

Work Safe- Live to Graduate

Basic Lab Safety for Georgia
Tech IPST Students June 2007

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Georgia Tech Environmental Health and Safety

Department Front Office.....	4-4636
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Physical Safety- Alton Chin-Shue.....	5-0263
(Electrical Safety, Ergonomics, Lock-out-tag-out)	
Fire Marshal- Mike Hodgson	4-2990
Chem-Hazard- D. Wolfe-Lopez.....	5-2964
(Also Noise, Laser & Other Non-ionizing Radiation,)	
• http://www.safety.gatech.edu/	



Basics

- Right to Know
- Signs and labels
- Safety Equipment
- PPE
- Health and Hygiene
- Housekeeping
- Waste Disposal
- Chemical Hazards
- Compressed Gases
- Electrical Safety

Things you should ask before you walk into a lab

- Check the emergency notification information on the door- is it up to date?
- Do you know how to get MSDSs for all the chemicals in this room- not just the ones you will be working with?
- Are you wearing eye protection?



EH&S Says:

You must be wearing eye protection to walk into a lab.

Yes, this means visitors too.

Question:

- What is the best kind of eye protection?
- Any kind that you will actually wear, as long as it meets ANSI Z87.1 and has side shields for splash protection



FAQ

Can I wear contact lenses in the lab?

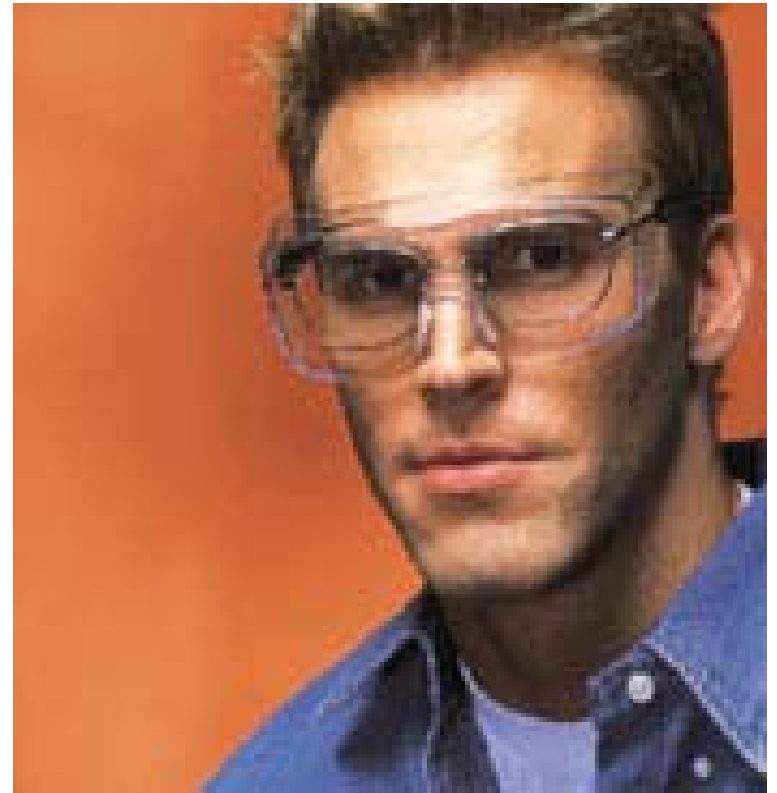
Yes, If you wear approved safety glasses with side shields or goggles over them



HD101 - Black , Clear

FAQ

What about my regular glasses?
You must wear safety glasses with side shields or goggles over them



FAQ

What about eye protection and lasers?

This is dependent on the class of laser you are working with- contact EH&S for an individual hazard assessment

Remember- Some chemicals/*processes* make goggles necessary- follow your advisor's advice in these cases.



Things you should do after you walk into a lab

- Locate emergency exits
- Locate emergency showers and eyewash stations
- Locate fire extinguishers



Get Territorial!

Don't Let Anyone Block:

- **YOUR** emergency exit
- **YOUR** emergency shower
- **YOUR** emergency eyewash
- **YOUR** fire extinguisher

When to Take a Shower



- If you are splashed with a chemical in an area of your body which cannot be put under a sink faucet and flooded immediately- you must use an emergency shower



How to Take a Shower

- If your clothing is involved- remove it on the way to the shower-
- Yell for help
- Remain in the shower for 15 minutes
- Get someone to call the GT Police
- Do not re-don contaminated clothing

How to Use an Eye Wash



- Yell for help
- Hold your eyelids open with your fingers as you rinse your eyes
- Have your helper watch a clock for you to make sure that you continue to rinse your eyes for a full 15 minutes

Post Eyewash

- You must seek medical attention immediately afterwards
- Students who require medical attention can go to Student Health- after hours/non-students need to go to Grady Hospital to ensure proper care.
- Take the MSDS with you



Appropriate Protective Apparel

- Lab coat is required when handling chemicals
- Lab coat must cover the wearer to the knees
- An apron may be substituted for a lab coat but is not recommended because it does not provide protection to arms



Your Safety in the Lab Starts with What you Wear to Work Today

- Shorts and skirts not recommended
- Nylons also not recommended
- Knee length lab coat when handling splash-able chemicals
- No canvas, open front or back, or open weave shoes

Gloves- What You Don't Know Can Kill You

- Gloves required when handling chemicals
- The most common PPE mistake seen in laboratories at GT is relying on latex gloves to provide chemical protection from organics/ solvents
- Best choice for all all purpose use- nitrile
- Resources for gloves include:
 - Bestglove.com
- Contact GT EH&S for help

Thou Shalt Not Have Food or Beverage in the Laboratory

- No eating, drinking, smoking applying cosmetics, lip balm, fussing with contact lenses or even popping a stick of gum in the laboratory

Also

- After removing your gloves and before you leave the lab- wash your hands
- No food in laboratory refrigerators
- No washing food dishes in laboratory sinks

The Secret to Working Safely with Chemicals

○ KNOW WHAT YOU ARE WORKING WITH

- Know your inventory
- Be familiar with the characteristics of the chemicals in your area

Preventing Exposure

- Review the MSDS- do you understand it?
- Do you need to put this in a fume hood?
- Are you using the right kind of gloves?
 - What you don't know can kill you
- Call EH&S if you have any questions-
 - 404-894-4635

Chemical Hazards

What to Look for on an MSDS

- Health effects = signs and symptoms
- Vapor density
 - If <1 , the material is lighter than air and may rise
 - If >1 , the material is heavier than air and may stay low to the ground

Vapor pressure

- Determines how easily a substance becomes airborne and presents an inhalation hazard. The higher the VP, the greater the hazard

What to Look For...

Physical and Chemical Properties

- Corrosivity

pH Scale

0

7

14

Acid

Neutral

Base

Remember pH is a logarithmic scale: 7 is neutral, 6 is 10X stronger than 7, 5 is 100X stronger than 7,

Corrosives In Your Lab

- Acids and Bases are corrosives= they damage what ever they touch
- HCl (AKA Muriatic Acid) will burn skin, eyes, mucus membranes or lung tissue. In severe inhalation cases it will cause a potentially fatal delayed effect called pulmonary edema.
- Gloves should be natural or butyl rubber, neoprene or nitrile.
- Concentrated acids should be dispensed in a fume hood

HF- Not Just an Acid

- Hydrofluoric Acid is a deadly poison with delayed effects:
 - Redness and pain from an HF exposure can be delayed as much as 24 hours
 - HF binds up calcium in the blood with the potential of stopping the heart
 - HF also “attacks” and binds up the calcium in bone

All Labs with HF Must Also Have Calcium Gluconate Ointment on Hand

- Treatment:
 - Wash for 15 minutes
 - Apply Ca-gluconate gel liberally
 - Not a burn ointment!
- Seek medical attention
- Take the MSDS with you!

Physical and Chemical Properties-

- flammability and combustibility
 - Flash Point- Temperature at which a liquid gives off sufficient vapor to support combustion if provided with a source of ignition
- If the fp < 100°F- it's flammable

Solvent Vapors are Heavier Than Air

- And they like to travel, especially downhill
- Solvent vapors have a way of seeking out sources of ignition
- Any equipment operating below countertop level should be intrinsically safe
- Always inform your neighbors when you have a spill



Refrigerating Flammable Materials

- Always be sure to only refrigerate flammable materials in “flammable safe” or “explosion proof” refrigerators



More About Organics/Solvents

- Symptoms of acute solvent overexposure are **headache, dizziness, nausea, fatigue...Sleepiness, coma, death.**
- Overexposure to organics/solvents also typically cause damage to the liver, kidney, bone forming tissue, demylenation of the the central or peripheral nerves. Some solvents, such as benzene are also known carcinogens.

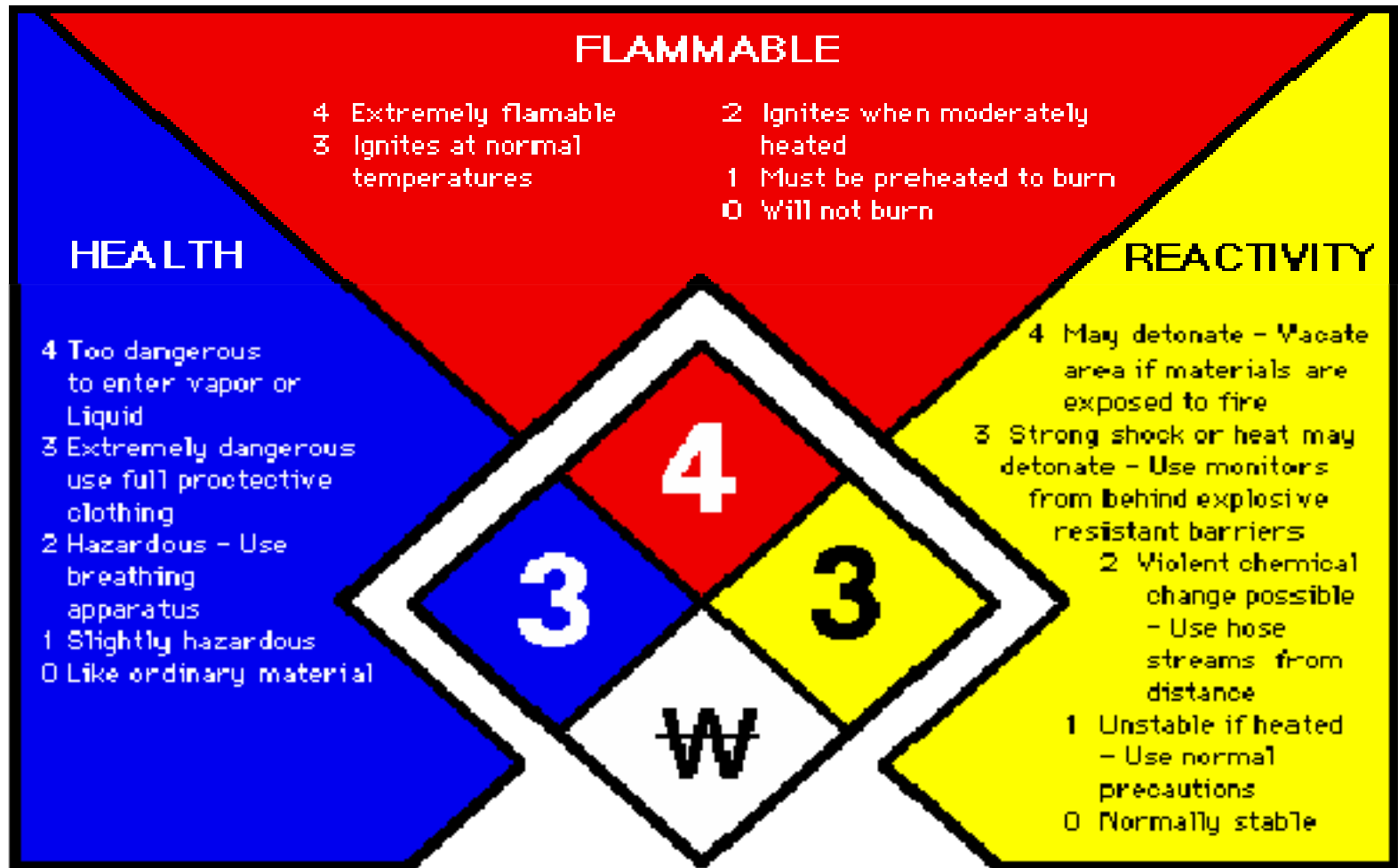
What to Look For -Reactivity

- Highly Reactive Substances- Watch your expiration dates
- Do not open a liquid organic peroxide or peroxide former (such as tetrahydrofuran) if crystals or precipitate is present. These crystals are shock and pressure sensitive.
- If you find a bottle with crystals- do not open, crystals often form under the cap. Opening it could cause an explosion.

Toxicity Levels- Human

- Extremely Toxic (LD_{50} Rat = 5mg/kg)
 - Lethal dose for a human = a taste - < 7 drops
- Highly toxic (LD_{50} Rat = 5-50mg/kg)
 - Lethal dose for a human = 7 drops - 1 tsp.
- Moderately toxic (LD_{50} Rat = 50-500mg/kg)
 - Lethal dose for a human = 1 tsp - 1 oz
- Slightly (LD_{50} Rat = 500mg-5g/kg)
 - Lethal dose for a human = 1 oz - 1 pt.
- Practically Non-toxic (LD_{50} Rat = >5g/kg)
 - Lethal dose for a human > 1 pt.

NFPA



When it's Time for Clean Up

- Store all liquids in secondary containment
- Segregate Acids, Bases and Flammables into separate, appropriate, labeled cabinets
- Separate reactive materials such as acids, bases and oxidizers from one another in separate cabinets.
 - Organic from inorganic acids
 - Inorganic acids from one another



How to Dispose of Chemical Waste

- Organics- Never go down the drain, collect them and call for a waste pick up
- Metals- Never go down the drain, collect as above
- Acids and bases- never go down the drain, collect as above
- P-Listed materials (highly hazardous)- check www.safety.gatech.edu never go down the drain, collect as above

Empty Bottles

- Rinse acid and base bottles – ***Rinsate*** may go down the drain, deface label, dispose in glass trash
- Dry off organic residue by leaving bottle open in hood, deface label, dispose as above- note, don't let bottles accumulate in hood
- P-Listed materials- bottle is hazardous- do not rinse, dispose of as hazardous waste- call EH&S for a pick up.

Packaging Chemical Waste

- Container must:
 - Be compatible with waste
 - Have non-leaking closure
- Consolidate smaller containers of compatible materials.
- Lids must be closed except when actually adding waste
- Must be labeled from the time you start collecting the waste

Light bulb
glass on
counter.

Glass shards
from
explosion
traveled up
to 32 feet
and some
were
embedded
up to $\frac{3}{4}$ inch
in the fume
hood
ductwork
insulation.



Labeling Chemical Waste

- Excess chemicals with manufacturer's original label need not be labeled.
- All others: Chematix label or:
 - Name and phone number of responsible individual
 - Contents: Chemical Name(s) and approximate percentages.
 - Other pertinent information.

MINOR SPILLS

SPILLS YOU CAN HANDLE

- NOTIFY POSSIBLY AFFECTED PERSONNEL
- CLEAN IT UP
- BAG WASTE FOR PROPER DISPOSAL
- REPLENISH SUPPLIES
- EXAMINE WHAT WENT WRONG

MAJOR SPILLS

SPILLS YOU CAN'T HANDLE

- MEDICAL ATTENTION REQUIRED
- VIOLENT ON-GOING REACTION OR FIRE
- HIGHLY DANGEROUS OR UNKNOWN MATERIAL

WHAT TO DO

- NOTIFY PERSONNEL IN AREA
- CLOSE FUME HOOD/SHUT OFF EQUIPMENT
- POST WARNING SIGN
- PULL FIRE ALARM IF NECESSARY

WHAT TO DO (#2)

- CONTACT POLICE (4-2500)
- If possible, remain on or close to phone.

- REMAIN IN AREA UNTIL RELEASED



Using Compressed Gas Cylinders

- Gas Cylinders must be restrained with a chain (preferable) or strap between the “waist” and “shoulder”.
- Remove regulators and cap cylinders before moving.
- Cap unused cylinders
- Never use grease or Teflon tape on cylinder fittings

Using Compressed Gas Cylinders

- Fittings vary between gas types: toxic, corrosive, inert, flammable, oxidizing.
- Never force a fitting- you are probably using the wrong type.
- Always use non sparking tools around flammable and oxidizers
- Cylinder (not the cap) must be labeled as to contents. Do not rely on cylinder color to identify- they vary between manufacturers.

Fume Hoods

- Are ventilated work areas, not junk yards!
- Don't fill up the hood with junk, waste, stored chemicals
- Keep work 6" back from front of hood
- Keep sash at 18" unless setting up or taking down
- Close hood completely when not using.

Electrical Safety

- Make sure equipment/electrical cords are in good condition
- Make sure equipment is grounded (3 plugs)
- Make sure equipment s/a hot plate-stirrers- are safe to use around flammable materials (no power strips in fume hoods)
- Permanent equipment must have permanent wiring- no extension cords.



Questions?
