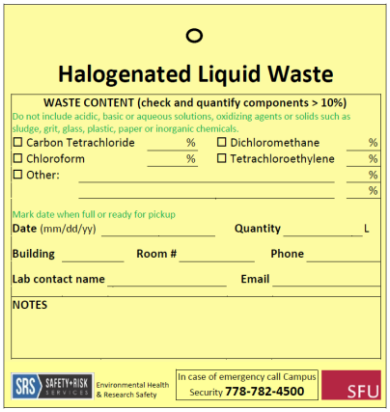

Figure 5. Halogenated Liquid Waste label

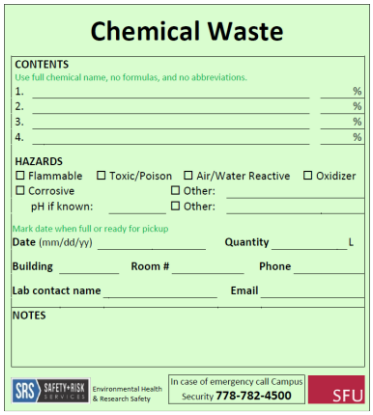

Figure 6. Chemical Waste label

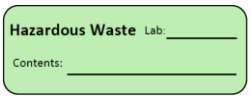

Figure 7. Chemical Waste label (small format)

5.2 Hazardous Chemical Waste Storage

Hazardous chemical waste should not be stockpiled in the lab but regularly removed by the Hazardous Waste Disposal Contractor. The following are guidelines to consider when storing hazardous chemical waste:

- Do not store hazardous chemical waste in high traffic areas, where the likelihood of a spill or knocking over a waste container is high.
- Storage areas must be well ventilated.
- Store incompatible chemical wastes separately, so they cannot react in the event of a spill or a leak. Consult relevant SDSs for incompatibilities.
- Use secondary containment to contain any spills or leaks.
- Fume hoods that are being used for experiments and reactions are not to be used to store hazardous chemical waste. If a fume hood is designated as a storage for hazardous chemical waste, it may only be used for storage (i.e., no experiments or reactions), and the fume hood must be clearly labeled as such.
- Full or partially full solvent waste containers should be stored in flammable storage cabinets. The maximum volume of any flammable material that may be stored outside a flammable storage cabinet is 25 liters.

- Flammable storage cabinets do not require mechanical ventilation if the safety caps on the cabinet remain in place and the doors remain closed. If ventilation is required for a cabinet, contact Environmental Health and Safety.

5.3 Pick-Up from Laboratories

Hazardous chemical waste is collected from the Burnaby, Surrey and Vancouver campuses by SFU's Hazardous Waste Contractor, repacked and shipped to a licensed facility for disposal. Pick-up days at the Burnaby Campus are Tuesdays and Fridays, pick up at the Surrey Campus is on every second Thursday, and pick up from Vancouver campuses are scheduled when required.

To arrange for hazardous waste removal, a request is placed through http://hazmatwaste.its.sfu.ca/ and the following information is provided:

- Name and contact information of requestor
- Campus, department, building and room #
- Requested pickup day
- Waste type, waste name and total waste quantity
- Type of container and number of containers
- Location of the waste within the laboratory or work area
- Any specific instructions regarding accessing laboratories in restricted areas

The request must be submitted by 3 pm on the day prior to the preferred collection day.

Laboratories that generate a consistent type and quantity of hazardous chemical waste can request a regular weekly pickup by placing a recurring pickup request through http://hazmatwaste.its.sfu.ca/.

Hazardous chemical waste generators must ensure waste containers are ready for collection and at the designated location by 9 am on the day of collection. Hazardous Waste Contractor personnel have the right to refuse to pick up waste which is inadequately packaged, improperly labeled or in containers with visible external contamination.

5.4 Final Disposal Destinations for SFU Hazardous Chemical Waste

Hazardous chemical waste is transported by the hazardous waste contractor from SFU to various facilities for final treatment and disposal. Only lecture bottles containing atmospheric gases and large quantities of hydraulic (vacuum pump) oil that is not mixed with any other type of waste are recycled. Most waste streams are treated with high temperature incineration and the residual ash is sent to secure landfill. A summary of how various types of chemical waste generated at SFU are disposed of is shown in Table 5.

Category of Hazardous Chemical Waste	Treatment and Disposal
Organic solvent waste (halogenated and non-halogenated)	Incineration
Aqueous waste	Incineration
Dry waste with residual contaminants	Incineration
Surplus chemicals and experimental by-products	Incineration
Mercury waste	Stabilization and landfill
Gas Cylinders (lecture size) – Hazardous	Incineration
Gas Cylinders (lecture size) – Atmospheric	Recycling
Electrophoresis gel waste	Incineration
HPLC/GC sample vials	Incineration
Sharps	Autoclaving
Contaminated glass waste	Landfill
Unknowns	Incineration
Unstable/expired	Incineration
Vacuum pump oil	Recycling

Table 5: Final Disposal Methods

6. Waste Stream Disposal Guide

Hazardous chemical waste must be collected properly to be disposed of properly off-site. Table 6 summarizes the method for collecting the common types of chemical waste generated at SFU, as well as how to have the collected and packaged waste picked up from your laboratory. Ensure your waste is labelled with the SFU hazardous waste labels, or pick-up may be delayed. Contact EHS at ehrs_sfu@sfu.ca for more information.

Category of Hazardous Chemical Waste	Description	Collecting and Packaging	Pick-up
Organic solvent waste	Segregated into halogenated and non-halogenated	White translucent 5 L Baritainer or re-used container of leak proof, compatible material equipped with a secure and sealable lid. Only fill containers to 75% capacity.	Request pick-up by Hazardous Waste contractor or contact EHS to be added to automatic pick-up list.
Aqueous waste	Water-based liquid waste that may have a pH that falls outside the 5.5-10.5 range, or contains other hazardous contaminants (e.g., heavy metals)	Container (5 L or less) of leak proof, compatible material equipped with a secure and sealable lid. Vented caps are recommended for wastes which may evolve gases. Only fill containers to 75% capacity.	Request pick-up by Hazardous Waste contractor or contact EHS to be added to automatic pick-up list.
Dry waste with residual contaminants	Any material, but not limited to, plastic bags, empty bottles, plastic containers, paper towel, gloves, pipette tips, filter paper, etc. contaminated with hazardous residue.	Collect in thick, clear plastic bag. Place bag in heavy duty cardboard box or plastic pail. Max. weight = 10 kg.	Request pick-up by Hazardous Waste contractor.

Category of Hazardous Chemical Waste	Description	Collecting and Packaging	Pick-up
Surplus chemicals or experimental waste and by-products	Any solid or liquid in an appropriate means of containment, which exhibits one or more of the following characteristics: flammability, spontaneously combustible, dangerous when wet, oxidizers, poisonous/toxic, corrosives, environmentally hazardous, or containing polycyclic aromatic hydrocarbons.	Containers for liquid chemical waste must be leak proof, compatible with waste and have a secure and sealable lid. Containers for solid chemicals shall not be re-used to hold liquid waste. Containers for solids shall have secure lids and be packed in a cardboard box with sufficient cushioning to prevent breakage. Max. weight = 10 kg.	Request pick-up by Hazardous Waste contractor.
Mercury waste	Includes any equipment containing mercury such as thermometers, barometers, blood pressure gauges, flasks of mercury, etc. as well as materials or containers contaminated with mercury.	If no mercury has spilled and the equipment is intact, place into a puncture-proof, sealable container of appropriate size to contain the mercury and equipment. Do not use an oversize container as it will be disposed of as hazardous waste. For broken equipment and mercury released from a spill, place all waste/clean-up materials in a sealed vial or jar and label as “Mercury Waste”. Contact EHS for more information concerning disposal.	For intact mercury-containing equipment, request pick-up by Hazardous Waste contractor. For broken mercury-containing equipment, or for spill clean-up materials, contact EHS.

Category of Hazardous Chemical Waste	Description	Collecting and Packaging	Pick-up
Gas cylinders	Cylinders that cannot be returned to the manufacturer, such as cylinders older than 10 years or cylinders not eligible for re-filling.	Ensure gas cylinder valve is closed and protective cap is secured to cylinder. Ensure cylinder is properly restrained while waiting for disposal.	Contact EHS for special pick-up and disposal procedures.
Electrophoresis gel waste	Gels containing trace amounts of chemicals (e.g., ethidium bromide, GelRed, SYBR Green, etc).	Collect in thick, clear plastic bag. Place bag in heavy duty cardboard box or plastic pail. Max. weight = 10 kg.	Request pick-up by Hazardous Waste contractor.
HPLC/GC sample vials	Small vials containing solutions from analysis on gas chromatography (GC) or high-performance liquid chromatography (HPLC) instruments.	Collect in thick, clear plastic bag. Place bag in heavy duty cardboard box or plastic pail. Max. weight = 10 kg.	Request pick-up by Hazardous Waste contractor.
Sharps	Needles, syringes, blades or laboratory glass capable of causing punctures or cuts.	Collect and store in appropriate sharps container. Sharps containers are available at Science Stores.	Request pick-up by Hazardous Waste contractor.
Contaminated Glass Waste	Contaminated broken and unbroken glass waste and empty glass containers.	Collect in thick, clear plastic bag. Place bag in heavy duty cardboard box or plastic pail. Max. weight = 10 kg.	Request pick-up by Hazardous Waste contractor.
Unknowns	A chemical where the chemical composition characteristics are unknown.	Leave in original container, and contact EHS.	Contact EHS to coordinate removal.

Category of Hazardous Chemical Waste	Description	Collecting and Packaging	Pick-up
Unstable/Expired	Chemicals that have decomposed or dried into potentially unstable compounds that may react or become explosive under certain conditions (e.g., ether or other peroxide forming compounds, picric acid).	All expired chemicals and, in particular, peroxide-forming compounds[1], must be handled with great care. Chemicals showing signs of deterioration, past their expiry date or with an unknown expiry date should not be opened. Isolate the bottle and advise lab occupants not to handle or disturb it. Contact EHS for assistance.	Contact EHS to coordinate removal.
Vacuum Pump Oil	Hydraulic fluids no longer required for their intended purpose or are waste products.	Collect in original supplier's container if in good condition; or collect in a 5 L solvent waste container designated for waste oil.	Request pick-up by Hazardous Waste contractor.

Table 6: Collection Guide for Common Types of Chemical Waste

[1] For more information about peroxide-forming compounds, refer to: https://www.sfu.ca/srs/work-research-safety/research-safety/chemical-safety/procedures.html

7. Hazardous Waste Storage Facility

As required under the BC Hazardous Waste Regulation, SFU is registered with the BC Ministry of Environment as a hazardous waste generator. SFU maintains a passive, on-site storage facility for hazardous waste generated at Burnaby campus. Located adjacent to the Facilities Services building, the 1200 sq. ft. facility is used by the hazardous waste contractor to:

1. Sort collected wastes into streams according to compatibility;
2. Combine different containers and bottles of compatible waste in a drum or barrel, called a lab pack. Lab packs are used to transport multiple smaller containers of waste and includes one or more inner linings and absorbent/cushioned packaging;
3. Combine certain waste streams (e.g., waste solvents and waste oils) in bulk drums;
4. Store wastes until drums or lab packs are ready for transport off site for treatment and/or disposal.

As SFU's primary business is not waste management and the facility provides passive, on-site storage, SFU is not required to submit an operational plan, contingency plan and closure plan for the facility. Nevertheless, SFU has collaborated with its hazardous waste contractor to ensure the development of a contingency plan which would satisfy the regulatory requirements and summarizes the necessary measures to ensure a safe and orderly response in the case of an emergency situation at the facility.

The facility is equipped with one safety eyewash and shower station, 3 chemical fire extinguishers and a CO_2 fire suppression system which automatically discharges following the triggering of any one ceiling heat sensor or the activation of a manual pull station.

8. Hazardous Chemical Waste Spill Response

When a hazardous chemical waste spill occurs in the lab, individuals involved must conduct an initial risk assessment to determine if evacuation is required and the level of evacuation (room, floor, or building). In the case of most small spills occurring in the lab, individuals involved may be able to respond if they have received spill response training, and have the appropriate spill cleanup materials available.

If there is any doubt about worker safety, or an individual's ability to clean up a spill, contact the lab manager and other resources such as EHS, Facilities Services, and Campus Security to assist with assessment and response. In some instances, external Hazmat response teams may have to be called upon to assist with response and clean-up.

When a hazardous chemical waste spill or release occurs:

1. Mitigate immediate hazards and obtain first aid or medical aid for injuries;
2. Inform your supervisor;
3. Secure incident site for follow-up investigation.

For more information about Spill Response see: https://www.sfu.ca/srs/work-research-safety/research-safety/lab-safety/procedures1.html

9. Incident Reporting

All incidents are required to be reported at SFU. In addition, near miss incidents (incidents where a spill, release or exposure was narrowly averted) are also required to be reported. Incidents and near misses must be immediately reported to your supervisor and EHS so a follow up investigation can be conducted. The purpose of an incident investigation is not to assign blame, but to identify the causative factors that led to incident and implement preventative measures and corrective actions to ensure a similar incident does not happen again. Investigation and follow-up of near misses serves to prevent actual accidents, spills, releases and exposures from occurring. Investigation findings can lead to the development of new safe work procedures and protocols that can be implemented across the university.

Incidents involving hazardous chemical waste include:

- hazardous chemical waste spills (solids/liquids);
- hazardous chemical waste releases (gas/vapours); and/or
- individual exposures to hazardous chemical waste through inhalation, dermal or ocular contact, subcutaneous contact (cut or puncture) or ingestion.

Incident reporting procedure:

1. Report the incident to EHS at https://www.sfu.ca/srs/contact/report/report-incident.html
2. For incidents involving medical aid or time loss for SFU employees, the employee's Supervisor is required to also complete a WorkSafeBC WCB Form 7 and forward it to Human Resources.
3. For more information, refer to the EHS website.

Certain spills and releases are required to be reported to provincial and federal authorities, depending on the nature and quantity of the material spilled or released. EHS is responsible for reporting the spills and/or releases on behalf of SFU to government authorities.

10. Recordkeeping

As required by legislation, SFU is required to maintain detailed records pertaining to the collection, movement and storage of hazardous chemical waste. EHS is responsible for collecting and keeping copies of these records. Table 7 highlights the types of records SFU is required to keep.

Type of Record	Description	Requirement
Waste Evaluation	Waste profiles and testing of all hazardous waste generated at SFU.	Keep these records for as long as a waste profile is current.
Manifests	Used to ensure chain of custody during transportation to final disposal destination.	2 years.
Training	TDG training for SFU employees required to ship hazardous waste.	Training is valid 3 years; shippers must be able to present training certificate upon request.
Incident Reports	Records of any follow-up or investigation of incidents and near misses.	Incident reports to be kept indefinitely.

Waste Records	Quantities and types of waste at the Facility.	Current information to present upon inspection.
Facility Inspection	Facility inspection reports, including any spill protection features.	Must be conducted annually, and inspection reports to be kept indefinitely.
Emergency System Testing	Testing of fire alarm and protection systems; eye wash and shower, fire extinguishers.	Must be conducted annually, and inspection reports to be kept for the life of the equipment.

Table 7: Recordkeeping Requirements

11. Inspections

Laboratories that generate hazardous chemical waste are to conduct and document monthly self-inspections using a customized checklist based on the hazards present in their laboratory. Deficiencies and items requiring follow-up action are to be reported to the laboratory supervisor or PI for correction.

Laboratories that generate hazardous chemical waste are also required to be inspected annually by the joint local safety committee responsible for that department. Inspection summaries are to be submitted to the local safety committee. Deficiencies and items requiring follow-up action are to be reported to the laboratory supervisor or PI for correction.

For inspection templates and assistance, contact EHS.

12. Resources and Contacts

Additional information and assistance may be obtained through the following resources and contacts.

12.1 Internal Resources

- SFU Environmental Health and Safety
  https://www.sfu.ca/srs/work-research-safety.html
- SFU EHS Peroxide forming compounds
  https://www.sfu.ca/srs/work-research-safety/research-safety/chemical-safety/procedures.html
- SFU EHS Spill Response
  https://www.sfu.ca/srs/work-research-safety/research-safety/lab-safety/procedures1.html
- SFU EHS Incident Reporting
  https://www.sfu.ca/srs/contact/report/report-incident.html

12.2 External Resources

- BC Hazardous Waste Regulation
  http://www.bclaws.ca/Recon/document/ID/freeside/63_88_00
- BC Occupational Health and Safety Regulation
  https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation
- BC Spill Reporting Regulation
  https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/187_2017
- Metro Vancouver Sewer Use Bylaw No. 299 Consolidated
  https://metrovancouver.org/boards/Bylaws/GVSDD_Bylaw_299_Consolidated.pdf
- Metro Vancouver Landfill Banned and Prohibited Materials
  https://metrovancouver.org/services/solid-waste/disposal-ban-program
- Federal Transportation of Dangerous Goods
  http://www.tc.gc.ca/eng/tdg/safety-menu.htm
- Workplace Hazardous Materials Information System (WHMIS)
  http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php

12.3 Emergency Contacts

Fire, Police, Ambulance (Campus Security) 778-782-4500
First Aid (Campus Security).....778-782-4500
Poison Control Centre (toll free) 800-567-8911
Poison Control Centre (Metro Vancouver).....604-682-5050

12.4 Non-Emergency Contacts

Non-Emergency Campus Security 778-782-3100
SFU Environmental Health and Safety 778-782-5935
SFU EHS Director, Research and Laboratory Safety 778-782-7265
SFU EHS Program Manager, Chemical Safety & Hazardous Waste 778-782-8633
SFU Science Stores 778-782-3305
SFU Facilities Services.....778-782-3582

13. References

1. *Health and Safety Policy*, Simon Fraser University
2. *Transportation of Dangerous Goods Regulations*, Transport Canada
3. *Occupational Health and Safety Regulation*, British Columbia Ministry of Labour
4. *Hazardous Waste Regulation*, British Columbia Ministry of Environment
5. *Spill Reporting Regulation*, British Columbia Ministry of Environment
6. *Metro Vancouver Sewer Use Bylaw No. 299 Consolidated*, Metro Vancouver
7. *Metro Vancouver Landfill Banned and Prohibited Materials*, Metro Vancouver

Appendix A. Non-hazardous chemicals

Table A.1 Non-hazardous liquid chemicals

- 2-[4-(2-hydroxyethyl)piperazin-1-yl]ethanesulfonic acid
- allura red AC
- alpha tocopherol acetate
- ampicillin sodium
- Aprotinin
- aureomycin
- bacitracin
- benzyl benzoate
- carbopol
- cefotaxime
- chloroquine
- deoxyribonuclease 1
- deuterium oxide
- dextrose solution
- dihydroxyfumaric acid hydrate
- di-potassium hydrogen orthophosphate 3-hydrate
- erada-stain
- ethoxyehtoxy ethanol
- ethylene glycol
- fungizone
- gluconic acid lactone
- glycerol
- glycerol polyglycidyl ether
- griseofulvin
- hyaluronidase
- liquid paraffin
- maltose hydrate mannide mono oleate
- methyl green
- N-nitro-L-arginine
- lanolin
- oleic acid
- pegylated interferon
- peroxidase
- poly(ethylene glycol) diglycidyl ether
- poly-lysine
- propylene carbonate protease peptone sodium chloride solution
- soybean oil
- squalane
- streptolysin O
- tetramethylene sulfone
- tocopherol
- triacetin
- triethylene glycol
- vasopressin
- vitamins
- yeast peptone dextrose (ypd) broth

Table A.2 Non-hazardous solid chemicals

- 1,3-diphenylisobenzofuran
- 2,2-di(4-tert-octylphenyl)-1-picryl hydrazyl
- 2-carboxybenzaldehyde
- 3-quinolinecarboxylic acid

A

- acetylimidazole
- adenine hemisulfate salt
- adenosine
- adenosine 5'-triphosphate,disodium salt
- agar
- agar, bacteriological grade
- agarose
- albumin
- albumin human
- albumin, bovine
- alfa-lactose
- alspha-D(+) melibiose
- alpha-methyl-mannopyranoside
- alpha-naphthyl acetate
- alumina wool
- amberlyst 15
- amino-2-naphthol-4-sulfonic acid
- aminobutiric acid
- ammonium phosphate, monobasic
- ampicilline sodium salt
- aprotinin
- anthracenecarboxylic acid
- arginine hydrochloride
- aragonite
- ascorbic acid
- ascorbate oxidase
- atipamezole hydrochloride
- azelaic acid

B

- bacto agar
- bacto peptone
- bacto tryptone
- bacto-levulose
- bacto-peptamin
- bacto-peptone
- barium sulfate
- b-cyclodextrin
- beef extract
- b-nicotinamide adinine dinucleotide
- biotin
- bleach (aqueous sodium hypochlorite solution)
- borax (sodium tetraborate)
- boron carbide
- bromo phenol blue
- brucella agar
- buthionine sulfoximine
- butylated hydroxytoluene

C

- calcite, crystal
- calcium acetate
- calcium borogluconate
- calcium carbonate
- calcium d-gluconate
- calcium dihydrogenphosphate monohydrate
- calcium lactate
- calcium sulfate dehydrate
- carbamazepine
- casamino acids
- catalase
- cellobiose
- cellulose
- cetyl alcohol
- chitin
- chlortetracycline
- cholesterol
- choline chloride
- chlorophenylalanine
- chlorophyllin sodium salt
- cinnarizine
- collagen
- cyanuric acid

D

- deoxyribonucleic acid
- dexamethasone sodium phosphate
- dextran T 500
- dextrose
- dextrose anhydrous
- diammonium phosphate
- diastase
- dibutyryladenosine AMP
- dichlorofluorescein
- diglycidyl ether of polypropylene glycol
- dihydroxyfumaric acid hydrate
- dimethylglyoxime
- di-sodium hydrogen phosphate anhydrous
- di-sodium hydrogen orthophosphate
- di-octopamine HCl
- domperidone
- drierite

E

- elastase
- ethyleneaminotetraacetic acid
- ethylenedinitrilo-tetraacetic acid disodium salt dihydrate
- europium (III) chloride hexahydrate

F

- ferric citrate
- ferrozine
- ficoll
- fluorobenzamide
- fructose
- fructose 6 phosphate
- fucose

G

- gadolinium chloride
- gelatin
- glucose
- glucose-1-diphosphate
- glucose 1 phosphate
- glucose 6 phosphate dehydrogenase
- glucose-6-sulfate (potassium salt)
- glucuronic acid
- glutamine
- glycerol 2-phosphate disodium salt hydrate
- glycine
- glycogen
- glycylglycine
- gum mastic

H

- hektoen enteric agar
- hemocyanin
- heparin lithium salt
- hepes
- heptakis (2,6-di-o-methyl)-b-cyclodextrin
- hexamethylbenzene
- hyaluronic acid
- hydrocortisone

- hydroxyethylpiperazine-n'-2-ethanesulfonic acid (HEPES)
- hydroxypropyl-b-cyclodextrin
- hypoxanthine

I

- inulin
- invertase
- isopropyl b-d-thiogalacto-pyranoside

L

- L-ascorbic acid
- lab-lemco broth
- lactose
- lanthanum chloride
- lauroylsarcosine
- leucylglycine
- lincocin
- lincomycin hydrochloride
- lipopolysaccharide
- Lithium benzoate
- lithium citrate
- lithium tetraborate
- L-lysine
- l-(-)sorbose
- lysine monohydrochloride
- lysozyme

M

- mac-conkey agar
- magnesium acetate
- magnesium carbonate
- magnesium chloride
- magnesium hydroxide
- magnesium oxide
- magnesium sulphate
- magnesium sulfate heptahydrate
- malt extract
- maltose
- mannitol
- melatonin
- methyline blue chloride
- methyl-d-glucamine
- methyl-d-glucopyranose
- minocycline
- m-9 minimal salts
- molecular sieve
- montmorillonite K10
- mueller hinton agar
- mueller hinton broth
- Myoglobin
- myo-Inositol

N

- nanoanoyl-n-methyl-glucamide
- nickel oxide + aluminum oxide
- nigrosin
- norethindrone
- n-propyl gallate

O

- octanediol
- ovalbumin

P

- paclitaxel
- palmitic acid
- p-amino benzoic acid
- paraffin
- pectin
- pectinase (fungal)
- pepsin
- pepstatin A
- pepton from meat pepsin-digested
- perylene
- phentolamine hydrochloride
- placebo drug (sugar pills)
- polybrene (= hexadimethrine bromide)
- poly-d-lysine hydrobromide
- poly (DL-lactide-co-glycolid)
- poly caprolactone
- poly ethylene vinyl acetate
- polygalacturonic acid
- poly l lactide
- Polymethylmethacrylate powder
- polystyrene (recycle plastic 6)
- polyethylene chips
- potassium chloride
- potassium citrate
- potassium di-hydrogen phosphate
- potassium iodide
- potato dextrose agar
- prednisone
- propane-1,2-diol (propylene glycol)
- protein A sepharose
- propylene glycol
- protease
- protease E
- protein g-agarose
- pseudomonas agar base
- pseudomonas Isolation agar
- pumice stone powder

Q

- quinidine sulfate salt

R

- raffinose
- RGP peptide
- ribose

S

- saccharin
- saccharin sodium
- saccharose (sucrose)
- salicylic acid
- sea sand
- sephadex
- sepharose
- silica gel
- silicon monoxide
- sodium acetate trihydrate
- sodium bicarbonate
- sodium dihydrogen orthophosphate
- sodium hydrogen carbonate
- sodium hydrogen orthophosphate (= sodium dihydrogen orthophosphate)
- sodium phosphate
- sodium phosphate dibasic dodecahydrate
- sodium phosphate monobasic
- sodium phosphate monobasic dehydrate
- sodium sulfate
- sodium thiosulphate
- soluble starch
- staplococcus medium
- starch
- starch hydrolysed
- stearic acid
- sterile water
- succinic acid
- sucrose
- syringic acid

T

- tannic acid
- tartaric acid
- tetramethylmurexide
- tetrathionate broth base
- thioflavin T
- thymidine
- thymolphthalein
- trehalose
- trifluoromethane sulfonic anhydride
- triple sugar iron agar
- tris
- tris (hydroxymethyl) aminomethane hydrochloride
- trisodium citrate
- tryptone
- tryptophan
- tryptose phosphate broth
- tungsten disulfide

U

- uracil
- uridine

V

- vanadium
- vermiculite
- vitamin B12
- vitamin D31

X

- xanthosine
- xylazine
- xylenecyanol FF