

Safety in the Laboratory

Why Should I Care?

- Hazards are Everywhere
 - What you don't know, can kill you
 - Murphy's Law
 - Rule of 300
- Minimize or Avoid Hazards
 - Knowledge
 - Critical thinking
 - Responsibility
 - Communication

Physical Hazards

- Everyday Hazards
 - Tripping/slipping
 - Electrical (bad ground, frayed wires, etc.)
 - Burns
 - Sharps
- Machinery and Equipment
 - Crushing hazards
 - Noise
 - Hot/cold surfaces (burns)
 - High voltage/electrical arcs

Physical Hazards

- Radiation/Light
 - Lasers
 - Radioactivity
 - Magnetic fields
 - Other electromagnetic radiation
 - UV Lamps
 - Radio frequency radiation
 - X-rays
- Non-Flammable Compressed Gases
- Cryogenics

Biological Hazards

- Physical Hazards
 - Crushing/trampling by animals
 - Bites (physical damage, infection)
- Allergic Reactions
 - Bites/stings
 - Allergens
- Biohazards
 - Infectious agents
 - Venom/toxins
 - Parasites

Chemical Hazards

- Acute Hazards
 - Explosive
 - Poison/toxic
 - Flammability (flammable vs. combustible)
 - Pyrophoric/spontaneously combustible
 - Water reactive (moisture sensitive)
 - Corrosive (acids, bases, other)
 - Oxidizer/organic peroxide

Chemical Hazards

- Chronic Hazards
 - Poison/toxic
 - Sensitizer
 - Mutagen, teratogen, carcinogen
 - Absorbed through skin
- *Primarily* Nuisance Hazards
 - Irritant
 - Vesicant
 - Lachrymator
 - Stench

Protecting Yourself

- Be Aware of your Environment
- Correct known Hazards
- Check Safety Equipment regularly
- Be Prepared
 - Know emergency procedures
 - Locate emergency equipment
 - Don't trust to luck (Rule of 300)
- Leave yourself an Escape Route

Protecting Yourself

- Familiarize Yourself with Materials and Procedures before Starting Work
 - Published procedure
 - **S**tandard **O**perating **P**rocedures
 - Label and **M**aterial **S**afety **D**ata **S**heet
 - When in doubt, ASK!
- Know Exposure Routes
 - Inhalation
 - Ingestion
 - Absorption through skin






Protecting Yourself

- Minimize Your Exposure
 - Change procedure if necessary
- Choose proper **P**ersonal **P**rotective **E**quipment
 - Clothing (maximum coverage, no bling)
 - Eye protection
 - Gloves
- Use Safety Equipment to lessen Exposure
 - Hoods
 - Box, glove bag, etc.

Protecting Yourself

- Observe **G**ood **L**aboratory **P**ractices
 - Technique
 - Hygiene
 - Workspace (clean up regularly)
 - Personal (hand washing, no food, no cosmetics)
 - Behavior
 - Labeling
- Don't Work Alone (Buddy System)
 - Chemistry's rule

Communicating Hazards

- Labeling
 - General labels   
 - International symbols 
 - DOT placards 
 - NFPA diamond 
- Material Safety Data Sheets
 - Where to find
 - How to read

Emergency Procedure: Injury

- See Handout
 - Health form
 - Notifications
 - Accident report form
- Cuts, Bruises, Burns
 - Minor: student self-treats using lab first aid kit
 - Major: call 911
- Chemical Exposure
 - Minor: wash copiously with water
 - Major: safety shower (15 min), call 911

Emergency Procedure: Incident

- Don't Panic
- Assess the Situation
 - Identify problem (what, where, how big)
 - Call for help and notify mentor
- If Problem is not life-threatening,
 - Isolate and contain
 - Clean up (Physical Plant x4200)
 - Dispose of waste
 - Clean up yourself
 - Notification

Emergency Procedure: Incident

- If Problem is life-threatening, **Evacuate**
 - Dial 911
 - Pull fire alarm to evacuate building
- If Building is evacuated
 - Magruder: meet on Violette west steps
 - Violette: meet at Magruder SE door
 - Both: Stokes Stadium
 - Mentors take roll, account for all students and report to Miller/Nagan/Thompson
 - Identify problem and people involved

Fighting Fire

- Fire Control
 - Prevention (easiest fire to fight?)
 - Detection
 - Extinction
- Fire Triangle
 - Fuel, oxidizer, ignition source
- Fighting a Fire
 - Remove one or more legs of triangle
 - How?
 - When do you run?

Fire Extinguishers

- Basic Types
 - Class A: ordinary combustible materials
 - Class B: flammable or combustible liquids
 - Class C: electrical equipment
 - Class D: metal
 - Mixed type (usually AB, BC or ABC)
- Cautions
 - Don't use A or B (or water) on C fire
 - Don't use A, B or C on D fire

Cleaning Up after an Incident

- General
 - Minimize exposure, wear appropriate PPE
 - Wash everything with soap and water
- Blood and Biological
 - See handout for general procedure
 - Wash area with bleach solution
- Chemical and Oil
 - Contain with spill pillows/adsorbent
 - Do not attempt to neutralize acids
 - Double bag all solid contaminated items

Disposal of Waste

- Drain Disposal of Chemical Waste
 - Water soluble, minimal hazard
- Segregation of Chemical Waste
 - Halogenated/non-halogenated organic, inorganic/heavy metal
- Biological Waste
 - Drain disposal
 - Non-drain disposal (biohazard bag)
- When in Doubt, Ask!

Safety Links

Truman Chemistry Links

<http://chemlab.truman.edu/>
Health Form (PDF form)
Basic Safety Information

<http://chemlab.truman.edu/CHEM100Labs/CHEM100Files/SenateBill.htm>

McCormick Web Page

<http://www2.truman.edu/~jmccormi/> (scroll to Safety heading)
Accident Report Form (PDF)
Incident Report Form (PDF)
Blank Lab Contact Poster (Word)
NFPA Labels (PowerPoint)
Hazardous Waste Collection Forms (PDF)
