

Chemical Database

**Chemicals Used in BJU Press Secondary Science Lab
Manuals**

Last Updated: 2/16/17



Please Note

BJU Press is not responsible for the use of, disposal of, or any injuries related to any chemicals which this database or any published work references. Any references and ancillary materials are listed as an aid to the student and/or the teacher and in an attempt to maintain accepted academic and safety standards.

You are legally responsible for the safety of your students in the lab. Insist that they follow safe lab practices. Do not leave them unattended while they are working on any experiment or project in the lab.

The law requires that all permanent containers (not beakers, flasks, etc., that are used only during experiments) be labeled with an HMIS (Hazardous Materials Identification System) label. HMIS labels rank the chemical hazard in terms of health, flammability, reactivity, and contact on a scale from 0 to 4 (0 = no hazard; 4 = extreme hazard). The chemical industry is transitioning to the GHS (Globally Harmonized system). The information that you will need to prepare these labels can be found in the SDS (Safety Data Sheet) obtained from the chemical supplier. These are available online if you do not have a copy of one you need. You can download icons for GHS labels by doing a keyword search on *Globally Harmonized System*.

An SDS must be on file for each chemical you have on hand, and it must be located in an area that is easily accessible to your students. It would be a valuable use of your instructional time to go over the HMIS/SDS formats with your students. In fact, they will be using one to answer questions in Lab Activity 1.

Your legal responsibilities as a laboratory instructor are covered for the most part by the following groups of regulations:

1. Occupational Safety and Health Standards, especially OSHA 29 CFR 1910.1200 Hazard Communication and OSHA 29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories.
2. EPA Summary of Small Quantity Hazardous Waste Generator Rules—Resource Conservation and Recovery Act (40 CFR 261.5).

An excellent book that explains these regulations in plain English is *Investigating Safely: A Guide for High School Teachers* by Julian Texley, Terry Kwan, and John Summers (2004, NSTA Press). Also consider visiting <http://www.nsta.org/safety/> for articles and tips to keep your science classroom safe.

You may want to consult your school lawyer to determine whether any local or state regulations should be taken into consideration. Rules regarding laboratory safety and chemical disposal are constantly changing. Information in this document should be regarded as only generalized suggestions. You should consult the safety and chemical disposal laws in your own state and community, as well as the most recent OSHA guidelines.

Although you may resent the intrusion of the government into your classroom, your example will influence the attitude of your students with regard to personal safety, a Christian's responsibility to government, and our responsibility for the environment.

Be sure that you are aware of local regulations regarding waste disposal of chemicals before purchase.

Working with Acids

Concentration

When purchasing acids to use for experiments in chemistry, you will find that they come in varying strengths, or concentrations. If you purchase acids from a science supplier, the concentration is usually reported in molarity, M , which is the moles of acid per liter of solution. The concentrations of acids mentioned in BJU Press secondary science textbooks usually refer to the concentration of acids with this unit. However, you can buy acids from other places, such as hardware stores, auto supply stores, and home centers. These acids can have their concentrations expressed in units other than molarity.

Occasionally, you may find the concentrations of acids reported in percent by volume (v/v%) or percent by weight (w/v%). If you have a concentration in percent by volume, convert this into a concentration in percent by weight, using the equation

$$c_{\%w} = c_{\%v} d,$$

where $c_{\%w}$ is the concentration in percent by weight, $c_{\%v}$ is the concentration in percent by volume, and d is the density of the solute in g/ml. The density of concentrated sulfuric acid (H_2SO_4), the solute of a sulfuric acid solution, is 1.8361 g/ml. The density of concentrated hydrochloric acid (HCl), the solute of a hydrochloric acid solution, is 1.1977 g/ml. Use these values for d when calculating the concentration in percent by weight from percent by volume.

To convert a concentration in percent by weight to molarity (M) or moles/liter, use the equation

$$c_M = \frac{10c_{\%w}d}{m_M},$$

where c_M is the concentration in molarity, $c_{\%w}$ is the concentration in percent by weight, d is the density of the solution in g/mL (see table below), and m_M is the molar mass of the substance in g/mol. It's 98.086 g/mol for sulfuric acid and 36.458 g/mol for hydrochloric acid.

Density of solutions (g/mL)

Concentration (% by w or v)	HCl	H_2SO_4
1	1.0031	1.0049
2	1.0081	1.0116
3	1.0130	1.0183
4	1.0179	1.0250

5	1.0228	1.0318
10	1.0476	1.0661
15	1.0727	1.1021
20	1.0980	1.1398
30	1.1492	1.2191
40	1.1977	1.3028
50		1.3952
60		1.4987
70		1.6105
80		1.7272
90		1.8144
92		1.8240
94		1.8312
96		1.8355
98		1.8361

Values obtained from D.R. Lide, Ed., *CRC Handbook of Physics and Chemistry*, 86th ed. (Boca Raton: Taylor & Francis, 2005), 8-52-77.

As an example, let's assume that you've purchased a gallon of muriatic acid (HCl) at your local home center. You wish to know its concentration in molarity. The label indicates that it's 30% concentration by volume. To convert this value to molarity, you would first calculate the concentration in percent by weight using the first formula above.

$$c_{\%w} = c_{\%v} d$$

$$c_{\%w} = (30\%)(1.1977 \text{ g/ml})$$

$$c_{\%w} = 35.931\%$$

Now we'll need to convert this to the concentration in molarity. Look up the density for 30% HCl on the table above (1.1492 g/ml). The molar mass for hydrogen chloride is 36.458 g/mol. Finally, you would use the second formula shown above to calculate the concentration.

$$c_M = \frac{10c_{\%w} d}{m_M}$$

$$= \frac{10(35.931\%)(1.1492 \text{ g/ml})}{36.458 \text{ g/mol}}$$

$$\approx 11.3 \text{ M}$$

You can also look for online *concentration converters* by using these terms in a keyword search. However, you need to know if your percent composition is by weight or by volume before using them. As a general rule of thumb with liquid/liquid combinations, most percent concentrations are by volume. Using an incorrect conversion could result in an inaccurate concentration, although in the context of high-school chemistry experiments, this will probably not create a hazardous situation or significantly affect the results of the experiment. There are a

few exceptions, particularly those that involve neutralization reactions, in which inaccurate concentrations could cause the experiment to fail due to significantly divergent results.

Making Solutions

To dilute a stock acid solution, use the equation

$$V_u = \frac{M_k V_k}{M_u},$$

where V_u is the amount of stock solution you need to use to make your desired solution, M_k is the molarity of the solution that you want, V_k is the volume of the solution you want, and M_u is the molarity of the stock (original) solution. After you have calculated the amount of acid that you need, subtract this amount from the total amount of solution that you plan to make. This is approximately the amount of water that you will need. Before you begin, be sure to put on protective clothing such as gloves, goggles, and a lab apron.

- 1 Measure out a little less than the amount of water required to make the solution—about 10 mL less—in a graduated cylinder.
- 2 Now take the stopper out of the stock solution bottle and hold the tab between your second and third fingers (assuming that you are using a glass bottle with a stopper). No acid should touch your skin. To avoid contamination, do not place the stopper on the table top.
- 3 In a second graduated cylinder, measure out the amount of stock solution acid that you calculated.
- 4 Slowly pour this acid into the first graduated cylinder already containing water, rinsing out the graduated cylinder that contained the stock acid with a little water. *Never add water directly to a concentrated acid.* You may use a stirring rod if desired to direct the acid into the water and stir it gently.
- 5 Add whatever remaining water is needed to reach the final volume of your solution.

Burns and Spills

Make a saturated solution of sodium bicarbonate (baking soda) to keep on hand for acid burns. To make this solution, take the volume (in milliliters) of solution that you want, and multiply this volume by 0.15 to get the grams of sodium bicarbonate required to make a saturated solution. For example, to make one liter of a saturated solution of sodium bicarbonate, you will need 150 g of sodium bicarbonate, since one liter is 1000 milliliters. Then work through the following steps.

- 1 Weigh out the amount of sodium bicarbonate needed.
- 2 Measure out the volume of water needed in a graduated cylinder. Pour this into an appropriately sized beaker.
- 3 Heat this water so that it is warm to the touch, or use warm tap water.
- 4 Stir the sodium bicarbonate into the warm water.

- 5 Filter out any undissolved sodium bicarbonate using a funnel, filter paper, and a second container. This solution has a shelf life of three years if stored at room temperature in a dry place free from contamination.

If a student gets a burn from handling an acid, immediately take them to a sink and pour the concentrated neutralizer solution over the area. Rinse with water. For acid spills, put on gloves before cleanup. Add solid sodium bicarbonate to the spill until the acid stops fizzing. Wipe up with absorbent towels.

Waste Disposal

Check local regulations before disposing of chemicals down the drain. To dispose of waste acid, slowly add sodium bicarbonate until the acid stops fizzing, and then pour it down the drain with plenty of running water. If desired, check the pH of your solution with universal pH paper or a pH meter before pouring it down the drain. You can also neutralize waste acid with sodium hydroxide pellets, though this chemical presents a hazard that solid sodium bicarbonate will not. Use indicator paper or phenolphthalein to ensure neutralization.

Working with Bases

Making Solutions

If you are making a solution from a solid form of a base, such as sodium hydroxide (NaOH) or potassium hydroxide (KOH) pellets, use the equation

$$m = c_M V m_M,$$

where m is the mass of solid base, in grams, c_M is the concentration of the solution that you want, in molarity, V is the volume of solution that you need in ml, and m_M is the molar mass of the solid base. It's 39.998 g/mol for sodium hydroxide and 56.108 g/mol for potassium hydroxide.

- 1 Measure out a volume of water equal to the volume of the solution that you need. Place this in a beaker.
- 2 Measure out the mass of solid base that you need on a piece of weighing paper or in a small container.
- 3 Pour the solid base into the volume of water, stirring with a stirring rod until dissolved.

Burns and Spills

Make a saturated solution of boric acid (H_3BO_3) to keep on hand for base burns. Boric acid is sold as a powdered solid. To make this solution, take the volume (in milliliters) of solution that you want and multiply this volume by 0.19 to get the grams of boric acid required to make a saturated solution. For example, to make one liter of a saturated solution of boric acid, you will need 190 g of sodium bicarbonate, since one liter is 1000 milliliters. Then work through the following steps.

- 1 Weigh out the amount of boric acid needed.
- 2 Measure out the volume of water needed in a graduated cylinder. Pour this into an appropriately sized beaker.
- 3 Heat this water so that it is warm to the touch, or use warm tap water.
- 4 Stir the boric acid into the warm water.
- 5 Filter out any undissolved boric acid using a funnel, filter paper, and a second container. This solution has a shelf life of five years if stored at room temperature in a dry place free from contamination.

If a student gets a burn from handling a base, immediately take them to a sink and pour the concentrated neutralizer solution over the area. Rinse with water. For base spills, put on gloves before cleanup. Add some phenolphthalein indicator until the puddle turns pink. Add solid boric acid or vinegar to the spill until the puddle turns clear. Wipe up with absorbent towels.

Waste Disposal

Check local regulations before disposing of chemicals down the drain. To dispose of waste base, add phenolphthalein. The base should turn pink. Slowly add hydrochloric acid until the puddle turns clear, and then pour it down the drain with plenty of running water. If desired, check the pH of your solution with universal pH paper or a pH meter before pouring it down the drain.

Acetic Acid

CH_3COOH , $\text{CH}_3\text{CO}_2\text{H}$, or $\text{C}_2\text{H}_4\text{O}_2$

Other Names

ethanoic acid

Local Sources

The most direct source of acetic acid is food-grade white vinegar, obtainable at any grocery store. Most white vinegars are about 5% acetic acid. Their concentration is therefore approximately 0.83 M. However, as vinegar brands vary to some extent, it's important to consult the label and treat the value as approximate. Non-white vinegars should not be used in chemistry since they contain many substances other than acetic acid, are not transparent, and have widely varying concentrations.

Notes

Glacial acetic acid is water-free (anhydrous) and is therefore the maximum concentration. It must be ordered from an online supplier. It tends to crystallize at around 62 °F (17 °C), so it shouldn't be stored below this temperature. It is also much more corrosive than vinegar and should be handled like any other concentrated acid.

Online Supplier

hometrainingtools.com

amazon.com

Books

LIFE SCIENCE, 4th Edition, *EARTH SCIENCE*, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition, *CHEMISTRY*, 4th Edition, *BIOLOGY*, 5th Edition

Acetone



Other Names

none

Local Sources

Acetone is found in some nail polish removers (not all, however; check label). It is often mixed with colorants or other substances. This variety can be found in the cosmetics section of any drugstore or department store. A purer variety without additives is available in beauty supply stores. It is also sold by hardware stores and home centers in the paint section as a cleaner/stripper.

Notes

none

Online Supplier

not recommended due to flammability and local availability

Books

CHEMISTRY, 4th Edition

Aluminum

Al

Other Names

none

Local Sources

Aluminum is readily available in many different forms. Sheet aluminum can be found in hardware stores, home centers, and hobby stores. Grocery stores sell aluminum foil.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

LIFE SCIENCE, 4th Edition, *EARTH SCIENCE*, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition

Ammonium Aluminum Sulfate



Other Names

ammonium alum, alum

Local Sources

Ammonium aluminum sulfate usually goes under the generic name of alum. It is sold as a natural deodorant, an astringent (a powder that stops minor bleeding), and as a food additive used for canning and pickling. It can be found in drugstores, health food stores, and some grocery stores in the aisle where spices and pickling supplies are located.

Notes

Both ammonium aluminum sulfate and potassium aluminum sulfate go by the name of alum. The ammonium version is less common. In general, if a product is labeled as alum, it will be the potassium variety. They are very similar in their behavior and for most labs may be used interchangeably.

Online Supplier

hometrainingtools.com
photoformulary.com

Books

EARTH SCIENCE, 4th Edition

Ammonium Chloride



Other Names

sal ammoniac

Local Sources

Ammonium chloride is sold in blocks as a soldering iron cleaner. These can be found at metal jewelry supply or metal craft stores. Some health food stores sell it in tablet form as a nutritional supplement, although these usually contain small amounts of other substances.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition

Ammonium Hydroxide



Other Names

ammonia

Local Sources

Ammonium hydroxide is an aqueous solution of ammonia gas (NH_3). A dilute form (5–10%) is readily available from grocery stores. Concentrated ammonium hydroxide must be ordered.

Notes

If buying ammonium hydroxide from the grocery store, be sure to purchase the clear variety. If the liquid is cloudy or tinted, it contains soaps or other substances.

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition

Benedict's Reagent



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

It is possible to make Benedict's reagent if you have the requisite chemicals on hand (sodium carbonate, copper (II) sulfate, and sodium citrate). Instructions can be found online. However, it is often simpler just to order a prepared solution.

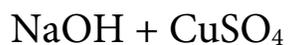
Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

LIFE SCIENCE, 4th Edition, *BIOLOGY*, 5th Edition

Biuret Solution



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

It is possible to make biuret solution if you have the requisite chemicals on hand (sodium hydroxide and copper (II) sulfate). Instructions can be found online. If you take this route, you must prepare the solution immediately before use as it degrades if stored. However, it is often simpler just to order a prepared solution since it will contain stabilizers that extend its shelf life.

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

LIFE SCIENCE, 4th Edition, *BIOLOGY*, 5th Edition

Boric Acid



Other Names

hydrogen borate, boracic acid

Local Sources

Boric acid is used as a low human/animal toxicity insecticide for roaches and silverfish. It can be found in the pest control section of hardware stores and home centers. Check the label to confirm that the preparation contains only boric acid. Boric acid was formerly sold by drugstores as an eyewash. This practice has declined in recent years, so drugstores are no longer a local source.

Notes

Boric acid does not dissolve at room temperature, so solutions must be prepared with boiling water.

Online Supplier

hometrainingtools.com
amazon.com

Books

PHYSICAL SCIENCE, 5th Edition

Bromothymol Blue



Other Names

bromothymol sulfone phthalein

Local Sources

Bromothymol blue is commonly used as a pH indicator in pool and aquarium test kits. These can be found at hardware stores, pool supply stores, and pet stores. However, many kits do not identify the specific indicator chemical used, so it can be difficult to be sure that the desired one is present. If the color reference card shows colors ranging from yellow through green through dark blue, the indicator is probably bromothymol blue.

Notes

none

Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition

Calcium Carbonate



Other Names

chalk

Local Sources

Calcium carbonate is commonly used as an antacid and also as a mineral supplement. These can be found in grocery stores, drugstores, and the health-care section of a department store. In all cases, however, check the label carefully to be sure that calcium carbonate truly is the active ingredient since there are other antacid agents and other forms of supplemental calcium. When choosing one of these sources, be sure to avoid colored or strongly flavored forms. Although natural chalk is calcium carbonate, blackboard chalk is almost always calcium sulfate. Eggshells are another possible source.

Notes

none

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition

Calcium Chloride



Other Names

none

Local Sources

Calcium chloride is used in a number of everyday products. In each case, however, it's essential to check labels to confirm that calcium chloride is the key ingredient as some brands may use other substances. Road deicers often contain calcium chloride and are available at hardware stores and home centers. Pool water hardness adjusters may contain calcium chloride, so check in a pool supply store or the pool section of a department store. Finally, calcium chloride is the main ingredient in some pickling products, where it's used to increase pickle crispness. These can be found in larger grocery stores in the canning or spice section.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Calcium Hydroxide



Other Names

slaked lime, pickling lime

Local Sources

Calcium hydroxide is used in marine aquariums, where it goes by the name *Kalkwasser*, and in pickling, where it is usually called pickling lime. The former can be found in pet stores that sell marine aquarium supplies. The pickling or spice section of a well-equipped grocery store may have the latter. Be sure to check the label since there could be other substances in the product. Also, not all pickling aids are based on calcium hydroxide.

Notes

To make limewater, a simple indicator of carbon dioxide, mix a heaping spoonful of calcium hydroxide with 500 mL of distilled water. Shake well for one minute and allow the solution to settle overnight. In the morning, carefully pour off the liquid portion and store it in a sealed container. Limewater degrades over time, so it is generally best to mix a fresh batch shortly before doing a lab. Bubbling carbon dioxide through limewater causes it to change to an opaque, milky liquid composed of suspended calcium carbonate.

Online Supplier

hometrainingtools.com

amazon.com

Books

LIFE SCIENCE, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition

Carmine



Other Names

cochineal, cochineal extract, crimson lake, carmine lake, natural red 4, C.I. 75470, or E120

Local Sources

Carmin is a dye that is commonly used for dying natural fibers. Laboratory-grade carmin is generally available only from chemical supply companies.

Notes

Carmin is derived from certain species of scale insects. After boiling the insects in ammonia or sodium carbonate solution, insoluble material is filtered out, and the resulting carminic acid solution is precipitated with alum, producing a red aluminum salt.

Online Supplier

amazon.com

carolina.com

Books

BIOLOGY, 5th Edition

Copper

Cu

Other Names

none

Local Sources

Copper is readily available in many different forms. Plumbing parts, tubing and pipes, and sheets are common examples. Many of these can be found in hardware stores and home centers. Hobby stores and stained glass suppliers often sell copper foil and copper sheets. Grocery stores sell copper scouring pads. Pre-1982 pennies are mostly copper, with a small amount of zinc added. Pennies made after this date are almost entirely zinc with a copper plating on the outside.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Copper (II) Chloride



Other Names

cupric chloride

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

Copper (II) chloride varies in its appearance depending upon its hydration. The anhydrous variety is brown, while the dihydrate version is blue-green.

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition

Copper (II) Sulfate



Other Names

cupric sulfate, bluestone, blue vitriol

Local Sources

Copper (II) sulfate is the main ingredient in some tree root killers. It is also used as an insect dust for gardens and an algaecide in ponds. These forms can be found in hardware stores, home centers, and garden stores. Check the label since not all products use this substance; some may contain additional chemicals.

Notes

Copper (II) sulfate comes in a variety of hydrates. The most common form, which is bright blue, is the pentahydrate. Anhydrous (water-free) is a gray or pale-green powder. The pentahydrate can be changed into the anhydrous form by heating in a crucible or lab oven until the blue crystals change to a powder.

Online Supplier

hometrainingtools.com

amazon.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Ethanol

$\text{CH}_3\text{CH}_2\text{OH}$, $\text{C}_2\text{H}_5\text{OH}$, or $\text{C}_2\text{H}_6\text{O}$

Other Names

ethyl alcohol, denatured alcohol, surgical spirit

Local Sources

Ethanol is the main ingredient of many rubbing alcohols. These are usually 70% ethanol, with the remaining percentage being largely water. All contain a denaturing agent designed to prevent use as a beverage. Drugstores and the health-care section of a department store will carry this variety. However, it is crucial to read the label since rubbing alcohols may contain isopropanol instead of ethanol. Higher purity ethanol can be found in hardware stores, home centers, and paint stores, where it is used as a solvent for paints and shellacs. These too will be denatured. Always check the label to be sure that you're getting ethanol and not another type of alcohol.

Notes

Ethanol is flammable and burns with a pale, almost transparent, blue flame that is difficult to see in bright light. Always exercise care when using it since burns and accidental fires are very common.

Online Supplier

not recommended due to its flammability and local availability

Books

LIFE SCIENCE, 4th Edition, *CHEMISTRY*, 4th Edition

Glucose



Other Names

dextrose

Local Sources

Glucose can be found under the name of dextrose as a sweetener in some health food stores. Some larger grocery stores may also carry it.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition, *BIOLOGY*, 5th Edition

Glycerin



Other Names

glycerol, glycerine

Local Sources

Glycerin is readily available from drugstores and health food stores. It is also used in soap making, so stores that sell supplies for this hobby will probably carry glycerin. Confirm that the variety offered is unscented.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

BIOLOGY, 5th Edition, *EARTH SCIENCE*, 4th Edition

Hydrochloric Acid

HCl

Other Names

muriatic acid

Local Sources

Hydrochloric acid can be found locally as muriatic acid at hardware stores and home centers, usually in the heavy duty cleaner section, where it is sold as a concrete and metal cleaner. Muriatic acid is also sold by some pool supply stores as a pH adjuster.

Notes

The main problem with using locally obtained muriatic acid is that its concentration is usually not specified by molarity (mol/L), but rather in percentage. The problem is further complicated by the fact that the percentage listed on the label is often not identified as by weight (w/v) or volume (v/v). Consult the label or the specific brand's MSDS/SDS for more information. If you cannot find more detailed data, as a rough estimate, assume a concentration of around 10 M. If what you're doing doesn't require precise concentrations, this approximation may be sufficient. See the [Working with Acids](#) page near the beginning of this database for help in converting percentage to molarity and then diluting the acid to the concentration required for your lab.

Lab-grade hydrochloric acid is sold in a variety of concentrations. The most useful is the concentrated type (12 M) since it can be diluted to any lower concentration quite easily. See the [Working with Acids](#) page near the beginning of this database for instructions as to how to dilute the acid to the concentration required for your lab. Since hydrochloric acid is a strong acid and exothermically mixes with water, special care must be taken when working with it.

Online Supplier

hometrainingtools.com
carolina.com

Books

EARTH SCIENCE, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition, *CHEMISTRY*, 4th Edition

Hydrogen Peroxide



Other Names

none

Local Sources

Hydrogen peroxide is sold in drugstores and in the health-care section of grocery and department stores. It is used as a hair bleach, an antiseptic, and a mouthwash. In the United States, it is almost always sold at 3% strength. If you are in another country, however, check the label carefully as it may be stronger, as much as 6%.

Notes

Lab-grade hydrogen peroxide is much stronger, and is therefore a powerful oxidizer. It should not be used for high-school experiments due to its tendency to decompose violently.

Hydrogen peroxide tends to break down into oxygen and water over time once its container has been opened. If a container is too old, it's better to discard it than risk ruining a lab activity.

Online Supplier

not recommended due to its local availability

Books

CHEMISTRY, 4th Edition, *BIOLOGY*, 5th Edition

Iodine Solution

I + KI

Other Names

Lugol's iodine, tincture of iodine

Local Sources

Tincture of iodine (iodine and sodium iodide dissolved in alcohol) is available at some drugstores as an antiseptic. Lugol's iodine (iodine and potassium iodide dissolved in water) is available at some health food stores as a dietary supplement. Compounding pharmacies also sell it.

Notes

It is possible to make your own iodine solution from elemental iodine, potassium iodide, and water. Instructions can be found online. However, it is increasingly difficult to buy elemental iodine, so it's generally better to obtain a prepared solution.

Online Supplier

hometrainingtools.com
amazon.com

Books

LIFE SCIENCE, 4th Edition, *BIOLOGY*, 5th Edition

Iron

Fe

Other Names

none

Local Sources

Iron is available in many forms, most of them available at hardware stores and home centers. Most will be steel rather than pure iron. Iron filings can be made by cutting the metal with a hacksaw, but this process is cumbersome if large quantities are required. A machine shop may be able to supply waste filings, but these may be coated with oil or mixed with other metals. For chemical reactions, purchase lab-grade filings from a supplier.

Notes

Keep iron filings in a sealed container so they don't rust. A small salt shaker is a convenient way to dispense filings for magnetism experiments.

Online Supplier

hometrainingtools.com

amazon.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Iron (III) Chloride



Other Names

ferric chloride

Local Sources

Iron (III) chloride is sold as an etchant for metal projects and hobby electronics circuit board fabrication. Some Radio Shack stores sell a 500 mL solution for this purpose. Typically, these solutions contain additional chemicals, so check the label before using.

Notes

Mixing powdered iron (III) chloride with water is exothermic. Use care as the solution can get quite hot. The solution is also strongly staining, so wear appropriate protective clothing.

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Iron (III) Oxide



Other Names

ferric oxide, rust

Local Sources

Rusted metal is a convenient source for small quantities of iron (III) oxide. Simply scrape the rust into a container. Larger quantities of uniform quality must be ordered.

Notes

Iron (III) oxide is often used as a reddish pigment. It is also used in some polishing compounds.

Online Supplier

[amazon.com](https://www.amazon.com)

Books

PHYSICAL SCIENCE, 5th Edition

Iron (II) Sulfate



Other Names

ferrous sulfate, green vitriol

Local Sources

Iron (II) sulfate is used to add iron to the soil. It is also found in supplements for those with iron deficiencies. The former can be found in garden stores and home centers, while the latter will be found in drugstores and health food stores. In both cases, however, there will probably be other substances present, which may affect the experiment's outcome. It is therefore better to order a lab-grade form.

Notes

none

Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Iron (II) Sulfide



Other Names

ferrous sulfide

Local Sources

Iron (II) sulfide is easy to make from iron filings and sulfur. Since these react in a 1:1 ratio, simply prepare a mixture of 1 g of iron to 0.57 g of sulfur, scaled to whatever quantity is required. Mix well and heat in a crucible until the mixture is red hot. Allow to cool and break up the product. Since this process releases noxious vapors, do all work in a lab hood or outside.

Notes

none

Online Supplier

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Isopropanol

C_3H_7OH or C_3H_8O

Other Names

isopropyl alcohol

Local Sources

Isopropanol is the main ingredient in many rubbing alcohols. These are usually 70%–99% pure depending on the brand (consult the label). They can be found in drugstores and the health-care section of department stores. Be careful, however, as rubbing alcohols can be made from ethanol rather than isopropanol.

Notes

Unlike ethanol, which burns with a pale, almost transparent, blue flame that is difficult to see in bright light, isopropanol burns with a smoky, yellow flame. Always exercise care when using it since burns and accidental fires are very common.

Online Supplier

not recommended due to its flammability and local availability

Books

LIFE SCIENCE, 4th Edition, *CHEMISTRY*, 4th Edition, *BIOLOGY*, 5th Edition

Lithium Chloride

LiCl

Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Lithium Nitrate



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

carolina.com

Books

CHEMISTRY, 4th Edition

Magnesium

Mg

Other Names

none

Local Sources

Campfire starters are made from magnesium. These can be found at sporting goods stores and camping stores. However, in this form, the magnesium is a large block that must be cut or shaved into smaller pieces. Magnesium ribbons must be ordered.

Notes

Magnesium ignites fairly easily and burns with a very intense, hot flame. Avoid creating metal dust or very small shavings as they can ignite easily. Magnesium fires cannot be extinguished with water or a CO₂ fire extinguisher, both of which will accelerate the fire. Smother a magnesium fire with dry sand or use a fire extinguisher rated for metal fires (Class D).

Online Supplier

hometrainingtools.com

amazon.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Magnesium Chloride



Other Names

none

Local Sources

Magnesium chloride is used in marine aquariums to maintain a proper mineral balance. It can be found in pet stores that stock marine aquarium supplies. It is also used as a mineral supplement and therefore can be found in some health food stores. Check the label, however, to confirm that no other compounds are present.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition

Magnesium Hydroxide



Other Names

milk of magnesia (as a suspension)

Local Sources

Magnesium hydroxide is commonly used in antacids and laxatives. Its suspended form, often referred to as milk of magnesia, can be purchased at drugstores, grocery stores, and the health-care section of department stores.

Notes

none

Online Supplier

[amazon.com](https://www.amazon.com)

Books

BIOLOGY, 5th Edition

Magnesium Sulfate



Other Names

Epsom salts

Local Sources

Magnesium sulfate is used as a laxative, foot soak, bath salt, and garden supplement. It can be found at drugstores, grocery stores, the health-care section of department stores, and at garden centers.

Notes

The variety most commonly seen is the crystalline heptahydrate form.

Online Supplier

hometrainingtools.com

amazon.com

Books

EARTH SCIENCE, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition, *BIOLOGY*, 5th Edition

Manganese Chloride



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition

Manganese Dioxide



Other Names

none

Local Sources

Manganese dioxide is a key component in zinc-carbon dry cell batteries. Saw off the top of a new D-cell battery with a hacksaw and scoop out the black mixture that surrounds the central carbon rod. This mixture contains manganese dioxide, carbon, and either ammonium or zinc chloride. There is enough manganese dioxide in the mix for many types of experiments in which the other chemicals do not pose a problem. While alkaline batteries also contain manganese dioxide, they are not as easy to disassemble, so the common zinc-carbon battery is preferable. If pure manganese dioxide is required, it must be ordered.

Notes

none

Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Manganous Sulfate



Other Names

manganese (II) sulfate

Local Sources

Manganous sulfate is sold in hardware and gardening stores as a soil amendment.

Notes

Manganous sulfate solution is commonly included in test kits that use the Winkler Method for measuring the dissolved oxygen content of water samples. Suppliers of such kits, such as LaMotte or Hach, will usually sell refills of the necessary chemicals.

Online Supplier

[amazon.com](https://www.amazon.com)

[hach.com](https://www.hach.com)

Books

BIOLOGY, 5th Edition

Methanol

CH₃OH or CH₄O

Other Names

methyl alcohol, wood alcohol

Local Sources

Methanol is not readily available in most locations. Some gasoline additives designed to prevent freezing of the fuel line are mostly methanol. Check the labels carefully as not all gasoline antifreezes contain methanol. Some may contain methanol combined with other chemicals.

Notes

Methanol is flammable and burns with a pale, almost transparent, blue flame that is difficult to see in bright light. Always exercise care when using it since burns and accidental fires are very common.

Online Supplier

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Methyl Orange



Other Names

none

Local Sources

Methyl orange is used in various kinds of water test kits, including some used for pools. However, many kits do not identify the specific indicator chemical used, so it can be difficult to be sure that the desired one is present. Pool supply stores that sell test kit refills may offer methyl orange.

Notes

none

Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Methyl Red



Other Names

acid red 2

Local Sources

Methyl red is used in some pH test kits, However, many kits do not identify the specific indicator chemical used, so it can be difficult to be sure that the desired one is present. Generally, this chemical is best ordered.

Notes

none

Online Supplier

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Methylene Blue



Other Names

none

Local Sources

Methylene blue is used to treat certain fish diseases, so better-equipped pet stores may carry it in the aquarium remedies section. Check the labels since many fish pharmaceuticals are identified by what they cure rather than by what they contain.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

LIFE SCIENCE, 4th Edition, *BIOLOGY*, 5th Edition

Mineral Oil

Other Names

white oil, paraffin oil

Local Sources

Mineral oil can be obtained from a drugstore or the health-care section of a department store. It is also sold by hardware stores, home centers, and woodworking stores as a butcher block conditioning oil.

Notes

Mineral oil is not a single chemical but a family of petroleum-based oils. For this reason, a molecular formula is not provided.

Online Supplier

[amazon.com](https://www.amazon.com)

Books

CHEMISTRY, 4th Edition

Phenol Red



Other Names

phenolsulfonphthalein, PSP

Local Sources

Phenol red is a narrow-range pH indicator used in some pool test kits. It can be found at pool supply stores. It can also be ordered from a chemical supply company.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

BIOLOGY, 5th Edition

Phenolphthalein



Other Names

none

Local Sources

Phenolphthalein is used in some pH test kits. However, many kits do not identify the specific indicator chemical used, so it can be difficult to be sure that the desired one is present. Generally, this chemical is best ordered from a supplier.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition

Potassium Aluminum Sulfate



Other Names

potassium alum, alum

Local Sources

Potassium aluminum sulfate usually goes under the generic name of alum. It is sold as a natural deodorant, an astringent (a powder that stops minor bleeding), and as a food additive used for canning and pickling. It can be found in drugstores, health food stores, and some grocery stores in the aisle where spices and pickling supplies are located.

Notes

Both ammonium aluminum sulfate and potassium aluminum sulfate go by the name of alum. The ammonium version is less common. In general, if a product is labeled as alum, it will be the potassium variety. They are very similar in their behavior and for most labs may be used interchangeably.

Online Supplier

photoformulary.com

Books

EARTH SCIENCE, 4th Edition

Potassium Chloride

KCl

Other Names

salt substitute

Local Sources

Potassium chloride is the main ingredient in most salt substitutes used by those on low sodium diets. It can be found in any grocery store. Check the label to confirm that nothing else is in the product since some salt substitutes contain a small quantity of ordinary salt (sodium chloride) to improve flavor.

Notes

none

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Potassium Hydrogen Phthalate



Other Names

KHP

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Potassium Hydroxide

KOH

Other Names

caustic potash

Local Sources

Unlike sodium hydroxide, which can be found in a number of everyday products, potassium hydroxide is fairly uncommon. Generally, it must be ordered.

Notes

Potassium hydroxide is usually mixed with water to achieve a specific concentration. See the [Working with Bases](#) page near the beginning of this database for instructions as to how to safely mix solutions to the concentration required for your lab. Since potassium hydroxide is a strong base and also exothermically mixes with water, special care must be taken when working with it.

Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition

Potassium Iodide Azide

Other Names

alkaline iodide azide

Local Sources

There are no local suppliers for potassium iodide azide. This product must be ordered from a chemical supply company.

Notes

Potassium iodide azide consists of a mixture of sodium hydroxide, potassium iodide, and sodium azide in an aqueous solution. It is used in the Winkler Method for testing water for dissolved oxygen and is therefore commonly included in kits sold for that purpose. Both the liquid and its vapors are hazardous. Read all warning labels carefully.

Online Supplier

carolina.com

fishersci.com

Books

BIOLOGY, 5th Edition

Potassium Nitrate



Other Names

saltpeter, nitre

Local Sources

Potassium nitrate is sold by some home and garden centers as a stump remover. Check the label to confirm that potassium nitrate is the main ingredient and that there are no other significant chemicals present.

Notes

The terms saltpeter and nitre are also used with the closely related compound sodium nitrate.

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition

Potassium Permanganate



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

Potassium permanganate can form an explosive mixture if combined with concentrated sulfuric acid. Since it is a powerful oxidizer, it can react with fuels such as alcohol and spontaneously combust.

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition

Potassium Thiocyanate

KSCN

Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Salicylic Acid



Other Names

2-hydroxybenzoic acid

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

Many people think that ordinary aspirin is salicylic acid. While aspirin is converted into salicylic acid in the body, it is actually acetylsalicylic acid, a different substance. Aspirin may therefore not be used when salicylic acid is required.

Online Supplier

hometrainingtools.com

Books

CHEMISTRY, 4th Edition

Silicon Dioxide



Other Names

silica

Local Sources

White sand is mostly silicon dioxide. It may be obtained from a beach, garden center, building supply store, or home center.

Notes

none

Online Supplier

not recommended due to easy local availability

Books

PHYSICAL SCIENCE, 5th Edition

Sodium Bicarbonate



Other Names

baking soda, bicarbonate of soda

Local Sources

Sodium bicarbonate is sold as baking soda in almost all grocery stores.

Notes

none

Online Supplier

not recommended due to easy local availability

Books

EARTH SCIENCE, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition, *CHEMISTRY*, 4th Edition

Sodium Chloride

NaCl

Other Names

table salt

Local Sources

Sodium bicarbonate is sold as salt in almost all grocery stores.

Notes

none

Online Supplier

not recommended due to easy local availability

Books

EARTH SCIENCE, 4th Edition, *PHYSICAL SCIENCE*, 5th Edition, *CHEMISTRY*, 4th Edition

Sodium Hydroxide

NaOH

Other Names

lye, caustic soda

Local Sources

Sodium hydroxide is found in some drain cleaners, which are available in hardware stores and home centers. Check the label since there are many other chemicals used as drain cleaners. It is also sold as lye for home soap making and can be found in places where soap making supplies are available.

Notes

Sodium hydroxide is usually mixed with water to achieve a specific concentration. See the [Working with Bases](#) page near the beginning of this database for instructions as to how to safely mix solutions to the concentration required for your lab. Since sodium hydroxide is a strong base and is exothermically mixes with water, special care must be taken when working with it.

Online Supplier

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amazon.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Sodium Hypochlorite

NaClO

Other Names

chlorine bleach

Local Sources

Ordinary laundry bleach usually contains sodium hypochlorite. It can be found at most grocery stores. Check the label, however, as some bleaches are based on other chemicals. Sodium hypochlorite is also used as a pool and spa disinfectant and is sold for this purpose by pool supply stores in a variety of forms, both solid and liquid. Again, always check the label since pool chemicals frequently contain alternative substances or other chemicals in addition to the key ingredient.

Notes

Sodium hypochlorite can break down into toxic fumes if it comes in contact with other household chemicals. When mixed with some acids, chlorine gas will be liberated. Combining with household ammonia produces chloramine gas. Both are toxic and irritating.

Online Supplier

not recommended due to easy local availability

Books

CHEMISTRY, 4th Edition

Sodium Nitrate



Other Names

Chilean saltpeter, nitrate of soda

Local Sources

Sodium nitrate is sold by some home and garden centers as a fertilizer. Check the label to confirm that no other chemicals are present. It is also sold as a meat curing aid in some locations, although it may be mixed with salt and sodium nitrite as well.

Notes

The terms saltpeter and nitre are also used for the closely related compound potassium nitrate.

Online Supplier

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amazon.com

Books

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Sodium Thiosulfate



Other Names

sodium hyposulfite, hypo

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

Sodium thiosulfate is used in some photographic fixers. However, it is almost always mixed with several other chemicals, so using fixer is not a good idea even when it's available locally.

Furthermore, many fixers are based on ammonium thiosulfate rather than sodium thiosulfate.

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition, *BIOLOGY*, 5th Edition

Starch Indicator

Local Sources

There are no convenient local sources. This chemical must be ordered from a chemical supply company.

Notes

Starch indicator is used to test for the presence of free iodine. It is used in the Winkler Method for testing water for dissolved oxygen and is therefore commonly included in test kits sold for that purpose.

Online Supplier

carolina.com

hach.com

Books

BIOLOGY, 5th Edition

Strontium Chloride



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

hometrainingtools.com

onlinesciencemall.com

Books

PHYSICAL SCIENCE, 5th Edition, *CHEMISTRY*, 4th Edition

Strontium Nitrate



Other Names

none

Local Sources

There are no convenient local sources. This chemical must be ordered.

Notes

none

Online Supplier

onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Sucrose



Other Names

cane sugar, white sugar

Local Sources

Sucrose is available from any grocery store.

Notes

none

Online Supplier

not recommended due to its easy local availability

Books

PHYSICAL SCIENCE, 5th Edition, *BIOLOGY*, 5th Edition

Sulfur

S

Other Names

none

Local Sources

Sulfur is often sold in home centers and garden stores as a crop dusting agent. Drugstores in some regions carry it as a skin treatment, although this practice varies widely.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

CHEMISTRY, 4th Edition

Sulfuric Acid



Other Names

oil of vitriol

Local Sources

Dilute sulfuric acid can be found locally as battery electrolyte for lead-acid batteries at auto supply stores. It is also sold as a powerful drain cleaner at some hardware stores and home centers. Since drain cleaners vary widely in their ingredients, check labels carefully.

Notes

Battery electrolyte is diluted to a concentration of around 5 *M*. Drain cleaner concentration is usually specified in percentage. Consult the label or MSDS/SDS sheet for specific information. See the [Working with Acids](#) page near the beginning of this database for help in converting percentage to molarity and then diluting the acid to the concentration required for your lab.

Lab-grade sulfuric acid is sold in a variety of concentrations. The most useful is the concentrated variety (18 *M*) since it can be diluted to any lower concentration quite easily. See the [Working with Acids](#) page near the beginning of this database for instructions on how to dilute the acid to concentration required for your lab. Since sulfuric acid is a strong acid and exothermically mixes with water, special care must be taken when working with it.

Online Supplier

hometrainingtools.com
carolina.com

Books

CHEMISTRY, 4th Edition, *BIOLOGY*, 5th Edition

Thymol Blue



Other Names

thymolsulphonephthalein

Local Sources

Thymol blue is used in some pH test kits. However, many kits do not identify the specific indicator chemical used, so it can be difficult to be sure that the desired one is present. Generally, this chemical is best ordered from a supplier.

Notes

none

Online Supplier

hometrainingtools.com
onlinesciencemall.com

Books

CHEMISTRY, 4th Edition

Universal Indicator

Other Names

pH indicator

Local Sources

There are no convenient local sources. Universal indicator must be ordered from a chemical supply source.

Notes

Universal indicator contains a mixture of chemicals that will change color in response to the pH of a liquid. Each chemical in the mixture responds to a particular narrow range of pH; thus, multiple chemicals are necessary to create a wide-range indicator. Universal indicator can be purchased as either a liquid solution or as paper test strips. The liquid form is flammable. Read warning labels carefully.

Online Supplier

hometrainingtools.com
amazon.com

Books

BIOLOGY, 5th Edition

Zinc

Zn

Other Names

none

Local Sources

Zinc is commonly used as a coating for other metals (galvanization). For electrochemical experiments, galvanized nails are often acceptable. These may be obtained from any hardware store or home center. They are easily recognized by their light gray color and rough surface. Zinc sheet metal is also available from some hardware stores and home centers.

Notes

none

Online Supplier

hometrainingtools.com

amazon.com

Books

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