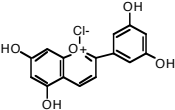


## APPENDIX 4.1

### COMMON AND INEXPENSIVE SOURCES OF CHEMICALS

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Many of the chemicals used in this book may be purchased from the market, drug store, pet store, or hardware store at dramatically lower prices than are available through scientific supply companies. We believe that students gain a greater appreciation for the applicability of chemistry to everyday life if they are able to use everyday products to conduct their experiments and investigations. Although the products listed on this page are less expensive, it should be noted that they often contain additives. Most of these additives do not affect the performance of the chemicals, but the instructor should always carefully examine the label to note the percent concentration of the desired substance and adjust the quantities used as necessary. It should also be noted that manufacturers sometimes change the composition of their products, so you should always carefully examine the contents label before purchasing. As with all experiments, the instructor should carefully perform all experiments and test for safety prior to classroom experiments or demonstrations.

<i>Chemical</i>	Formula	Source/Description
<i>acetic acid</i>	CH <sub>3</sub> COOH	<u>Vinegars</u> vary between 4-5.5% acetic acid; more concentrated acetic acid (28%) may be purchased at photography supply stores.
<i>acetone</i>	CH <sub>3</sub> COCH <sub>3</sub>	<u>Nail polish remover</u> is generally acetone ; <u>fiberglass cleaner</u> is also generally made of acetone and is available at boating supply stores.
<i>aluminum</i>	Al	<u>Aluminum foil</u> ; <u>aluminum turnings</u> are available as scrap from machine shops.
<i>potassium aluminum sulfate</i>	KAl(SO <sub>4</sub> ) <sub>2</sub> ·12H <sub>2</sub> O	<u>Alum</u> is available at most drug stores. It is used as an astringent to shrink mucus membranes.
<i>ammonia</i>	NH <sub>3</sub> (aq); NH <sub>4</sub> OH	<u>Household ammonia</u> (ammonium hydroxide) is an aqueous solution of ammonia. Note: this often has additives.
<i>ammonium nitrate</i>	NH <sub>4</sub> NO <sub>3</sub>	<u>Nitrate of ammonia</u> fertilizer is available at most garden supply stores.
<i>amylose</i>	(C <sub>6</sub> H <sub>9</sub> O <sub>5</sub> ) <sub>n</sub>	<u>Corn starch</u> is available at most markets and is used extensively in cooking.
<i>anthocyanin</i>		Anthocyanin solution can be prepared by cutting, boiling and filtering <u>red cabbage</u> .
<i>ascorbic acid</i>	C <sub>6</sub> H <sub>8</sub> O <sub>6</sub>	<u>Vitamin C tablets</u> sold at the market are primarily ascorbic acid.
<i>bromthymol blue</i>	C <sub>27</sub> H <sub>28</sub> Br <sub>2</sub> O <sub>3</sub> S	<u>Aquarium pH test kits</u> often employ bromthymol blue because it changes color in the 6.0-7.6 range.
<i>butane</i>	C <sub>4</sub> H <sub>10</sub>	The lighter <u>fluid</u> in hand-held <u>fire starters</u> or <u>cigarette lighters</u> is usually liquid butane.

<i>calcium carbonate</i>	CaCO <sub>3</sub>	<u>Chalk, limestone</u> and <u>marble chips</u> are good sources of solid calcium carbonate; some <u>antacids</u> are largely calcium carbonate.
<i>calcium chloride</i>	CaCl <sub>2</sub>	Much of the <u>road salt (de-icer)</u> used to de-ice roads in cold climates is calcium chloride.
<i>calcium hydroxide</i>	Ca(OH) <sub>2</sub>	Some <u>antacids</u> are primarily calcium hydroxide; <u>slaked lime</u> is calcium hydroxide and is used in <u>lime-softening water treatment</u> and in plastering.
<i>calcium hypochlorite</i>	Ca(ClO) <sub>2</sub>	<u>Bleaching powder</u> and some <u>swimming pool disinfectants</u> contain calcium hypochlorite. Available from cleaning or swimming pool supply companies.
<i>calcium oxide</i>	CaO	In the past <u>quiklime</u> was a material plasterers used in making plaster. It is now difficult to obtain from hardware stores.
<i>carbon</i>	C	<u>Charcoal</u> used in cooking, <u>activated charcoal</u> used in fish tank filters and <u>graphite</u> used in pencil leads are good sources of carbon.
<i>carbon dioxide</i>	CO <sub>2</sub>	<u>Dry ice</u> is available from party stores, refrigeration supply companies and ice cream companies.
<i>carbonic acid</i>	H <sub>2</sub> CO <sub>3</sub>	<u>Soda water</u> is simply carbonated water, a dilute solution of carbonic acid.
<i>copper</i>	Cu	<u>Electrical wire</u> , <u>copper pipe</u> , and <u>copper sheeting</u> are available at hardware stores; <u>American pennies</u> (minted 1944-1946, 1962-1982) are 95% copper and 5% zinc.
<i>copper sulfate pentahydrate</i>	CuSO <sub>4</sub> ·5H <sub>2</sub> O	Basicop□ or Bluestone□ algaecide used to kill algae and other aquatic pests contain copper sulfate.
<i>ethylene glycol</i>	CH <sub>2</sub> OHCH <sub>2</sub> OH	Some engine <u>antifreezes</u> are primarily ethylene glycol.
<i>glucose</i>	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	<u>Dextrose</u> (glucose) is available in many drug stores; some specialty throat lozenges are dextrose.
<i>glycerol</i>	C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	<u>Glycerin</u> is an emollient used to soften skin by delaying the evaporation of water. It is available at most drug stores.
<i>gold</i>	Au	Gold <u>jewelry</u> is generally not pure gold. Gold is generally alloyed with other metals to increase strength.
<i>helium</i>	He	<u>Helium</u> can be obtained from party stores or wherever helium balloons are available.
<i>hydrochloric acid</i>	HCl	<u>Muriatic acid</u> (the common name for HCl) is used in swimming pool maintenance. It is also sold as <u>masonry cleaner</u> and is available at the hardware store. Percentage concentrations vary.
<i>hydrogen peroxide</i>	H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide antiseptic (3%) is available from the drug store. Clairoxide□ hair bleach by Clairol is much more concentrated and is available from beauty supply stores.
<i>iodine</i>	I <sub>2</sub>	<u>Tincture of iodine</u> , a topical antiseptic used for treating wounds, is a solution of iodine dissolved in ethyl alcohol. It is available at most drug stores.
<i>iron</i>	Fe	<u>Steel wool</u> , <u>iron nails</u> , <u>iron bolts</u> , <u>nuts</u> , <u>screws</u> are good sources of iron. You can get iron filings by dragging a strong magnet through sand.

<i>ferric oxide</i>	$\text{Fe}_2\text{O}_3$	<u>Ceramic rust</u> is used to add a red color to pottery and can be purchased at ceramic stores.
<i>kerosene</i>	$\text{C}_n\text{H}_{2n+1}$ (n=12-16)	<u>Lamp oil</u> or <u>kerosene</u> is sold in the paint departments of most hardware stores.
<i>lead</i>	Pb	<u>Lead shot</u> and <u>lead sinkers</u> are used by fishermen and are available at sporting goods stores.
<i>magnesium hydroxide</i>	$\text{Mg}(\text{OH})_2$	<u>Milk of Magnesia</u> is an antacid used to settle sour (acidic) stomachs. Some <u>antacid tablets</u> also contain magnesium hydroxide.
<i>magnesium silicate</i>	$\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$	<u>Talcum powder</u> comes from <u>talc</u> , the softest of all minerals, and is used as a <u>dusting powder</u> for babies. It is available in the bodycare section of the drug store.
<i>magnesium sulfate</i>	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	<u>Epsom salt</u> is sold at most drug stores and is used as a laxative or as an anti-inflammatory soak.
<i>methanol</i>	$\text{CH}_3\text{OH}$	<u>Methanol</u> is sold as a solvent in paint supply stores under the names " <u>wood alcohol</u> " or " <u>methyl alcohol</u> ."
<i>methylene blue</i>	$\text{C}_{16}\text{H}_{18}\text{ClN}_3\text{S}$	<u>Methylene blue</u> ( <u>Methiodol</u> antiseptic) is used to treat small injured fish and is available at pet stores.
<i>mineral oil</i>	complex mixture of hydrocarbons	<u>Mineral oil</u> is sold in drug stores as an emollient. Some <u>baby oils</u> are essentially mineral oil and fragrance.
<i>nickel</i>	Ni	<u>Pre-1985 Canadian nickels</u> are made of nickel. Note: American "nickels" are composed of 25% nickel and 75% copper.
<i>oxygen</i>	$\text{O}_2$	Portable <u>welding oxygen</u> tanks are available at welding shops and some hardware stores.
<i>paraffin</i>	$\text{C}_n\text{H}_{2n+2}$ (n>19)	<u>Candle wax</u> is made of paraffin. Some grocery stores sell <u>paraffin</u> as a sealant for home canning.
<i>phenolphthalein</i>	$\text{C}_{20}\text{H}_{14}\text{O}_4$	Ex-Lax laxative contained phenolphthalein prior to 1997. In that year it was determined phenolphthalein might cause cancer, and thus the ingredients were changed.
<i>phosphoric acid</i>	$\text{H}_3\text{PO}_4$	Some pH reducers (available at pet stores) used in fish tanks are simply dilute solutions of phosphoric acid.
<i>potassium bitartrate</i>	$\text{KHC}_4\text{H}_4\text{O}_6$	Cream of tartar is available at the market and is used to stabilize delicate foods like meringue toppings and other baked egg-white products.
<i>potassium carbonate</i>	$\text{K}_2\text{CO}_3$	Some agricultural supply companies sell potash to farmers who need to increase the potassium content in their soils.
<i>potassium bromide</i>	KBr	Potassium bromide may be purchased from photography stores where it is used in photographic development.
<i>potassium chloride</i>	KCl	Lite Salt is used as a salt substitute by people who must limit their sodium intake, and is available at most markets.
<i>potassium iron (II) hexacyanoferrate(III)</i>	$\text{KFe}[\text{Fe}(\text{CN})_6]$	Mrs. Stewart's liquid <u>laundry bluing</u> is used to whiten clothes and may be found in the detergents section of the market.
<i>potassium nitrate</i>	$\text{KNO}_3$	<u>Salt peter</u> or <u>quick salt</u> is used to cure home made sausages and corned beef and may be available at some butcher shops.

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<i>potassium permanganate</i>	$\text{KMnO}_4$	Clearwater□ is a solution of approximately 50% potassium permanganate and is used to remove odors and cloudiness from water to be used in aquariums.
<i>propane</i>	$\text{C}_3\text{H}_8$	Gas barbecue fuel is generally made of propane and is available at many gasoline stations or picnic supply stores.
<i>2-propanol</i>	$\text{CH}_3\text{CHOHCH}_3$	Rubbing alcohol (isopropyl alcohol) is a concentrated solution (generally 70%) of 2-propanol and may be found in most drug stores.
<i>silicon dioxide</i>	$\text{SiO}_2$	Quartz sand is relatively pure silicon dioxide and is available at most building supply stores.
<i>silver</i>	Ag	Older non-clad American dimes, quarters, half dollars and silver dollars are 90% silver and 10% copper.
<i>sodium acetate</i>	$\text{NaC}_2\text{H}_3\text{O}_2$	Re-Heater□ and other hand-warmers are available at sporting goods stores.
<i>sodium bicarbonate</i>	$\text{NaHCO}_3$	Baking soda is pure sodium bicarbonate and may be found in the baking section of the market.
<i>sodium carbonate</i>	$\text{Na}_2\text{CO}_3$	Washing soda is used to treat wool fibers and is available at spinning, weaving, and art supply stores.
<i>sodium chloride</i>	NaCl	The table salt used in cooking is sodium chloride. Iodized salt contains a trace of sodium iodide.
<i>sodium hydroxide</i>	NaOH	Known also as caustic soda and lye, sodium hydroxide is used in many commercial drain cleaners.
<i>sodium hypochlorite</i>	NaClO	Household bleach is generally a 5% solution of sodium hypochlorite.
<i>sodium phosphate</i>	$\text{Na}_3\text{PO}_4$	Tri-sodium phosphate, commonly known as TSP, is available at hardware stores and is used to clean walls prior to painting.
<i>sodium tetraborate decahydrate</i>	$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$	Borax , such as Twenty Mule Team Borax□ Laundry Booster is sodium tetraborate decahydrate.
<i>sodium thiosulfate</i>	$\text{Na}_2\text{S}_2\text{O}_3$	Photographer's hypo is used in photograph development and is available at photography supply stores.
<i>sucrose</i>	$\text{C}_{12}\text{H}_{22}\text{O}_{11}$	Table sugar is available at grocery stores in large or small bags.
<i>sulfur</i>	S	Flowers of sulfur is sold at some garden stores to treat certain plant diseases.
<i>sulfuric acid</i>	$\text{H}_2\text{SO}_4$	Battery acid, also known as oil of vitriol, is sulfuric acid and may be obtained at some auto supply stores.
<i>tungsten</i>	W	The filament in incandescent light bulbs is made of tungsten.
<i>zinc</i>	Zn	Recent American pennies (1982-present) are 97.5% zinc with a 2.5% copper coating.