Ways to Reduce Hazardous Waste in the Laboratory

1. Centralize purchasing of chemicals through one person in the laboratory
2. Inventory chemicals at least once a year
3. Indicate in the inventory where chemicals are located
4. Update inventory when chemicals are purchased or used up
5. Purchase chemicals in smallest quantities needed
6. If trying out a new procedure try to obtain the chemicals needed from another laboratory or purchase small amounts initially After you know you will be using more of these chemicals purchase in larger quantities unless you can obtain excess chemicals from someone else
7. Date chemical containers when received so that older ones will be used first
8. Keep MSDSs for chemicals used on file
9. Keep information about disposal procedures for chemical waste in your laboratory on file
10. If possible establish an area for central storage of chemicals
11. Keep chemicals in your storage area except when in use
12. Establish an area for storing chemical waste
13. Label all chemical containers as to their content even those with only water
14. Keep halogenated solvents separate from non halogenated solvents
15. Keep recyclable waste excess chemicals separate from non recyclables
16. Keep organic wastes separate from metal containing or inorganic wastes
17. Keep nitric acid waste separate from other inorganic acid wastes
18. Keep hydrofluoric acid waste separate from other inorganic acid wastes
19. Keep nonhazardous chemical wastes separate from hazardous waste
20. Keep highly toxic wastes cyanides etc separated from the previous groups
21. Avoid experiments that produce wastes that contain combinations of radioactive biological and or hazardous chemical waste
22. Keep chemical wastes separate from normal trash paper wood etc
23. Develop procedures to prevent and or contain chemical spills purchase spill cleanup kits contain areas where spills are likely to occur
24. Use the least hazardous cleaning method for glassware Use detergents such as Alconox Micro RBS35 on dirty equipment before using KOH ethanol bath acid bath or No Chromix
25. Eliminate the use of chromic acid cleaning solutions altogether
26. Substitute red liquid spirit filled digital or thermocouple thermometers for mercury thermometers where possible
27. Use a bimetal or stainless steel thermometer instead of mercury thermometer in heating and cooling units. Stainless steel laboratory thermometers may be an alternative to mercury thermometers in laboratories as well
28. Evaluate laboratory procedures to see if less hazardous or nonhazardous reagents could be used
29. Review the use of highly toxic reactive carcinogenic or mutagenic materials to determine if safer alternatives are feasible
30. Avoid the use of reagents containing arsenic barium cadmium chromium lead mercury selenium and silver
31. Consider the quantity and type of waste produced when purchasing new equipment
32. Purchase equipment that enables the use of procedures that produce less waste
33. Review your procedures regularly e. g. annually to see if quantities of chemicals and or chemical waste could be reduced.
34. Look into the possibility of including detoxification and or neutralization steps in laboratory experiments
35. When preparing a new protocol consider the kinds and amounts of waste products and determine whether they can be reduced or eliminated
36. When researching a new or alternative procedure include consideration of the amount of waste produced as a factor

37. Examine your waste excess chemicals to determine if there are other uses in your laboratory. Neighboring laboratories departments or non laboratory areas garage paint shop art department might be able to use them
38. See if colleagues can use a chemical before you dispose of it.
39. Try using detergent and hot water for cleaning of parts instead of solvents
40. Use the smallest container possible for dipping or for holding photographic chemicals
41. Store and reuse developer in photo laboratories
42. Precipitate silver out of photographic solutions for reclamation
43. Neutralize corrosive wastes that don't contain metals at the laboratory bench
44. Deactivate highly reactive chemicals in the hood
45. Evaluate the possibility of redistillation of waste solvents in your laboratory
46. Evaluate other wastes for reclamation in your laboratory
47. Scale down experiments producing hazardous waste wherever possible
48. In teaching laboratories consider the use of microscale experiments
49. In teaching laboratories use demonstrations or video presentations as a substitute for some student experiments that generate chemical wastes
50. Use pre weighed or pre measured reagent packets for introductory teaching laboratories where waste is high
51. Include waste management as part of the pre and post laboratory written student experience
52. Encourage orderly and tidy behavior in laboratory

Use the following substitutions where possible:

Original Material	Substitute	Comments
67. Acetamide	Stearic acid	In phase change and freezing point depression
68. Benzene	Alcohol	
69. Benzoyl peroxide	Lauryl peroxide	When used as a polymer catalyst
70. Carbon tetrachloride	Cyclohexane	In test for halide ions
71. Formaldehyde	Peracetic acid	In cleaning of kidney dialysis machines
72. Formaldehyde	Formalternate Flinn Scientific	For storage of biological specimens
73. Formaldehyde	Ethanol	For storage of biological specimens
74. Formalin	See Formaldehyde	
75. Halogenated Solvents	Nonhalogenated Solvents	In parts washers or other solvent processes
76. Mercuric chloride reagent	Amitrole (Kepro Circuit Systems)	Circuit board etching
77. Sodium dichromate	Sodium hypochlorite	
78. Sulfide ion	Hydroxide ion	In analysis of heavy metals
79. Toluene	Simple alcohols and ketones	
80. Wood's metal	Onions Fusible alloy	
81. Xylene	Simple alcohols and ketones	

82. Xylene or toluene based liquid scintillation cocktails	Nonhazardous proprietary liquid scintillations cocktails	In radioactive tracer studies
83. Mercury salts	Mercuryfree catalysts (e.g.CuSO 4 TiO 2 K 2 SO 4 3)	Kjeldahl digests

84. Use best geometry of substrate carriers to conserve chemicals
85. Polymerize epoxy waste to a safe solid
86. Consider using solid phase extractions for organics
87. Put your hexane through the rotavap for reuse
88. Run mini SDS PAGE 2d gels instead of full size slabs
89. Treat sulfur and phosphorus wastes with bleach before disposal
90. Treat organolithium waste with water or ethanol
91. Seek alternatives to phenol extractions e g small scale plasmid prep using no phenol may be found in Biotechnica Vol 9 No 6 pp 676 678
92. Collect metallic mercury for reclamation
93. Investigate possiblility for recovering mercury from mercury containing solutions
94. Recover silver from silver chloride residue waste and gold from gold solutions
95. Purchase compressed gas cylinders including lecture bottles only from manufacturers who will accept the empty cylinders back
96. When testing experimental products for private companies limit donations to the amount needed for research
97. Return excess pesticides to the distributor
98. Do not accept chemicals donations from outside the University.
99. Replace and dispose of items containing polychlorinated biphenyls PCBs.