Montana Department of
ENVIRONMENTAL QUALITY

March 7, 2005

MONTANA SCHOOL LAB CHEMICAL INVENTORY
Compilation Report

Summary of Inventory Results

On August 20, 2004, the Montana Department of Environmental Quality (DEQ) sent a survey to over four hundred schools in Montana, requesting information on chemicals in storage for use in science lab courses. Because mismanagement and improper storage of hazardous chemicals in school labs has become a nationwide safety issue, we wanted to learn whether there is a problem in Montana schools. Our purpose was to determine the types of chemicals present in our school science labs and whether chemicals with potential hazardous characteristics were present.

Over 37% of the 406 middle and high schools we surveyed responded, reporting a total of 570 different chemicals. The number of chemicals per school ranged from 2 to 432.

Attachment A contains a table of common chemicals with potential health and safety risk that have been historically or are currently used in school lab courses. The table shows the chemicals, their risk characteristic, and the number of Montana schools reporting that chemical in stock.

Attachment B shows the 120 chemicals most commonly used in current basic high school chemistry classes. The list may assist teachers and administrators in determining what chemicals are necessary for their science courses and what chemicals can be removed.

Attachment A
Lab Chemicals of Concern Reported by Montana Schools

The following table shows some of the most common hazardous chemicals found in school science labs and the number of Montana schools reporting these chemicals in their inventory. The table also indicates information on potential health risks and hazardous waste disposal.

The chemicals listed will often exhibit more than one risk factor and not all these risks are equal. Not all forms of the chemicals listed are equally hazardous.

Legend:
Bolded = Compounds of Immediate Concern
C = Carcinogenic/Mutagenic **T** = Toxic
E = Explosion/Fire hazard **R** = Reactive
H = this chemical is a regulated hazardous waste when discarded (Administrative Rules of Montana -Hazardous Waste Management Program Rules – Title 17, Chapter 53)

Concern	Chemical Name	Times Reported
C	Acetamide	46
HR	Acetic Anhydride	26
C	Acridine Orange	5
HTC	Acrylamide	2
HE	Acrylic Acid	2
T	Adrenaline (Epinephrine)	13
HER	Aluminum Nitrate	57
HETR	Ammonia, gas cylinders	1
HR	Ammonium Hydroxide (>3 Molar)	30
HR	Ammonium Hydroxide, concentrated	31
HER	Ammonium Nitrate	78
HER	**Ammonium Perchlorate** *Explosive as a result of friction or heat*	**3**
HC	Aniline	23
CT	Antimony Compounds	38
CT	Antimony, lump	44
CT	Antimony, powder	30
HCT	Arsenic Compounds	30
C	Asbestos	8
HT	Barium Compounds	390
HEC	Benzene	36
C	Benzidine	8
E	**Benzoyl Peroxide** *May explode spontaneously when dry*	**7**
HER	Benzyl Alcohol	2

Concern	Chemical Name	Times Reported
HER	Bismuth Nitrate	27
HTR	Bromine	30
E	**Butanol 2 (Butyl Alcohol)** *Aged Butanol 2 may form explosive peroxides*	**8**
HCT	Cadmium Compounds	103
HCT	Cadmium, Cadmium Salts	10
HCT	Cadmium, powder	19
T	Caffeine	14
HER	Calcium Carbide	67
HER	Calcium Nitrate	101
HR	Calcium Oxide	82
HET	**Carbon Disulfide** *Ignitable by friction*	**22**
HCT	Carbon Tetrachloride	34
HET	Carbonyl Disulfide	4
HER	Ceric Ammonium Nitrate	2
HTR	Chlorine water	29
HTR	Chlorine, gas cylinders	2
HCT	Chloroform	31
HCT	Chromium Compounds	173
HCT	Chromium, lump	11
CT	Cobalt Compounds	225
CT	Cobalt, powder	7
T	Colchicine	4
HER	**Collodion (Nitrocellulose)** *May explode upon mechanical impact or static discharge*	**10**

Attachment A
Lab Chemicals of Concern Reported by Montana Schools

Concern	Chemical Name	Times Reported
HER	Copper Nitrate	92
HT	Cresol	3
HET	Cyclohexane	23
HET	Cyclohexene	10
HT	Dichlorobenzene, p-	26
HC	Dichloroethane, 1,2- (Ethylene Dichloride)	4
HCT	Ethyl Carbamate (urethane)	3
HET	**Ethyl Ether (diethyl ether or anhydrous ether)** *Forms shock sensitive, explosive compounds*	**5**
HT	Ethylene Glycol	39
HER	Ferric Nitrate	73
HCT	Formaldehyde	29
HCT	Formaldehyde (37% Solution)	15
HCT	Formic Acid	38
HEC	Gasoline	2
HTR	Hydrochloric Acid (>5 molar)	61
HTR	Hydrofluoric Acid	11
HER	Hydrogen Peroxide, >29%	9
HER	**Hydrogen Peroxide, 30%** *Acts as a strong catalyst, creating a potentially explosive combination of heat and oxygen*	**33**
C	Hydroquinone	19
HTR	Iodine	115
HTR	Iodine Tincture	55
HER	Iron Nitrate (ferric nitrate)	29
HER	Lauroyl Peroxide	1
E	**Lead Azide** *Shock sensitive*	**0**
HETR	Lead Compounds	420
E	**Lead Picrate** *Highly shock sensitive*	**0**
HETR	Lead, lump	62
HETR	Lead, powder	18
HER	Lithium Nitrate	75
HER	Lithium, Metal	15
HER	Magnesium Nitrate	70
HER	Magnesium Perchlorate	1
HER	Manganese Dioxide (Manganese Peroxide)	106
HER	Manganese Nitrate	26
HER	Manganese Peroxide	1
HT	Mercury	44
HT	Mercury Compounds	178
HT	Mercury Thermometers	38
HT	Mercury, liquid	40
HE	Methyl Ethyl Ketone	15
HCT	Methylene Chloride	7
T	Naphthalene	42
CT	Nickel Compounds	209
CT	Nickel, dust	12
HCT	Nicotine	10
HTR	Nitric acid (>1 molar & <10 molar)	31
E	**Nitroglycerin** *Shock sensitive when aged*	**0**
HER	**Perchloric Acid** *Reacts with metals to form hydrogen gas and heat*	**8**
HT	Phenol	34
HR	Phosphoric Acid	64
HETR	Phosphorus Pentoxide	8
HETR	Phosphorus, Yellow or White	25
E	**Picric Acid** *Highly explosive when dry. Stable when in liquid or hydrated crystal form.*	**3**
HTR	Potassium Bromate	29
HTR	Potassium Chlorate	87
HTR	Potassium Cyanide	22
HTR	Potassium Ferricyanide	64
HTR	Potassium Ferrocyanide	66

Attachment A
Lab Chemicals of Concern Reported by Montana Schools

Concern	Chemical Name	Times Reported
TR	Potassium Iodate	69
HER	Potassium Nitrate	100
HER	Potassium Nitrite	25
HER	Potassium Perchlorate	7
HR	Potassium Permanganate	111
HER	Potassium, metal	18
HET	Pyridine	5
C	Pyrogallic Acid,	23
HT	Selenium	3
HCT	Silver Compounds	194
HCT	Sodium Arsenate	10
HETR	**Sodium Azide** *Unstable explosive in dry form*	**11**
HTR	Sodium Bromate	16
HER	Sodium Chlorate	42
HER	Sodium Cobaltinitrate	14
HTR	Sodium Cyanide	5
HER	Sodium Nitrate	92
HER	Sodium Nitrite	51
HER	Sodium Perchlorate	3
HER	Sodium Peroxide	39
HER	Sodium, metal lump	38
HER	Sodium, metal, small chips	12
HER	Strontium Nitrate	78
HR	Sulfuric Acid	103
HCT	Tetrachloroethylene	1
HCT	Thioacetamide	9
HCT	Thiourea	12
HER	Thorium Nitrate	2
HET	Toluene	32
HCT	Trichloroethylene	4
HCT	Uranyl Nitrate	4
HER	Zinc Nitrate	88
HER	Zirconium Nitrate	1

Attachment B
Chemicals Used in Current-Day School Inorganic Chemistry Lab Courses

1. Acetone
2. Aluminum Chloride hexahydrate
3. Aluminum Nitrate
4. Aluminum Sulfate
5. Ammonia
6. Ammonium Chloride
7. Ammonium Paramolybdate tetrahydrate
8. Ammonium Peroxydisulfate
9. Ammonium Nitrate
10. Argon, gas
11. Barium Chloride dihydrate
12. Barium Hydroxide
13. Barium Nitrate
14. Benzoic Acid
15. Bromthymol Blue
16. Calcium Carbonate
17. Calcium Chloride
18. Calcium Chloride dihydrate
19. Calcium Hydroxide
20. Calcium Ethanoate
21. Calcium Nitrate
22. Calcium Oxide
23. Camphor
24. Carbon-14
25. Carbon Dioxide gas
26. Carbon Dioxide solid
27. Cesium-137
28. Chromium (III) Nitrate
29. Cobalt Cloride
30. Copper metal
31. Copper (II) Chloride dihydrate
32. Copper (II) Nitrate
33. Copper (II) Sulfate pentahydrate
34. Dibutyl Phthalate
35. EDTA
36. Ethanoic Acid
37. Ethanol
38. Ethyl Acetate
39. Glycerin
40. Hexane
41. Hydrochloric Acid
42. Hydrogen Peroxide (3%)
43. Iron metal
44. Iron (II) Sulfate
45. Iron (III) Chloride hexahydrate
46. Iron (III) Nitrate nonhydrate
47. Iron (III) Sulfate
48. Kerosene
49. Lauric Acid
50. Lead metal
51. Lead (II) Chloride
52. Lead (II) Nitrate
53. Lithium Chloride
54. Lithium Nitrate
55. Magnesium ribbon & turnings
56. Magnesium Chloride
57. Magnesium Chloride hexahydrate
58. Magnesium Nitrate
59. Magnesium Sulfate heptahydrate
60. Manganese Chloride
61. Manganese (IV) Oxide
62. Methanoic Acid
63. Methanol
64. 2-Methyl-1-Propanol
65. Methyl Red
66. Nickel Chloride
67. Nitric Acid
68. 1-Octanol
69. 1-Pentanol
70. Phenolphthalein
71. Polyvinyl Alcohol
72. Potassium Chloride
73. Potassium Chromate
74. Potassium Ethanoate
75. Potassium Ferricyanide
76. Potassium Hydrogen solution
77. Potassium Hydroxide
78. Potassium Iodide
79. Potassium Nitrate
80. Potassium Sulfate
81. Potassium Thiocyanate
82. Salicylic Acid
83. Silver Nitrate
84. Sodium Acetate
85. Sodium Bisulfate
86. Sodium Carbonate
87. Sodium Carbonate decahydrate
88. Sodium Chloride
89. Sodium Chromate
90. Sodium Dichromate dihydrate
91. Sodium Dihydrogen Phosphate
92. Sodium Ethnaoate
93. Sodium Hydrogen Carbonate
94. Sodium Hydroxide
95. Sodium Iodide
96. Sodium Monohydrogen Phosphate dodecahydrate
97. Sodium Nitrate
98. Sodium Oxalate
99. Sodium Phosphate
100. Sodium Polyacrylate
101. Sodium Phosphate dodecahydrate
102. Sodium Silcate
103. Sodium Sulfate
104. Sodium Sulfate decahydrate
105. Sodium Thiocyanate
106. Sodium Thiosulfate pentahydrate
107. Stannous Chloride
108. Starch
109. Strontium Nitrate
110. Sucrose
111. Sulfur
112. Sulfuric Acid
113. Thallium-204
114. Tin
115. 1,1,2-Trichloro-1,2,2-Trifluoroethane
116. Urea
117. Zinc metal (various forms)
118. Zinc Chloride
119. Zinc Nitrate Hexahydrate
120. Zinc Oxide