Safe Chemical Management in School Science Laboratories

Guidance for Teachers and School Administrators

Division of Epidemiology, Environmental & Occupational Health
Consumer, Environmental & Occupational Health Service
Right to Know Unit

NJ Health
New Jersey Department of Health

Acknowledgements

This guidance document was developed by the following staff from the Consumer, Environmental and Occupational Health Service in the New Jersey Department of Health (NJDOH):

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Introduction

Accidents involving hazardous chemicals can be extremely serious and may cause significant injuries and sometimes death. Long-term exposures to these chemicals can increase the risk of adverse health effects including cancer and other chronic conditions.

On-site inspections conducted by the New Jersey Department of Health's Right to Know Unit field staff have documented significant health and safety violations in public schools regarding unsafe storage and labeling of hazardous laboratory chemicals. Many of these issues are illustrated in this guidance document.

This guidance document outlines a proactive approach schools can take to keep their classrooms safe and accident-free. Expenses incurred from disposal, spills, and other incidents, including potential liabilities/lawsuits, can be considerable.

Do not let chemical hazards go unnoticed. Be aware of the potential danger.

Purpose

This document contains information that can help schools promote a safe science classroom laboratory environment. Critical steps involve:

1) Being aware of the hazards of the chemicals you use and store;

2) Disposing of unnecessary hazardous chemicals; and

3) Ensuring the chemicals you need are stored safely.

This guide is organized in two sections as follows:

- **Section I** provides guidance on conducting an evaluation of the classroom and storage areas, with an emphasis on the management of specific hazardous chemicals identified by the National Institute of Occupational Safety and Health (NIOSH). This section also includes information about certain laboratory safety equipment in order to ensure they are adequate and functional.
- **Section II** provides information on best practices for the purchase, storage, and disposal of hazardous chemicals in New Jersey public schools.

Teachers are encouraged to download this publication from the New Jersey Department of Health's website at:

https://nj.gov/health/workplacehealthandsafety/right-to-know/.

SECTION I

Assess Your Science Classroom and Storage Areas

Start by conducting a walkthrough of your science classroom and chemical storage areas. Determine if there are chemical management practices that may pose health and safety risks to students and school employees.

➲ Unlabeled, unused/excess, and expired chemicals

The following list of chemical management practices should be avoided:

- **Unlabeled chemicals**: an unlabeled container is unacceptable and arrangements should be made to remove any containers with unknown contents immediately from all classrooms and shelving following an established disposal plan.
- **Unsealed chemicals**: unsealed or not properly sealed containers can cause accidental spills and can potentially volatilize.
- **Incorrectly labeled chemicals**: containers with labels that do not list the chemical names and Chemical Abstract Service (CAS) numbers of the five most predominant chemical ingredients.
- **Unused chemicals**: leftover chemicals transferred from their original containers and stored in secondary containers such as beakers, vials, and flasks.
- **Excess chemicals**: chemicals that were purchased in excessive amounts. Excess quantities of stored flammable chemicals, for example, pose a risk to all school occupants.
- **Expired chemicals**: any chemical with an attached label older than 3 years or with an expired manufacture date.
- **Improperly stored chemicals**: chemicals that are improperly stored, such as on top of cabinets, on mobile carts, on bench tops or in fume hoods can be hazardous.

The following pages illustrate examples of improper chemical management identified during school inspections conducted by the NJDOH Right to Know staff.

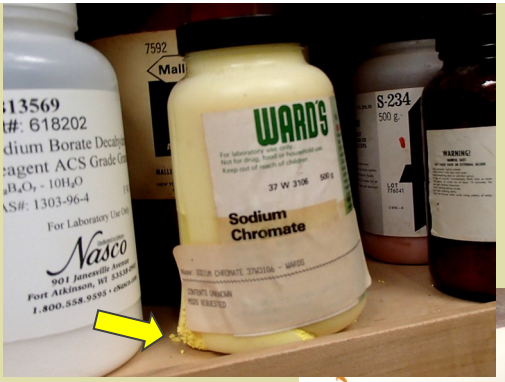
RTK Inspection Photos

Bottles with incomplete and illegible labels

Shelf with containers of expired chemicals including a jar filled with broken mercury-containing thermometers

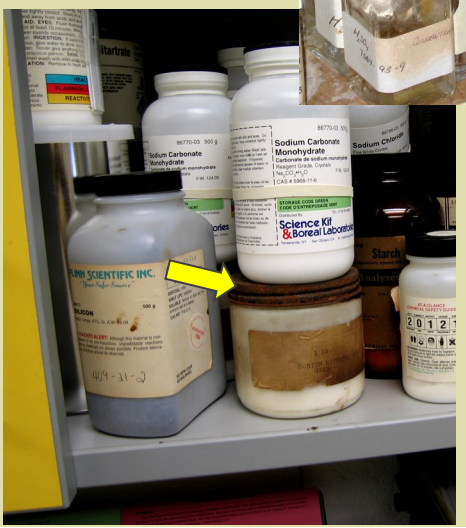
Excess quantities of chemicals

Overcrowded storage closet with carts filled with incompatible chemicals



Deteriorated container of sodium chromate, an oxidizer, corrosive, and known human carcinogen

Open vials of sulfuric acid, a highly corrosive compound



Container of sodium nitrate (an irritant and oxidizer) with rusted lid among other improperly stored containers.

STEP 2

Take a chemical inventory and check your current RTK Survey to see if any of the hazardous chemicals (from Appendix A and B) described below are used and stored in your classroom and storage closets. Also noted below are other hazardous substances of concern.

➲ Hazardous chemicals (from Appendix A and B)

The following categories were developed by NIOSH to raise awareness regarding certain substances used in science labs:

- **Substances with greater hazardous nature than educational utility** — NIOSH identified 87 chemical substances (see Appendix A, page 25) that should be eliminated from school science labs. The list includes flammables, known and suspected human carcinogens, and corrosives.
- **Substances with a hazardous nature, <u>but may have</u> potential educational utility** — These are 56 additional chemicals that NIOSH recommends be removed from school science labs but can be retained under certain circumstances (see Appendix B, page 34). These substances include explosives, highly flammables, mutagens, carcinogens, and others.

The New Jersey Department of Health analyzed the 2017 RTK Online Survey data to determine how frequently the hazardous chemicals (from Appendix A and B) chemicals were reported by NJ public schools on their inventories. Results show that 83% of these chemicals were reported by NJ schools including primary schools. The detailed surveillance findings are available in a Supplement document at: https://www.nj.gov/health/workplacehealthandsafety/documents/right-to-know/scmgt_supplement.pdf.

Removing these chemicals from schools may require revising science curricula to determine less hazardous substitutes.

NOTE: there is a subset of 28 chemicals in Appendix A and B that are not listed on the RTK Hazardous Substance List, hence not reportable on the RTK Survey (see Supplement document, p. 7). Please review the Safety Data Sheet for each of these chemicals if used or stored at your school.

➲ Other school classrooms and storage areas containing hazardous substances

Below is a list of potentially hazardous substances commonly found

RTK Inspection Photos

This group of photographs illustrates other hazardous substances often found in classrooms and/or storage areas such as (from top) paints, pigments and stains, photo processing chemicals and preserved biological specimens.

provided by the manufacturer's for information regarding physical properties, health effects, safe handling, and proper storage and disposal. Appendix C describes in detail the contents of a SDS.

- Art supplies, including paints, pigments, stains, inks, glazes, solvents, and adhesives
- Photo processing chemicals
- Preserved biological specimens
- Cleaning products
- Pesticides

See Page 22 for guidance on how to dispose lab chemicals

Promote a safe and rewarding learning experience for the students by ensuring that all equipment and storage cabinets are always in working order.

Equipment Safety

Check your work area to see if you have the recommended safety equipment available such as:

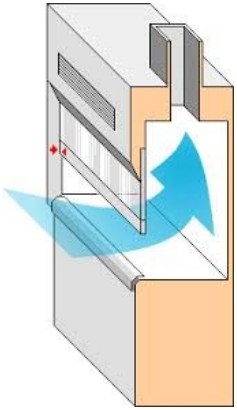
- ☑ Emergency eyewash/shower station;
- ☑ Flammable storage cabinet;
- ☑ Corrosive storage cabinet;
- ☑ Chemical fume hood;
- ☑ Personal protective equipment;
- ☑ Spill cleanup kit

A checklist for chemical fume hood and eye wash station is provided below.

Chemical fume hood

Follow this pre-check list for chemical fume hood safety:

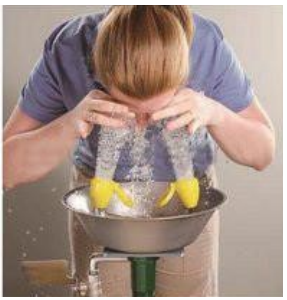
- ☑ **Confirm that the hood is operational:** If fitted with a local on/off switch, make sure the switch is in the "on" position. Never work with a malfunctioning hood. Report problems to the appropriate school administrator.



- ☑ **Confirm air flow alarm is on:** Some models may not have this feature.
- ☑ **Lower sash to optimum height:** Optimum height is the sash height at which airflow is maximized without creating turbulence. Sash height should be marked on the side of the hood.
- ☑ **Keep equipment in fume hood to an absolute minimum:** Limit to only items needed for the ongoing experiment. Keep all exhaust ports unobstructed.
- ☑ **Replace hood components prior to use:** Any hood components removed to conduct maintenance or repair activities, or to set up experimental apparatus must be replaced prior to using the hood for contaminant control.
- ☑ **Clean fume hood when finished.**
- ☑ **Do not store chemicals inside the hood.**

Emergency eye wash station

Flush eyewash station(s) weekly and check for the following:



- ☑ Is the water clear?
- ☑ Are the jets working properly?
- ☑ Is the water tepid?*
- ☑ Is the area around the station clear of obstructions?
- ☑ Is there a bucket located under the eyewash to collect runoff?
- ☑ Are there any leaks?
- ☑ Is there an emergency contact number nearby?

Note that public schools are required to comply with the NJDOH PEOSH Medical Services and First Aid Standard (see Resources starting page 49).

*ensure that the water used for the entire 15 minutes of required washing is not too hot or too cold to be safe for rinsing the eyes. The American National Standards Institute (ANSI) standard for eyewashes and emergency showers (Z358.1-2014) defines tepid water as water at temperatures between 60 to 100 ^{0}F.

SECTION II

Make Chemical Inventory Management a Priority

Regular inventory management is key to fostering a healthy and safe science classroom. This involves prudent purchasing, compliant labeling, and proper storage and disposal.

➲Decision-Making and Exploring Other Options

Chemical hazards in the laboratory can be minimized by using hands-on classroom kits, demonstrations or video presentations as a substitute for some experiments. Also consider the following:

- Make an educated decision as to whether you want to introduce this chemical to your classroom. Always keep in mind that you will have to safely dispose of any wastes you generate.
- Check and see if the chemical is included in Appendix A and B.
- Determine if there is a safer substitute you could purchase.

➲Guidelines for Teachers on Purchasing

When purchasing chemicals is necessary, adhere to the following guidelines:

- Obtain the manufacturer's Safety Data Sheet (SDS) for the chemical or product prior to purchase. See Appendix C for an SDS description.
- Review the hazards of the chemical(s).
- Get guidance from your Right to Know Coordinator or someone who oversees what can be safely ordered.
- Check to see if the ingredients are on the NJ Right to Know Hazardous Substance List and if they are Special Health Hazards, i.e., corrosive, carcinogen, and so on.

  ⇒ review the NJ Right to Know Hazardous Substance Fact Sheet for each ingredient at:
  https://web.doh.state.nj.us/rtkhsfs/indexfs.aspx?lan=english
- Determine if you will have any waste chemicals from your lesson and plan how you will safely dispose of it.
- Order only the quantity of chemical necessary for your lessons for one school year or less.
- Do not purchase in bulk just because it is cheaper. Hazardous chemicals cost money to inventory, store, dispose of and pose a hazard that could cost far more if there is a fire, spill, or accidental exposure.

Labeling

All containers of chemicals in public schools are required to be labeled according to the NJ Right to Know regulations (N.J.A.C. 8:59—Subchapter 5). The label must list the chemical names and Chemical Abstract Service (CAS) numbers of the five most predominant chemical ingredients in the container regardless if they are hazardous or non-hazardous. Any hazardous ingredients which are not in the top five ingredients must also be listed on the label (except if it is below 1%, or below 0.1% for carcinogens, mutagens, and teratogens).

Example:

NAME	CAS#
Hydroquinone	123-31-9
Paraformaldehyde	30525-89-4
Sodium methanal bisulfite	870-72-4
Triethylene glycol	112-27-6
Water	7732-18-5

Although manufacturers are not required to list the top five ingredients and their CAS numbers on the product label, many do. When ordering, you should choose products that list the ingredients and CAS numbers on the label whenever possible.

Containers which are two ounces or smaller may be labeled by means of a code or number system if the code or number system will allow the employee or an emergency responder ready access to the names and CAS numbers of the ingredients.

If a substance is poured from a labeled container into an unlabeled container, the substance must be used up by the end of the day and the container emptied. If a substance remains in the container beyond that day, it must be labeled.

There are some exemptions from the requirement to include RTK labeling. For containers that are labeled according to specific

Federal and State laws, the manufacturer's label is acceptable when certain requirements are met. One example is for products that:

1) are two kilograms (4.4 pounds) or two liters (0.53 gallons) or smaller;
2) are labeled according to the OSHA Hazard Communication Standard; and
3) do not contain special health hazards.

If there is a Special Health Hazard ingredient then you need to list the chemical name and CAS number on the label. Consult the Right to Know Special Health Hazardous Substance List to identify such ingredients as follows: https://www.nj.gov/health/workplacehealthandsafety/documents/right-to-know/shhl_alpha.pdf

Valves, outlets, sample connections, drains and vents of pipeline systems must be labeled where a substance can be released into the environment. This includes compressed air, gas, and water lines in laboratories.

For more information regarding RTK labeling, please go to: https://www.nj.gov/health/workplacehealthandsafety/right-to-know/odispubr.shtml.

Teachers Should

- Check to make sure that all chemicals in your classroom and storage areas are properly labeled and include the manufacturer's Globally Harmonized System (GHS) compliant label (see illustration below) and the chemical names and CAS numbers of the top 5 ingredients.
- Make sure the labels are not damaged or obscured.
- Put a date delivered on new chemical containers when they arrive.
- Use up older chemicals in stock before opening new ones.
- Use hands-on classroom kits, demonstrations or video presentations as a substitute for some student experiments that generate chemical wastes.
- Keep storage areas neat and organized.

Components of a GHS-Compliant Label

1. Product identifier
2. Signal word
3. Hazard statement
4. Precautionary statements
5. Supplier information
6. Pictograms (see **Appendix D** for additional information)

Teachers Should Not

- Transfer chemicals into unlabeled containers and then leave them beyond the school day.
- Bring unlabeled chemicals or preserved biological specimens from home without permission from the school's Right to Know Coordinator.

Chemical Storage

An adequate chemical storage system separates materials according to chemical compatibility and hazard class. This section provides guidance on creating a safe storage area. Overall the following principles apply:

- All chemicals used in the classroom should be stored inside a cabinet or on a shelf that is secured to a wall with a ¾" front edge lip.
- All chemical storage areas should have doors with locks, be well ventilated, and access to students should be restricted at all times.
- All stored containers should be properly closed.

The DON'TS Regarding Chemical Storage

- No heavy materials, liquids, or large containers on high shelves
- No storage on tops of cabinets
- No storage on the floor, not even temporarily
- No storage on bench tops or fume hoods
- No storage on shelves above eye level
- No storage with or near food/drink
- No storage in personal refrigerators
- No exposure to direct heat, sunlight, or high temperature variability
- Never use food containers for storage

Chemical Compatibility

Chemicals should be stored by compatibility, not alphabetically. See the following guidance:

- Acids in dedicated acid cabinet; **nitric acid should be stored alone.**
- Highly toxic chemicals stored in dedicated, locked cabinet that is visibly labeled.
- Volatile chemicals stored in ventilated cabinet.
- Flammables stored in liquid storage cabinet.
- Water sensitive stored in separate, water-tight cabinet in a cool dry location.

RTK Inspection Photos

Chemical containers improperly stacked on shelf

Chemicals stored on the floor and in excess quantities

Chemicals used for class experiments permanently stored on mobile carts

Suggested Shelf Storage*

A suggested arrangement of compatible chemical families on shelves in a chemical storage room is depicted in the table below. Please note that this does not mean that these chemicals should be used in a school science laboratory.

- First, sort chemicals into **organic** and **inorganic** classes.
- Next, separate into the compatible families listed in the table below. These can then be arranged alphabetically.

INORGANICS	ORGANICS
1. Metals, Hydrides	**1.** Acids, Anhydrides, Peracids
2. Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates	**2.** Alcohols, Amides, Amines, Glycols, Imides, Imines
3. Amides, Azides**, Nitrates** (except Ammonium nitrate), Nitrites**, Nitric acid	**3.** Aldehydes, Esters, Hydrocarbons
4. Carbon, Carbonates, Hydroxides, Oxides, Silicates	**4.** Ethers**, Ethylene oxide, Halogenated hydrocarbons, Ketenes, Ketones
5. Carbides, Nitrides, Phosphides, Selenides, Sulfides	**5.** Epoxy compounds, Isocyanates
6. Chlorates, Chlorites, Hydrogen Peroxide**, Hypochlorites, Perchlorates**, Perchloric acid**, Peroxides	**6.** Azides**, Hydroperoxides, Peroxides
7. Arsenates, Cyanates, Cyanides	**7.** Nitriles, Polysulfides, Sulfides, Sulfoxides
8. Borates, Chromates, Manganates, Permanganates	**8.** Cresols, Phenols
9. Acids (except Nitric acid)	
10. Arsenic, Phosphorous**, Phosphorous Pentoxide**, Sulfur	

*Adapted from CPSC/NIOSH School Chemistry Laboratory Safety Guide: https://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf

**Chemicals deserving special attention because of their potential instability.

The following diagrams provide suggestions for shelf storage for inorganics and organics.

a. Suggested Shelf Storage Pattern for Inorganics*

Do NOT store chemicals ABOVE EYE LEVEL

Inorganic #10 Arsenic, Phosphorous Phosphorous Pentoxide, Sulfur	**Inorganic #7** Arsenates, Cyanates, Cyanides **STORE AWAY FROM WATER**
Inorganic #2 Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates	**Inorganic #5** Carbides, Nitrides, Phosphides, Selenides, Sulfides
Inorganic #3 Amides, Azides, Nitrates, Nitrites **EXCEPT Ammonium nitrate -** **STORE AMMONIUM NITRATE AWAY FROM ALL OTHER SUBSTANCES**	**Inorganic #8** Borates, Chromates, Manganates, Permanganates
Inorganic #1 Hydrides, Metals STORE AWAY FROM WATER. STORE ANY FLAMMABLE SOLIDS IN DEDICATED CABINET	**Inorganic #6** Chlorates, Chlorites, Hypochlorites, Hydrogen Peroxide, Perchlorates, Perchloric acid, Peroxides
Inorganic #4 Carbon, Carbonates Hydroxides, Oxides, Silicates	Miscellaneous

Acid Storage Cabinet	**Nitric Acid Storage Cabinet**

Do NOT store chemicals ON THE FLOOR

*Adapted from CPSC/NIOSH School Chemistry Laboratory Safety Guide: https://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107

b. Suggested Shelf Storage Pattern for Organics*

Do NOT store chemicals ABOVE EYE LEVEL

Organic #2 Alcohols, Amides, Amines, Imides, Imines, Glycols STORE FLAMMABLES IN A DEDICATED CABINET	**Organic #8** Cresols, Phenol
Organic #3 Aldehydes, Esters, Hydrocarbons STORE FLAMMABLES IN A DEDICATED CABINET	**Organic #6** Azides, Hydroperoxides, Peroxides
Organic #4 Ethers, Ethylene oxide, Halogenated Hydrocarbons, Ketenes, Ketones STORE FLAMMABLES IN A DEDICATED CABINET	**Organic #1** Acids, Anhydrides, Peracids STORE CERTAIN ORGANIC ACIDS IN ACID CABINET
Organic #5 Epoxy compounds, Isocyanates	Miscellaneous
Organic #7 Nitriles, Polysulfides, Sulfides, Sulfoxides, etc.	Miscellaneous

FLAMMABLES CABINET 1 Organic #2 Alcohols, Glycols, etc	**FLAMMABLES CABINET 2** Organic #3: Hydrocarbons, Esters, etc.
FLAMMABLES CABINET 3 Organic #4	**TOXIC SUBSTANCES CABINET**

Do NOT store chemicals ON THE FLOOR

*Adapted from CPSC/NIOSH School Chemistry Laboratory Safety Guide: https://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107

➲ Disposal of Hazardous Laboratory Chemicals

Some chemical wastes generated by schools may need to be managed as hazardous wastes. A hazardous chemical waste is defined as having one or more of the following characteristics: ignitability, corrosivity, reactivity, and toxicity. Chemical wastes are regulated by the NJ Department of Environmental Protection (NJDEP).

Hazardous wastes need to be managed from their initial point of generation until their ultimate point of disposal, known as "cradle to grave." An assigned EPA ID Number must be noted on all manifests for tracking disposal of school wastes and must be site specific for the address given.

School liability does not end when the wastes leave the school, and school administrators must make sure they receive a copy of the shipping manifest stating that their wastes arrived at their destination (e.g., treatment, storage, or disposal facility). Some schools may qualify for an exemption depending on the amount of generated waste. **Schools can contact the NJDEP Bureau of Hazardous Waste Compliance and Enforcement for more information (see Disposal Resources at the back of the booklet)**.

The disposal process may differ depending on the school district. NJDOH recommends beginning by developing a "Manage in Place" plan for all wastes until they can be properly disposed as follows:

- Store all waste in containers that are in good condition and are compatible with their contents.
- Clearly and permanently label each container as to its contents and label as hazardous waste.
- Store waste in a designated area away from normal laboratory operations to prevent unauthorized access.
- Store waste bottles away from sinks and floor drains.
- Do not completely fill waste bottles; leave several inches of space at the top of each waste container.
- Cap all waste bottles.

- Do not pour chemicals down the drain (unless authorized by a local sewer authority).
- Make sure you clean out acid neutralization tanks every 2 years or as per manufacturers' recommendations.
- Do not treat hazardous waste on-site.
- Contact professional, licensed hazardous waste haulers/ transporters that will ensure appropriate disposal.

Appendix A

Substances with Greater Hazardous Nature Than Educational Utility

The 87 chemical substances listed below were obtained from the School Chemistry Laboratory Safety Guide published by the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH) in collaboration with the U.S. Consumer Product Safety Commission (CPSC) [2006]. Carcinogenic substances were updated using the Report on Carcinogens (14th Edition) published by the National Toxicology Program [2016]. NIOSH recommends removing these substances from all school laboratories. See Appendix E for definitions of terms listed in the "Hazard" column.

Chemical & [CAS Number]	Count*	Hazard
Acrylonitrile [107-13-1]	1	Flammable (NFPA = 3), reasonably anticipated human carcinogen
Ammonium chromate [7788–98–9]	16	Oxidizer, known human carcinogen
Aniline [62–53–3]	8	Combustible, may be fatal if inhaled, ingested or absorbed through the skin
Aniline hydrochloride [142–04–1]	5	May be fatal if inhaled, ingested, or absorbed through the skin
Anthracene [102–12–7]	2	Irritant, may cause an allergic skin reaction
Antimony trichloride [10025–91–9]	9	Corrosive

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Arsenic and its compounds [N/A]	24	Known human carcinogen
Asbestos [1332–21–4]	0	Known human carcinogen
Ascarite II [N/A]	†	Corrosive, may be fatal if ingested
Benzene [71–43–2]	6	Flammable (NFPA = 3), known human carcinogen, mutagen
Benzoyl peroxide [94–36–0]	6	Flammable (NFPA = 3), explosive, oxidizer
Calcium cyanide [592–01–8]	1	May be fatal if inhaled or ingested
Carbon disulfide [75–15–0]	29	Flammable (NFPA = 4), acute central nervous system toxicity and peripheral neurotoxicity
Carbon tetrachloride [56–23–5]	18	May be fatal if inhaled or ingested, reasonably anticipated human carcinogen
Chloral hydrate [302–17–0]	0	Controlled barbiturate
Chlorine [7782–50–5]	15	Oxidizer, corrosive, may be fatal if inhaled
Chloroform [67–66–3]	38	Reasonably anticipated human carcinogen

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Chloropromazine [50–53–3]	†	Controlled substance
Chromium hexavalent compounds [N/A]	1	Known human carcinogen
Chromium trioxide [1333–82–0]	8	Oxidizer, corrosive, known human carcinogen
Colchicine [64–86–8]	1	May be fatal if ingested, mutagen
p-Dichlorobenzene [106–46–7]	143	Combustible, reasonably anticipated human carcinogen
Dimethylaniline [121–69–7]	1	May be fatal if inhaled, ingested, or absorbed through the skin
p-Dioxane [123–91–1]	1	Flammable (NFPA = 3), forms peroxides (Group 2), reasonably anticipated human carcinogen
Ethylene dichloride (1,2-Dichloroethane) [107–06–2]	28	Flammable (NFPA = 3), reasonably anticipated human carcinogen, mutagen
Ethylene oxide [75–21–8]	0	Flammable (NFPA = 4), explosive (NPFA = 3), may be fatal if inhaled or absorbed through the skin, known human carcinogen

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Gunpowder [N/A]	†	Explosive
Hexachlorophene [70–30–4]	0	May be fatal if inhaled, ingested or absorbed through the skin, possible teratogen
Hydriodic acid [10034–85–2]	3	Corrosive, may be fatal if inhaled or ingested
Hydrobromic acid [10035–10–6]	0	Corrosive, may be fatal if inhaled or ingested
Hydrofluoric acid [7664–39–3]	1	Corrosive, may be fatal if inhaled or ingested (liquid and vapor can cause severe burns not always immediately painful or visible but possibly fatal)
Hydrogen [1333–74–0]	73	Flammable (NFPA = 4)
Lead arsenate [7784–40–9]	0	Known human carcinogen, teratogen
Lead carbonate [1319–46–6]	†	May be fatal if inhaled or ingested, neurotoxic
Lead (VI) chromate [7758–97–6]	6	May be fatal if inhaled or ingested, known human carcinogen
Lithium, metal [7439–93–2]	110	Combustible, water reactive

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Lithium nitrate [7790–69–4]	275	Oxidizer
Magnesium, metal (powder) [7439–95–4]	521	May ignite spontaneously on contact with water or damp materials
Mercuric chloride [7487–94–7]	76	May be fatal if inhaled, teratogen
Mercury [7439–97–6]	78	Teratogen, neurotoxin, corrosive, may be fatal if inhaled or ingested. **NOTE: See page 33 for educational resources available from the Agency for Toxic Substances and Disease Registry**.
Methyl iodide (iodomethane) [74–88–4]	0	May be fatal if inhaled, ingested or absorbed through the skin, potential carcinogen (NIOSH)
Methyl methacrylate [80–62–6]	6	Flammable (NFPA = 3), explosive (vapor)
Methyl orange [547–58–0]	†	Possible mutagen
Methyl red [493–52–7]	†	Possible mutagen
Nickel, metal [7440–02–0]	204	Reasonably anticipated human carcinogen, mutagen
Nickel oxide [1314–06–3]	0	Reasonably anticipated human carcinogen, mutagen
Nicotine [54-11-5]	7	May be fatal if inhaled, ingested, or absorbed through the skin

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Osmium tetroxide [20816–12–0]	0	May be fatal if inhaled or ingested
Paris green [12002–03–8]	0	May be fatal if inhaled, ingested or absorbed through the skin, known human carcinogen
Phenol [108–95–2]	38	Combustible (liquid and vapor), corrosive, may be fatal if inhaled, ingested or absorbed through the skin
Phosphorus pentoxide [1314–56–3]	4	Water reactive, corrosive
Phosphorous, red, white [7723–14–0]	16	May ignite spontaneously in air
Phthalic anhydride [85–44–9]	29	Combustible/finely dispersed particles form explosive mixtures in air, corrosive
Potassium, metal [7440–09–7]	124	Flammable (NFPA = 3), water reactive, forms peroxides
Potassium oxalate [583–52–8]	†	Corrosive, may be fatal if ingested
Potassium sulfide [1312–73–8]	15	Spontaneously combustible, explosive in dust or powder form, corrosive
Pyridine [110–86–1]	8	Flammable (NFPA = 3), possible mutagen
Selenium [7782–49–2]	3	Severe irritant

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Silver cyanide [506–64–9]	1	May be fatal if inhaled, ingested or absorbed through the skin
Silver nitrate [7761–88–8]	580	Oxidizer, corrosive, may be fatal if ingested
Silver oxide [20667–12–3]	†	Oxidizer
Sodium arsenate [7631-89-2]	5	May be fatal if inhaled or ingested, known human carcinogen
Sodium arsenite [7784–46–5]	1	Known human carcinogen, teratogen
Sodium azide [26628–22–8]	9	Explosive, may be fatal if ingested or absorbed through the skin
Sodium chromate [7775–11–3]	111	Oxidizer, corrosive, known human carcinogen
Sodium cyanide [143–33–9]	4	May be fatal if inhaled, ingested or absorbed through the skin
Sodium dichromate [10588–01–9]	43	Oxidizer, corrosive, may be fatal if ingested, known human carcinogen
Sodium nitrite [7632–00–0]	98	Oxidizer
Sodium sulfide [1313–82–2]	73	Corrosive, may be fatal if inhaled or ingested
Sodium thiocyanide [540–72–7]	†	Contact with acid liberates very toxic gas

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

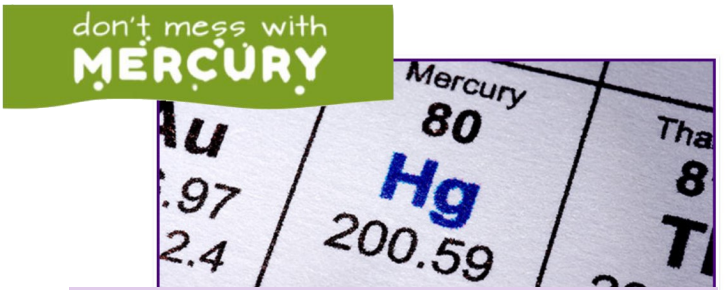
Chemical & [CAS Number]	Count*	Hazard
Stannic chloride (anhydrous) [7646–78–8]	24	Corrosive, hydrochloric acid liberated upon contact with moisture and heat
Stearic acid [57–11–4]	†	May form combustible dust concentration in the air
Strontium [7440–24–6]	1	Water reactive
Strontium nitrate [10042–76–9]	320	Oxidizer
Sudan IV [85–83–6]	†	Irritant, toxic properties have not been thoroughly evaluated
Sulfuric acid, fuming [8014–95–7]	0	Corrosive, may be fatal if ingested
Tannic acid [1401–55–4]	†	Irritant
Tetrabromoethane [79–27–6]	0	May be fatal if inhaled, ingested or absorbed through the skin
Thioacetamide [62–55–5]	44	Reasonably anticipated human carcinogen
Thiourea [62–56–6]	10	Reasonably anticipated human carcinogen
Titanium tetrachloride [7550–45–0]	3	Water reactive, corrosive, may be fatal if inhaled

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Titanium trichloride [7705–07–9]	0	Water reactive, corrosive
o-Toluidine [95–53–4]	2	Known human carcinogen, mutagen
Uranium [7440–61–1]	0	Radioactive material
Uranyl acetate [541–09–3]	3	Radioactive material
Urethane [51–79–6]	0	Combustible, reasonably anticipated human carcinogen
Wood's metal [8049–22–7]	†	May be fatal if inhaled or ingested, known human carcinogen (cadmium), neurotoxic

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration

†chemical not listed on RTK Hazardous Substance List



The Agency for Toxic Substances and Disease Registry's **Don't Mess With Mercury** website provides educational materials and tools for students, teachers, and school administrators in English and Spanish to help prevent mercury exposure incidents. Visit: https://www.atsdr.cdc.gov/dontmesswithmercury/.

Appendix B

Substances With Hazardous Nature, But May Have Potential Educational Utility

The 56 chemical substances listed in the following table should be removed from the school if alternatives can be used. For those that must be retained, amounts should be kept to a minimum, and are appropriate for advanced-level high school classes only. The list below was obtained from the School Chemistry Laboratory Safety Guide published by the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health in collaboration with the U.S. Consumer Product Safety Commission (CPSC) [2006]. Carcinogenic substances were identified and updated using the Report on Carcinogens (14th Edition) published by the National Toxicology Program [2016]. See Appendix E for definitions of terms listed in the "Hazard" column.

Chemical & [CAS Number]	Count*	Hazard
Acetamide [60–35–5]	62	Combustible solid
Aluminum chloride [7446–70–0]	159	Water reactive, corrosive
Ammonium bichromate [7789–09–5]	218	Oxidizer, corrosive, known human carcinogen
Ammonium oxalate [1113–38–8]	95	May be fatal if inhaled or ingested
Ammonium vanadate [7803–55–6]	20	May be fatal if inhaled or ingested

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Antimony [7440–36–0]	106	May be fatal if inhaled, irritant
Antimony oxide [1309–64–4	6	Irritant
Antimony potassium tartrate [28300-74-5]	10	Irritant
Barium chloride [10361–37–2]	†	May be fatal if ingested, irritant
Benzone (phenylbutazone) [50–33–9]	†	Irritant
Beryllium carbonate [66104–24–3]	0	Irritant
Bromine [7726–95–6]	50	Oxidizer, corrosive, may be fatal if inhaled or ingested
Cadmium and cadmium compounds [N/A]	76	Known human carcinogen
Carmine [860–22–0]	†	Irritant, burning may produce carbon monoxide, carbon dioxide, sulfur oxides, and nitrogen oxides
Catechol [120–80–9]	11	Corrosive
Chromic acid [7738–94–5]	2	Oxidizer, known human carcinogen

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Appendix B - cont'd

Chemical & [CAS Number]	Count*	Hazard
Chromium acetate [1066–30–4]	12	Irritant
Cobalt, metal [7440–48–4]	58	Reasonably anticipated human carcinogen
Cobalt nitrate [10141–05–6]	†	Oxidizer, irritant
Cyclohexane [110–82–7]	136	Flammable (NFPA = 3)
Cyclohexene [110–83–8]	26	Flammable (NFPA= 3), corrosive, forms peroxides
Dichloroindophenol sodium salt [620–45–1]	†	Irritant
2,4-Dinitrophenol [51–28–5]	0	Irritant
Ferrous sulfate [7720–78–7]	145	Irritant
Formaldehyde (formalin) [50–00–0]	24	Flammable (NFPA = 3), known human carcinogen
Fuchsin (acid/basic) [3244–88–0/ 632–99–5]	†	Irritant
Gasoline [8006–61–9]	15	Flammable (NFPA = 3)
Hematoxylin [517–28–2]	†	Irritant
Hydrogen sulfide [7783–06–4]	3	Corrosive

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Hydroquinone [123–31–9]	13	May be fatal if ingested
Isoamyl alcohol (isopentyl alcohol) [123–51–3]	85	Irritant, combustible liquid and vapor
Isobutyl alcohol [78–83–1]	101	Flammable (NFPA = 3)
Magnesium chlorate [10326–21–3]	†	Irritant
Methyl ethyl ketone [78–93–3]	70	Irritant, flammable (NFPA = 3)
Methyl oleate [112–62–9]	†	Toxic properties not investigated
Nickel carbonate [3333–67–3]	1	Reasonably anticipated human carcinogen
Nickelous acetate [373–02–4]	2	Reasonably anticipated human carcinogen
Pentane [109–66–0]	28	Irritant, flammable (NFPA = 4)
Petroleum ether [8032–32–4]	88	Flammable (NFPA = 4)
1-Phenyl-2-Thiourea (Phenylthiocarbamide) [103–85–5]	4	May be fatal if inhaled or ingested
Potassium chlorate [3811–04–9]	312	Oxidizer
Potassium chromate [7789–00–6]	288	Oxidizer, known human carcinogen

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Potassium periodate [7790–21–8]	†	Oxidizer
Potassium permanganate [7722–64–7]	585	Oxidizer, corrosive
Salol (phenyl salicylate) [118–55–8]	†	Irritant
Sodium bromate [7789–38–0]	19	Oxidizer
Sodium chlorate [7775–09–9]	167	Oxidizer
Sodium fluoride [7681–49–4]	152	May be fatal if inhaled or ingested
Sodium oxalate [62–76–0]	†	Corrosive, may be fatal if ingested
Sodium nitrate [7631–99–4]	†	Oxidizer, irritant
Sodium silicofluoride [16893–85–9]	0	Toxic
Sudan III [85–86–9]	†	Decomposes to oxides of nitrogen
Sulfamethazine [57–68–1]	†	Irritant
Toluene [108–88–3]	120	Flammable (NFPA = 3), irritant, may be fatal if ingested

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Chemical & [CAS Number]	Count*	Hazard
Trichloroethylene (TCE) [79–01–6]	11	Known human carcinogen **NOTE: See below for educational resources available from the Agency for Toxic Substances and Disease Registry**.
Xylenes [1330–20–7]	74	Flammable (NFPA = 3), irritant, may be fatal if ingested

*number of times reported by schools on their 2017 RTK Survey, at 100% concentration
†chemical not listed on RTK Hazardous Substance List

Trichloroethylene (TCE)

CAS #: 79–01–6

Long-term exposures to TCE may increase the risk of getting cancer. Short-term exposures to TCE can increase the risk of health impacts on the developing fetus in the first trimester of pregnancy. To learn more, visit: https://www.atsdr.cdc.gov/toxfaqs/tfacts19.pdf.

Appendix C

Safety Data Sheet

The OSHA* Hazard Communication Standard (HCS) requires that the chemical manufacturer, distributor, or importer provide Safety Data Sheets (SDSs) (formerly MSDSs or Material Safety Data Sheets) for each hazardous chemical to downstream users to communicate information on these hazards. Where the use of chemicals is necessary for your lesson plan, it is necessary to obtain the manufacturer's SDS for the chemical or product prior to purchase.

The information contained in the SDS is largely the same as the MSDS, except now the SDSs are required to be presented in a consistent user-friendly, 16-section format. This brief provides guidance to help workers who handle hazardous chemicals to become familiar with the format and understand the contents of the SDSs.

The SDS includes information such as the properties of each chemical; the physical, health, and environmental health hazards; protective measures; and safety precautions for handling, storing, and transporting the chemical. The SDS preparers may also include additional information in various section(s).

A summary of the 16 sections is as follows:

Section 1 (Identification) identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier.

Section 2 (Hazard(s) Identification) identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards.

Section 3 (Composition/Information on Ingredients) identifies the ingredient(s) contained in the product indicated on the SDS,

*Occupational Safety and Health Administration

including impurities and stabilizing additives. This section includes information on substances, mixtures, and all chemicals where a trade secret is claimed.

Section 4 (First-Aid Measures) describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical.

Section 5 (Fire-Fighting Measures) provides recommendations for fighting a fire caused by the chemical.

Section 6 (Accidental Release Measures) provides recommendations on the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties, or the environment. It may also include recommendations distinguishing between responses for large and small spills where the spill volume has a significant impact on the hazard.

Section 7 (Handling and Storage) provides guidance on the safe handling practices and conditions for safe storage of chemicals.

Section 8 (Exposure Controls/Personal Protection) indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure.

Section 9 (Physical and Chemical Properties) identifies physical and chemical properties associated with the substance or mixture. Information such as the evaporation rate, specific gravity, and flash points are given.

Section 10 (Stability and Reactivity) describes the reactivity hazards of the chemical and the chemical stability information. This section is broken into three parts: reactivity, chemical stability, and other.

Section 11 (Toxicological Information) identifies toxicological and health effects information or indicates that such data are not available.

Section 12 (Ecological Information — non-mandatory) provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment.

Section 13 (Disposal Considerations — non-mandatory) offers suggestions for the disposal of the chemical. Local, state, and Federal regulations should be followed.

Section 14 (Transport Information — non-mandatory) gives the transportation information required by the Department of Transportation. This often identifies the dangers associated with the chemical, such as flammability, toxicity, radioactivity, and reactivity.

Section 15 (Regulatory Information — non-mandatory) identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. The information may include any national and/or regional regulatory information of the chemical or mixtures (including any OSHA, DOT, EPA, or CPSC regulations).

Section 16 (Other Information) indicates when the SDS was prepared or when the last known revision was made. The SDS may also state where the changes have been made to the previous version. You may wish to contact the supplier for an explanation of the changes. Other useful information also may be included here.

Appendix D

OSHA Hazard Communication Standard Pictograms

The OSHA Hazard Communication Standard (HCS) requires pictograms on labels to alert users of the chemical hazards. As shown below, each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). NOTE: NJ public schools must comply with both Right to Know and PEOSH HCS labeling requirements. Pictograms must be included on labels in addition to the chemical names and CAS numbers.

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame**  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark**  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  • Gases Under Pressure	**Corrosion**  • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	**Environment** (Non-Mandatory)  • Aquatic Toxicity	**Skull and Crossbones**  • Acute Toxicity (fatal or toxic)

Appendix E

Useful Terms and Definitions

Absorption

Absorbing chemicals through the skin (dermal) contact can cause effects that are relatively innocuous to more severe. Many chemicals can also cross the skin barrier and be absorbed into the blood system. The eyes are particularly sensitive to chemicals.

Acid

A substance that dissolves in water and releases hydrogen ions (H+); acids cause irritation, bums, or more serious damage to tissue, depending on the strength of the acid, which is measured by pH.

Acute toxicity

Adverse effects resulting from a single dose, or exposure to a substance for less than 24 hours.

Allergy

An exaggerated immune response to a foreign substance causing tissue inflammation and organ dysfunction.

Asphyxiant

A substance that interferes with the transport of an adequate supply of oxygen to the body by either displacing oxygen from the air or combining with hemoglobin, thereby reducing the blood's ability to transport oxygen.

Base

A substance that dissolves in water and releases hydroxide ions (OH−); bases cause irritation, burns, or more serious damage to tissue, depending on the strength of the base, which is measured by pH.

Carcinogen

A substance that causes cancer.

CAS Registry number

An internationally recognized unique registration number assigned by the Chemical Abstracts Service to a chemical, a group of similar chemicals, or a mixture.

Chronic toxicity

Adverse effects resulting from repeated doses of, or exposures to, a substance by any route for more than three months.

Combustible liquid

A liquid with a flash point of 100 °F (37.8 °C) or higher.

Compatible materials

Substances that do not react together to cause a fire, explosion, violent reaction or lead to the evolution of flammable gases or otherwise lead to injury to people or danger to property.

Consumer Product Safety Commission (CPSC)

An independent U.S. Federal regulatory agency that protects the public against unreasonable risk of injury and death associated with consumer products.

Corrosive

A substance capable of causing visible destruction of, and/or irreversible changes to living tissue by chemical action at the site of contact (i.e., strong acids, strong bases, dehydrating agents, and oxidizing agents).

Department of Transportation (DOT)

U.S. Federal agency that regulates the labeling and transportation of hazardous materials.

Environmental Protection Agency (EPA)

U.S. Federal agency that develops and enforces regulations to protect human health and the natural environment.

Explosive

A substance that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Federal Hazardous Substances Act (FHSA)

The Federal Hazardous Substances Act (15 U.S.C 1261–1278), administered by the Consumer Product Safety Commission, requires that certain household products that are "hazardous substances" bear cautionary labeling to alert consumers to potential hazards that those products present and inform them of the measures they need to protect themselves from those hazards. Any product that is toxic, corrosive, flammable or combustible, an irritant, a strong sensitizer, or that generates pressure through decomposition, heat, or other means requires labeling.

Flammable

As defined in the Federal Hazardous Substances Act (FHSA) regulations at 16 CFR § 1500.3(c)(6)(ii), a substance having a flashpoint above 20 °F (−6.7 °C) and below 100 °F (37.8 °C). An extremely flammable substance, as defined in the FHSA regulations at 16 CFR § 1500.3(c)(6)(i), is any substance with a flashpoint at or below 20°F (−6.7 °C).

Flashpoint

The minimum temperature at which a liquid or a solid produces a vapor near its surface sufficient to form an ignitable mixture with the air; the lower the flash point, the easier it is to ignite the material.

Hazardous substance

As defined in the Federal Hazardous Substances Act (FHSA) at 16 CFR § 1500.3(b)(4)(i)(A), any substance or mixture of substances that is toxic, corrosive, an irritant, a strong sensitizer, flammable or combustible, or generates pressure through decomposition, heat or other means, if it may cause substantial personal injury or illness during or as a proximate result of any customary or reasonably foreseeable handling or use, including reasonably foreseeable ingestion by children.

Hepatotoxin

A chemical that can cause liver damage.

Ignitable

Capable of bursting into flames; ignitable substances pose a fire hazard

International Agency for Research on Cancer (IARC)

An agency of the World Health Organization that publishes IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. This publication documents reviews of information on chemicals and determinations of the cancer risk of chemicals.

Incompatible materials

Substances that can react to cause a fire, explosion, violent reaction or lead to the evolution of flammable gases or otherwise lead to injury to people or danger to property.

Ingestion

Taking a substance into the body by mouth and swallowing it.

Inhalation

Breathing a substance into the lungs; substance may be in the form of a gas, fume, mist, vapor, dust, or aerosol.

Injection

Substances may enter the body if the skin is penetrated or punctured by contaminated objects. Effects can then occur as the substance is circulated in the blood and deposited in the target organs.

Irritant

A substance that causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Known human carcinogen

A substance for which there is sufficient evidence of a cause and effect relationship between exposure to the material and cancer in humans.

Lacrimation

Excessive production of tears when the eye is exposed to an irritant.

Mutagen

A substance capable of changing genetic material in a cell.

National Fire Protection Association (NFPA)

An organization that provides information about fire protection and prevention and developed a standard outlining a hazard-warning labeling system that rates the hazard(s) of a material during a fire (health, flammability, and reactivity hazards).

National Institute for Occupational Safety and Health (NIOSH)

U.S. Federal agency of the Centers for Disease Control and Prevention (CDC) that investigates and evaluates potential hazards in the workplace. NIOSH is also responsible for conducting research and providing recommendations for the prevention of work-related illness and injuries.

National Toxicology Program (NTP)

U.S. Federal interagency program that coordinates toxicological testing programs, develops and validates improved testing methods, and provides toxicological evaluations on substances of public health concern.

Neurotoxin

A substance that induces an adverse effect on the structure and/or function of the central and/or peripheral nervous system.

Occupational Safety and Health Administration (OSHA)

U.S. Federal agency that develops and enforces occupational safety and health standards for all general, as well as, construction and maritime industries and businesses in the U.S.

Oxidizer

A substance that causes the ignition of combustible materials without an external source of ignition; oxidizers can produce oxygen, and therefore support combustion in an oxygen free atmosphere.

Peroxide former

A substance that reacts with air or oxygen to form explosive peroxy compounds that are shock, pressure, or heat sensitive.

Personal Protective Equipment (PPE)

Any clothing and/or equipment used to protect the head, torso, arms, hands, and feet from exposure to chemical, physical, or thermal hazards.

pH

A measure of the acidity or basicity (alkalinity) of a material when dissolved in water; expressed on a scale from 0 to 14.

Radioactive material

A material whose nuclei spontaneously give off nuclear radiation.

Reactivity

The capacity of a substance to combine chemically with other substances.

Reproductive toxicity

Adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring (International Programme on Chemical Safety (IPCS) Environmental Health Criteria 225, Principles for Evaluating Health Risks to Reproduction Associated with Exposure to Chemicals).

Secondary containment

An empty chemical-resistant container/dike placed under or around chemical storage containers for the purpose of containing a spill should the chemical container leak.

Systemic

Affecting many or all body systems or organs; not localized in one spot or area.

Teratogen

A substance which may cause non-heritable genetic mutations or malformations in the developing embryo or fetus when a pregnant female is exposed to the substance.

Toxic substance

In general, as defined in the Federal Hazardous Substances Act (FHSA) regulations at 16 CFR § 1500.3(b)(5), any substance (other than a radioactive substance) which has the capacity to produce personal injury or illness to humans through ingestion, inhalation, or absorption through any surface of the body.

Water reactive material

A substance that reacts with water that could generate enough heat for the item to spontaneously combust or explode. The reaction may also release a gas that is either flammable or presents a health hazard.

Resources

➲ Right to Know and PEOSH* Resources

- NJDOH Right to Know Program's website https://www.nj.gov/health/workplacehealthandsafety/right-to-know/
- NJDOH Right to Know Hazardous Substance List, a searchable list with specific health and safety information on each chemical. https://www.nj.gov/health/workplacehealthandsafety/right-to-know/hazardous-substances/index.shtml
- NJDOH PEOSH Occupational Exposure to Hazardous Chemicals in Laboratories Standard (29 CFR 1910.1450) https://www.nj.gov/health/workplacehealthandsafety/peosh/peosh-health-standards/lab.shtml
- NJDOH PEOSH Medical Services and First Aid Standard (29 CFR 1910.151) https://www.nj.gov/health/workplacehealthandsafety/peosh/peosh-health-standards/medsvcs.shtml
- NJDOH PEOSH Hazard Communication Standard (29 CFR 1910.1200/ N.J.A.C. 12:100-7) https://www.nj.gov/health/workplacehealthandsafety/peosh/peosh-health-standards/hazcom.shtml

➲ Chemical Inventory, Hazards, and Management

- CPSC/NIOSH School Chemistry Laboratory Safety Guide https://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf
- American Chemical Society: Guidelines for Chemical Laboratory Safety in Secondary Schools https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/acs-secondary-safety-guidelines.pdf
- OSHA: Laboratory Safety Guidance https://www.osha.gov/Publications/laboratory/OSHA3404laboratory-safety-guidance.pdf

*Public Employees Occupational Safety and Health

- Laboratory Safety: Chemical Fume Hoods https://www.osha.gov/Publications/laboratory/OSHAquickfacts-lab-safety-chemical-fume-hoods.pdf
- ANSI/ISEA Z358.1-2014 American National Standard for Emergency Eyewash and Shower Equipment https://webstore.ansi.org/default.aspx

➲Chemical Inventory, Hazards, and Management

- CPSC/NIOSH School Chemistry Laboratory Safety Guide https://www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf
- American Chemical Society: Guidelines for Chemical Laboratory Safety in Secondary Schools https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/acs-secondary-safety-guidelines.pdf
- OSHA: Laboratory Safety Guidance https://www.osha.gov/Publications/laboratory/OSHA3404laboratory-safety-guidance.pdf
- Laboratory Safety: Chemical Fume Hoods https://www.osha.gov/Publications/laboratory/OSHAquickfacts-lab-safety-chemical-fume-hoods.pdf
- ANSI/ISEA Z358.1-2014 American National Standard for Emergency Eyewash and Shower Equipment https://webstore.ansi.org/default.aspx

➲Disposal Resources

- Toolkit for Safe Chemical Management in K-12 Schools https://www.epa.gov/schools/toolkit-safe-chemical-management-k-12-schools
- NJDEP Bureau of Hazardous Waste Compliance & Enforcement https://www.state.nj.us/dep/enforcement/hw.html