

## Science Safety

The guides that are cited below were developed by the Council of State Science Supervisors (CSSS) with support from the Eisenhower National Clearinghouse for Mathematics and Science Education, the National Aeronautics and Space Administration, Dupont Corporation, Intel Corporation, American Chemical Society, and the National Institutes of Health. Science Safety Booklets may be printed for use by educators.

### Science Safety Booklets

- [Science and Safety: It's Elementary](#) (PDF) - A Elementary Safety Guide
- [Science and Safety, Making the Connection](#) (PDF) - A Secondary Safety Guide

## A SUGGESTED PATTERN FOR CHEMICAL STORAGE

The alphabetical method for storing chemicals presents hazards because chemicals, which can react violently with each other, may be stored in close proximity. Schools may wish to devise a simple color-coding scheme to address this problem. The code shown below, reproduced with permission from School Science Laboratories-A Guide to Some Hazardous Substances by the Council of State Science Supervisors, includes both solid and striped colors which are used to designate specific hazards as follows:

Red	- Flammability hazard: Store in a flammable chemical storage area.
Red Stripe	- Flammability hazard: Do not store in the same area as other flammable substances.
Yellow	- Reactivity hazard: Store separately from other chemicals.
Yellow Stripe	- Reactivity hazard: Do not store with other yellow coded chemicals; store separately.
White	- Contact hazard: Store separately in a corrosion-proof container.
White Stripe	- Contact hazard: Not compatible with chemicals in solid white category.
Blue	- Health hazard: Store in a secure poison area.
Orange	- Not suitably characterized by any of the foregoing categories.

Once the chemicals are sorted according to their color-coded hazards, sorting into organic and inorganic classes within a color should occur. The Flinn Chemical Catalog Reference Manual suggests organic and inorganic groupings that are further sorted into compatible families. For a FREE Reference Manual with the most current information, please contact Flinn at 1-800-452-1261.

Protective eyeglasses/safety goggles are required for every student enrolled in elementary and secondary science courses while participating in chemical-physical laboratory activities (MS Code 37-11-49).

## LABORATORY/CLASSROOM SAFETY EQUIPMENT

Acid cabinet  
Broken glass container  
Eyewash fountain (not plastic squeeze bottle station)  
Fire extinguishers (powder)  
First aid kit  
Fume hood  
MSDS sheets (book)  
Safety poster and contracts  
Safety shower  
Sand and buckets  
Solvent cabinet

## DANGEROUS CHEMICALS

The following lists reference chemicals that exhibit either *extremely* dangerous or *unusually* dangerous characteristics. These lists only reference chemicals that are more commonly found in laboratories and are by no means a complete list of dangerous chemicals. Teachers and administrators should always weigh the potential scientific usefulness against the potential hazards of **all** chemicals before ordering, storing or using them.

### Chemicals that exhibit extremely dangerous characteristics and are not recommended for use in high school laboratories:

**Antimony and its compounds** - Toxic if inhaled, swallowed, or absorbed through the skin.

**Benzene** – Carcinogenic.

**Benzoyl Chloride** - When heated it releases phosgene gas. Reacts violently with water.

**Benzoyl Peroxide** - Poisonous and severe explosion hazard.

**Carbon Disulfide** - Extremely flammable and poisonous, eye and lung irritant, potentially explosive.

**Chlorine (Gas)** - Corrosive and extremely poisonous.

**Dinitrophenol/2,4-Dinitrophenol** - Very poisonous. When dry it becomes explosive and shock sensitive.

**Ethylene Oxide (Gas)** - Extremely flammable and poisonous.

**Hydrofluoric (HF) Acid** - Extremely corrosive and toxic. Exposure may be fatal without immediate and very specialized first aid treatment. HF should never be stored or used in high school laboratories.

**Hydrogen (Gas)** - Extremely flammable.

**Hydrogen Chloride, Anhydrous (Gas)** - Extremely corrosive and poisonous.

**Hydrogen Sulfide (Gas)** - Flammable and extremely poisonous.

**p-Dioxane** - Extremely flammable and may present a severe explosion hazard.

**Perchloric Acid** - Poisonous and severe explosion hazard.

**Phosphorous, White/Yellow** - Flammable solid, toxic. Auto-ignites at 86 degrees Fahrenheit when exposed to air.

**Picric Acid** - When dry it becomes explosive and shock sensitive.

**Potassium Metal** - Flammable solid. Reacts violently with water. May form peroxides on the outer skin. Sodium metal is a safer alternative.

**Sulfur Dioxide (Gas)** - Corrosive and poisonous.

**Thermit** - Explosion hazard.

#### Generic Listings:

\*Compounds that exhibit severe explosion hazards

\*Poisonous gases

\*Compounds that have potential to decompose violently at normal room temperature

\*Perchlorates, Azides, Styphnates, Radioactive Compounds

**Chemicals that exhibit unusually dangerous characteristics and are not normally recommended for use in high school laboratories except in very small quantities and only when necessary for scientific reasons:**

**Ammonium dichromate** - toxic, flammable, explosive with organic compounds.

**Bromine** - Very corrosive and poisonous.

**Ethyl Ether** - Extremely flammable. Has potential to form explosive peroxides that may result in a shock-sensitive compound. Never store beyond expiration dates.

**Mercury, elemental** - Poisonous. Spills can be very difficult and expensive to clean up.

**Potassium/Sodium Cyanide** Extremely poisonous.

**Sodium Metal** - Flammable solid. Reacts violently with water.

**Generic Listings:**

\*Compounds that are unusually poisonous, air/water reactive or otherwise unstable.

\*Acute hazardous wastes (P-listed) as defined in 40 Code of Federal Regulations (CFR) Part 261.33.

\*Compounds that have potential to form explosive peroxides.

\*For additional chemical hazards, see Flinn's List of Devils in their FREE Reference manual.

# Common Safety Symbols\*

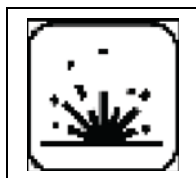
**Flammable**



**Poison**



**Explosive**



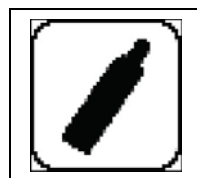
**Radioactive**



**Corrosive**



**Compressed Gas**



**Low Level Hazard**



**Severe Chronic Hazard**



*\*Globally Harmonized System of Classification and Labeling of Chemicals, United Nations New York and Geneva, 2005*

## **SUGGESTED SCIENCE EQUIPMENT AND SUPPLIES (Grades K-4)**

Balance Scales  
Batteries  
Beakers  
Calculators  
Compass  
Computer  
Filters  
Fire Extinguisher  
First-Aid Kit  
Flashlights  
Funnels  
Graduated cylinders  
Hand magnifying lens  
Hot plate  
Magnets  
Medicine droppers  
Meter sticks  
Metric rulers  
Metric weights  
Microscope  
Mirrors  
Non-mercury Thermometers  
Pans and Buckets  
Petri dishes  
Ph Indicators  
Plastic tubing (flexible and nonflexible)  
Popsicle sticks  
Prism  
Protractors  
Rock and Mineral samples  
Safety goggles  
Scissors  
Slide kits  
Small and large bulbs  
Spring scales  
Stop watch  
Tape measure  
Test tubes  
Tuning forks  
Weather Instruments  
Wire  
Wooden blocks

## **SUGGESTED SCIENCE EQUIPMENT AND SUPPLIES (Grades 5-6)**

Alcohol	Packing Peanuts
Alcohol thermometers	Pans
Baking soda	Petri Dishes
Balloons	pH indicators
Batteries	Pipe Cleaners
Beakers	Pipettes
Buckets	Plastic cups
Calculators	Plastic spoons/scoops
Colored filters	Plastic wrap
Compasses	Prisms
Computers	Protractors
Convex and Concave lenses	Ring stands
Copper Wire	Rock/mineral samples
Corn starch	Rubber bands
Cotton swabs	Sand
Craft sticks	Simple machines
Disposable Gloves	Slinky
Dried beans	Snips or Scissors
Electronic balance	Spring goggles
Electrical switches	Stoppers
Filters	Stop watches
Fire extinguisher	Straws
First Aid Kit	Styrofoam Plates
Flashlights	Sugar
Food coloring	Tape measures
Foil	Test tubes and test tube racks
Freezer bags	Triple beam balance
Funnels	Tuning Forks
Glycerine	Vinegar
Graduated cylinder	Weather Instruments
Hand lenses	Wooden blocks
Hot plate	
Hot wheel cars	
Hydrogen Peroxide	
Iron Filings	
Lab aprons	
Light bulbs	
Magnets	
Meter Sticks	
Metric rulers	
Metric weights	
Microscope	
Mirrors	

## **SUGGESTED SCIENCE EQUIPMENT AND SUPPLIES (Grades 7-8)**

Alcohol thermometers  
Anatomy models  
Batteries  
Beakers  
Blank slides  
Buckets  
Calculators  
Cell models  
Celsius thermometers  
Compasses  
Computers  
Concave lenses  
Convex lenses  
Copper wire  
Disposable gloves  
Electrical switches  
Fahrenheit thermometer  
Filters  
Fire extinguisher  
First Aid Kit  
Flashlights  
Funnels  
Glass tubing  
Graduated cylinders  
Hand magnifying lens  
Heat source  
Hose/tubing  
Insulated wire  
Lab aprons  
Light bulbs/holders  
Magnets (bar, horseshoe, ceramic)  
Magnifying glasses  
Medicine droppers  
Meter sticks and metric rulers  
Metric weights  
Microscopes  
Mineral test kits  
Mirrors  
Pans  
Periodic tables (individual and wall)  
pH indicators  
Pipe cleaners  
Plant models  
Plastic spoons  
Prisms  
Protractors  
Rock/mineral samples  
Safety goggles  
Simple machines  
Slide kits  
Slinkies  
Snip/Scissors  
Spring scales  
Stoppers  
Stop watches  
Stream table  
Styrofoam ball (various sizes)  
Tape measures  
Telescopes  
Test tubes holders  
Test tubes  
Triple beam balances  
Tuning forks  
Weather instruments  
Wire stripper  
Wooden blocks



## **SUGGESTED EQUIPMENT AND SUPPLIES (Physical Science)**

Alligator Clips	Simple pulleys
Balance	Small DC motors
Balloons	Stirring Rods
Beakers	Stopwatches
C- or D- cell battery holders	Test tube supports
Calorimeters	Test tubes
Candles	Toothpicks
Celsius Thermometers	Toy cars
Circuit Boards	Transfer pipets
Concave mirrors	Triple beam balance
Conductivity indicators	Tuning Forks
Convex mirrors	Watch Glasses
Density cylinder set	Wire stripper/cutter
Dispensing bottles	Wool and silk squares
Electroscopes	
Evaporation Dishes	
Filter paper	
Flashlights (light source)	
Funnels	
Gloves for various purposes	
Graduate Cylinders	
Gumdrops (marshmallows, etc.)	
Heat source (hot plate, bunsen burner, etc)	
Inclined planes (with pulley)	
Lab size Slinkies	
Lenses (convex and concave)	
Lens holders	
Litmus paper	
Long springs	
Marbles	
Mass hangers and weights	
Meter sticks	
Meter stick holders	
Metric rulers	
Miniature compasses	
Organic molecule sets	
pH paper	
Periodic Table	
Plastic and glass rods	
Plastic tubs	
Pulley mount clamps	
Resistors	
Ring stand setup	
Round Magnets (whole)	
Safety goggles	

## SUGGESTED EQUIPMENT AND SUPPLIES (Chemistry)

### *Laboratory Group Items*

Aprons, safety	Lighter, flint
Aspirators, vacuum	Loop, nichrome wire/flame test
Balances, triple beam	Meter stick
Beakers*	Molecular model set
Bottles, dropper	Mortar and pestle
Bottles, gas generating	Paper, filter
Bottles, plastic water bottles	pH meter
Bottles, reagent	Pipet, measuring
Boyles Law Apparatus**	Pipet, transfer
Brushes, test tube	Pipets, Beryl type, thin stem
Bulb, pipet	Pipets, Beryl type, microtype
Burets	Racks, test tube
Bunsen Burner (with tubing)	Rings
Calorimeter	Rods, glass stirring
Chart, periodic (wall size)	Spatulas
Clamp, thermometer	Spectroscope, student handheld
Clamps, burets (single and double)	Splints, wood
Clamps, test tube	Stand, rings
Conductivity device (battery operated)	Stoppers
Crucibles (with cover)	Stopwatch
Cylinders, graduated*	Thermometer, room
Desiccator	Thermometer, alcohol filled, student
Dishes, evaporating	Tongs, beaker
Flask, Erlenmeyer*	Tongs, crucible
Flask, Volumetric*	Triangles, crucible
Flask, Culture	Trough, pneumatic
Funnel, filter	Tube, gas collection
Gauze, wire (with ceramic center)	Tubes, test
Glasses, watch	Tubing, glass
Gloves, safety	Tubing, rubber
Goggles, safety	Well plates, micro*
Holder, filter funnel	

### *Classroom/Laboratory Items*

Balances, electronic centigram	Hot plate/magnetic stirrer
Barometer (mercury or aneroid)	Microwave
CBL™ or LabPro™ units/probes/software	Orbital model set
colorimeter	Oven, drying
pH strips	Power supply, spectrum tubes
pressure sensor	Refrigerator
temperature or	Software, computer
colorimeter/spectrophotometer/and	Spring, long
pH meter	Tubes, spectrum

**Purchase chemicals as needed in small quantities on a yearly basis.**

\* Variety of sizes according to curricular needs

\*\* Consider microscale alternatives (see suggested strategies)

## SUGGESTED EQUIPMENT AND SUPPLIES (Biology)

Assorted prepared slides	Plastic pipets
Autoclave	Refrigerator
Beakers	Ring stand
Benthic sampler	Safety goggles
Biological stains	Scalpel blades
Blank Slides	Scalpel handle
Blunt probes	Scissors
Burner tubing	Secchi disks
CBL with probes and software	Stereomicroscopes
Compound Microscopes	Stoppers
Concave slides	Teasing needles
Cotton swabs	Test kits
Culture dishes	Test tube holders
Dialysis tubing	Test tube racks
Disposable gloves	Thermometers (non mercury)
Dissecting pan	Tirrill burners
Dropper bottles	Tongs
Electrophoresis chambers	Triple beam balances
Electronic balances	Transparent ruler
Erlenmeyer flasks	Trowels
Flexcam	Wash bottles
Forceps	Water bath
Funnels	Water sampler
Glass stirring rods	
Graduated cylinders	
Graduated pipettes	
Hot plates	
Incubator	
Lens paper	
Life-size human skeleton model	
Magnifier	
Meter sticks	
Micropipettes	
Microwave	
Mortar and pestle	
Periodic table	
Petri dishes (plastic)	
pH meter	
Pipette bulbs or pumps	
Plankton net	
Plant press	

**\*Purchase chemicals as needed in small quantities on a yearly basis.**

## SUGGESTED EQUIPMENT AND SUPPLIES (Physics)

20MHz Oscilloscope (with probes)	Resistors (assorted)
AC/DC power supply	Resonance box
Alligator Clips	Round magnets (with hole)
Balloons	Screen holders
Bathroom scale (with kg markings)	Silicon solar cells
Beakers	Sine wave oscillator
C- and D- cell battery holders	Single pulleys
Calorimeters	Small bulbs with sockets
Candles/matches	Small DC motors
CdS photocells	Speaker/Amplifier
Celsius thermometers	Specific gravity sets
Clear protractors	Spectrum tubes
Diffraction grating slides	Spectrum tube power supply
Digital volt/ohm meters	Spring scales
Diodes	Springs
Electroscopes	Stands
Extra strength magnets	Stopwatches
Flashlights	Switches
Forces tables	Transformers
Glass blocks and prisms	Triple beam balances
Hall carriages	Tuning forks
Hand-cranked generator	Vernier calipers
Hand-powered vacuum pump	Wire stripper/cutters
Hotplate Wool and silk squares	
Inclined planes (with pulley)	
Lab size slinky	
LASER (pointers will work)	
Lenses (concave and convex)	
Lens holders	
Long springs (wave generator)	
Marbles	
Mass hangers and weights	
Meter sticks	
Meter stick holder	
Metric rulers	
Microphones	
Miniature compasses	
Mirrors (concave and convex)	
Multimeters	
Non-polarized capacitors	
Plastic and glass rods	
Plastic tubs	
Power cords	
Pulley mount clamps	
Pulley strings	