

Checklist for Science Departments and Laboratories

Items/Processes of Concern	Toxic Metal	Dangerous Waste	Preferred Alternatives and Best Management Practices ¹
Product Management and Storage			
Acids/bases Flammable reagents Oxidizers/reactive solids	X	X	<ul style="list-style-type: none"> • Research laboratory product substitutions to replace use of toxic metals and other hazardous substances with less toxic or non-hazardous products. • Research method minimization techniques to reduce use of toxic metals and hazardous substances. • Store chemical products by compatibility: acids with acids, bases with bases, flammables and poisons in dedicated cabinets. • Do not leave open reagents sitting in the hood when not in use.
Organic reagents	X	X	<ul style="list-style-type: none"> • Research laboratory product substitutions to replace use of toxic metals and other hazardous substances with less toxic or non-hazardous products. • Research method minimization techniques to reduce use of toxic metals and hazardous substances. • Use iron-salicylic complex instead of copper-ammonia complex in Beer's Law studies. • Use organic oxidants for chromium (IV) oxidants-oxalyl chloride/dimethyl sulfoxide in Swern oxidation of alcohols. • Use supercritical carbon dioxide for organic solvents in high-performance chromatography. • Use copper sulfate catalysts for mercury sulfate or selenium metal catalysts in Kjeldahl analyses. • Use methyl tert-butyl ether for diethyl ether (does not form explosive peroxides). • Store bulk chemical reagents in a central storage/distribution center for better control of inventory. • Do not leave open reagents sitting in the hood when not in use.
Stains	X	X	<ul style="list-style-type: none"> • Research laboratory product substitutions to replace use of toxic metals and other hazardous substances with less toxic or non-hazardous products. • Research method minimization techniques to reduce use of toxic metals and hazardous substances. • Use alcohol fixative instead of formaldehyde and citric acid-based preparatory chemicals. • Use SYBR Safe DNA gel stain instead of ethidium bromide (a known mutagen).

¹ Preferred alternatives are shown in **bold font**.

Items/Processes of Concern	Toxic Metal	Dangerous Waste	Preferred Alternatives and Best Management Practices ²
Dangerous Waste Designation and Management			
Good lab practices	X	X	<ul style="list-style-type: none"> • Establish hazardous waste designation procedures for all waste streams: reagent dilutions, analytical solvent and aqueous wastes, instrumentation carrier fluid wastes, waste instrumentation calibration standards, waste biology samples, etc. • Implement procedures to clearly identify appropriate waste disposal containers and accumulation areas. Procedures need to identify appropriate waste identification labels, risk labels, dates accumulated, appropriate secondary containment, and inspection logs to track container and storage conditions. • Store chemical products by compatibility: acids with acids, bases with bases, flammables and poisons in dedicated cabinets. • Do not allow working reagent dilutions to sit in a fume hood and evaporate; this is illegal disposal. • Store working reagent dilutions in containers that can be closed. Clearly label the container to identify contents, concentration, date prepared, and return to the dedicated cabinet with compatible reagents when not in use. • Use minimum amount of chemicals required for experiments or processes to minimize the volume of waste generated. • Protect drains in labs and product storage areas from spills. • Store calibration standard sets in sealed containers in the fridge when not in use. • Do not discharge laboratory waste to septic tanks. • Avoid storing chemical containers in fume hoods, on bench tops, or under the sink. • See Common Dangerous Waste Compliance Issues.
Lab equipment cleaning	X	X	<ul style="list-style-type: none"> • Use "No-Chromix," enzymatic cleaners, detergents, etc. instead of chromerge (sulfuric acid-sodium dichromate).
General			
General inventory			<ul style="list-style-type: none"> • Use Environmentally Preferable Purchasing. • Before ordering chemicals for use, determine anticipated rate of use, shelf life, required personal protective equipment and handling procedures, appropriate storage locations, and disposal method. • Do not take donations of chemicals unless they are products that would have been ordered to meet your needs. • Review curriculum for potential hazardous substance reductions. • Maintain up-to-date Material Safety Data Sheets (SMDSs) to match chemical products in current use.

² Preferred alternatives are shown in **bold font**.

Items/Processes of Concern	Toxic Metal	Dangerous Waste	Preferred Alternatives and Best Management Practices ²
<p>All generated waste streams</p> <p>Spilled products</p> <p>Unused and expired products</p>	X	X	<ul style="list-style-type: none"> • Use chemical inventory and tracking software to centralize product ordering, improve product tracking, storage requirement, waste management, reduce disposal of expired product, and minimize duplicate orders to prevent unnecessary disposal. • Keep your spill response plan updated and available to students and staff. • Identify all potential waste streams and establish designation procedures to determine if a hazardous waste or non-hazardous waste. • Implement dangerous waste designation, collection, accumulation, and disposal procedures for all waste streams. • Block floor drains in areas where chemicals are used or stored. • Store chemical containers and carboys in secondary containment tubs and trays to help keep spills from traveling down nearby drains. • See Common Dangerous Waste Compliance Issues.
<p>Computers</p> <p>Electronic equipment</p> <p>Appliances</p>	X	X	<ul style="list-style-type: none"> • Use energy-efficient computer and electronic equipment, and appliances. • Replace mercury-containing equipment with non-mercury equipment. • Use vendor take-back programs. • Surplus old equipment. • Recycle as Universal Waste. • If not recycled as Universal Waste: collect, manage, and dispose of as dangerous waste.
<p>Batteries</p> <p>Fluorescent lamps</p> <p>Mercury-containing equipment</p>	X	X	<ul style="list-style-type: none"> • Use rechargeable batteries. • Use LED lamps when appropriate. • Use low-mercury fluorescent lamps. • Remove and/or replace mercury-containing equipment and recycle as Universal Waste. • Implement a battery recycling program and recycle as Universal Waste. • Implement a whole-lamp recycling program and recycle as Universal Waste. • If not recycled as Universal Waste: collect, manage, and dispose of as dangerous waste.
Other:			
Other:			
Other:			

Notes, Comments, Follow-up

Resources

Common Dangerous Waste Compliance Issues: http://www.ecy.wa.gov/programs/hwtr/P2/schoolsAndLabs/tool/dw_issues.html

Dangerous Waste Basics: http://www.ecy.wa.gov/programs/hwtr/manage_waste/DangerousWasteBasics.html

EPEAT: <http://www.epeat.net/>

E-Stewards Electronic Recyclers: <http://e-stewards.org/>

Label Dangerous Laboratory Waste – It's the Law! poster: <https://fortress.wa.gov/ecy/publications/SummaryPages/1504004.html>

Laboratory Guide for Managing Dangerous Waste: <https://fortress.wa.gov/ecy/publications/SummaryPages/1504015.html>

Laboratory Waste Management Guide, King County publication: www.lhwmp.org/home/publications/publications_detail.aspx?DocID=o5fpDUrc/+c=

Life Technologies, SYBR® Safe DNA Gel Stain: <http://www.invitrogen.com/site/us/en/home/Products-and-Services/Applications/DNA-RNA-Purification-Analysis/Nucleic-Acid-Gel-Electrophoresis/DNA-Stains/SYBR-Safe.html>

Managing Dangerous Laboratory Waste poster: <https://fortress.wa.gov/ecy/publications/SummaryPages/1504005.html>

Shop Guide for Dangerous Waste Management: <https://fortress.wa.gov/ecy/publications/SummaryPages/0904015.html>

Treatment by Generator: <http://www.ecy.wa.gov/programs/hwtr/P2/schoolsAndLabs/tool/TBG.html>

Universal Waste Rule for Batteries, WAC 173-303-573(2): <https://fortress.wa.gov/ecy/publications/SummaryPages/98407a.html>

Universal Waste Rule for Lamps, WAC 173-303-573(5): <https://fortress.wa.gov/ecy/publications/SummaryPages/98407c.html>

Universal Waste Rule for Mercury-containing Equipment, WAC 173-303-573(3,4): <https://fortress.wa.gov/ecy/publications/SummaryPages/98407b.html>