

Module 1

Safety and Scientific Methods

Forensic Science Teacher Professional Development

Overview

Module 1 Safety and Scientific Methods

MODULE 1A

Unit 1: Introduction

Unit 2: General rules

Unit 3: Personal hygiene

Unit 4: Housekeeping

Unit 5: Protective clothing and equipment

MODULE 1B

Unit 6: Material Safety Data Sheet (MSDS/SDS)

MODULE 1C

Unit 7: National Fire Protection Association (NFPA)

Unit 8: Chemical storage

Unit 9: Flammable materials

Unit 10: Reactive chemicals

Unit 11: Corrosive chemicals: acids and bases

Unit 12: Video and compressed gas cylinder and Dewar cylinder

Unit 13: Control Measures, Ventilation and fume hoods, Spill clean-up

Unit 14: Blood-borne pathogens

MODULE 1D

Unit 15: Scientific Methods

Module 1A

General Lab Safety

Forensic Science Teacher Professional Development

Safety Overview

General rules prevent accidents and increase student safety.

Safety covers aspects needed to safely operate and maintain a lab.

- Rules, hygiene, housekeeping
- Protective clothing and equipment
- Material Safety Data Sheet (MSDS/SDS)
- National Fire Protection Association (NFPA)
- Chemicals
- Control measures and cleanup
- Blood-borne pathogens



Unit 2: General Rules

Module 1
Safety and
Scientific Methods

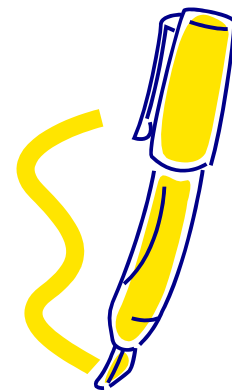
- Be able to read and understand Material Safety Data Sheets (MSDS/SDS).
- Know the appropriate safeguards for using any chemical, including personal protective equipment (PPE).
- Understand how to properly select, use, and care for personal protective equipment (PPE) in the work area. PPE includes eyes, face, hands, body, feet, respiratory, and hearing protection for workers.
- Know how to properly store all the chemicals.
- Know the Hazardous Waste Management procedures.
- Be familiar with personal hygiene practices.

Unit 2: General Rules

- Know procedures for emergencies: first aid, evacuation routes, and spill cleanup procedures.
- Never work alone in a science laboratory or storage area.
- Waste must be disposed of in accordance with federal, state, and local environmental control regulations.
- Always buy chemicals in the smallest quantities needed. Chemicals do expire. Once they expire, make sure they are disposed of correctly.
- Always be aware of your surroundings. Be observant of your lab partners and people around you.
- Analyze lab procedures in advance to pinpoint hazardous areas.

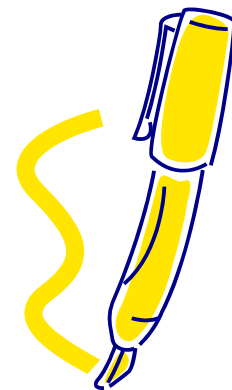
Helpful Hints

- Never pour unused chemicals back into the stock solution. This rule is to ensure the stock solution is never contaminated.
- A Standard Operating Procedure (SOP) is a written document that has all the details on the steps of the protocol or product. Some examples of SOPs in the lab are dishwashing guidelines, instructions on how to operate an instrument, or techniques on how to carry out a specific investigation.



Nomenclature

- Safety Data Sheets (SDS) have been used interchangeably with Materials Safety Data Sheets (MSDS), since the introduction of the Globally Harmonized System (GHS).
- The GHS is a system of classifying and labelling chemicals. The system was developed by the United Nations and is currently used around the world. For more information on GHS, visit the following site.
<https://www.osha.gov/dsg/hazcom/ghs.html>



Unit 2: General Rules Continued

Module 1
Safety and
Scientific Methods

Outdoor Safety

- For outdoor safety, everyone should use the same universal precautions as in an indoor laboratory.
- The majority of forensic work is taken to an indoor laboratory to process; however, there is some work that needs to be done outdoors.
- Be aware of environment conditions such as weather, temperature, vegetation, and animal life.
- Pay close attention to weather changes, especially for thunderstorms, lightning, flash floods, tornadoes, hurricanes, blizzards, etc.

Unit 2: General Rules Continued

Module 1
Safety and
Scientific Methods

Outdoor Safety

- Make sure to take the right tools that are needed for the field, such as a first aid kit, raincoats, and a good pair of shoes.
- With the universal precautions, you should protect your legs and feet by avoiding the use of shorts, skirts, and open shoes.
- Keep properly hydrated, especially during the summer.
- All the activities during the summer should be scheduled either during the morning or during the evening to avoid exposure to high temperatures.

Unit 2: General Rules Continued

Module 1
Safety and
Scientific Methods

Outdoor Safety

- Be aware of an extreme fire danger: a small spark can light a wildfire, or even a hot exhaust system on a car can start a fire.

Resources for outdoor safety:



<http://www.youtube.com/watch?v=9iyvlkVQm14>

Safety Guidelines for Field Researchers




<http://ehs.berkeley.edu/sites/default/files/lines-of-services/field-safety/fieldresearchsfty.pdf>

Unit 3: Personal Hygiene

Module 1
Safety and
Scientific Methods


- When a chemical has contacted the skin, wash with water promptly. Flush the skin or eyes for 15 minutes before seeking medical attention.
- Do not inhale or sniff chemicals. Fume hoods minimize the exposure to chemicals.
- Never pipette by mouth. Learn to use the pipette bulb (relatively cheap device) or automated pipette.
- Do not do any of the following in the lab or chemical storage room: eat, drink, chew gum, store beverages or food (including in the refrigerator or freezer), apply cosmetics, eat or drink ice from lab ice machine.
- Smoking is prohibited in a lab.
- Before leaving the laboratory, wash yourself well with soap and water.

Unit 4: Housekeeping

- Good housekeeping is a key element to avoid or minimize accidents.
- EMERGENCY EQUIPMENT: Make sure everyone has access to emergency equipment: showers, eyewashes, fire extinguishers, exits, and circuit breakers.
 -  Never block emergency equipment. Do not put trash cans or carts in front of them. Do not use locations where emergency equipment is found for storage.
- KEEP AREA CLEAR: Keep all bench tops clear of unused boxes, paper, and combustible material.
- LABELS: Properly label all containers and store chemicals in correct containers. Replace fading, falling off, or deteriorating labels. Use minimal abbreviations. Improper labeling creates hazards.
- STORAGE: Do not leave chemicals on desks, laboratory bench tops, floors, or fume hoods or in aisles.

Unit 4: Housekeeping

Module 1
Safety and
Scientific Methods

- REQUIRED ITEMS:
 - Puncture-resistant, plastic red container designated for glassware disposal
 - Biohazard cardboard box for paper, gloves, and other items for disposal
 - Proper disposal containers for batteries, electronics, and light bulbs separately in accordance with federal, state, and local environmental control regulations
- No unlabeled containers are allowed in the lab. Dispose of all unlabeled containers at the end of each workday.
- Collection containers for wastes must be labeled with the correct hazard identification.
- Bench tops and work areas should be clear and organized.
 -  Never place reactive chemicals near the edges of the lab bench.

Unit 4: Housekeeping

- Decontaminate all surfaces after completion of procedures or spills. Cleaning is done by wiping with a disinfectant such as isopropyl alcohol or a 10% bleach mixture in water.
- All aisles, corridors, hallways, stairs, and stairwells must be kept clear of chemicals, equipment, supplies, boxes, and debris.
- Eating and office areas must be clearly separated from laboratory and chemical storage areas.
- Never leave heat sources unattended (gas burners, hot plates, heating mantles, and sand baths).
- Floors must be kept dry at all times. Spills are to be cleaned up immediately from work areas and floors.

Unit 4: Housekeeping

Module 1
Safety and
Scientific Methods

Empty containers shall be treated in the following manner:

- For water soluble solvents, triple rinse, deface the label, re-label as “empty” and dispose with bio-hazardous waste.
- For non-water soluble solvents, triple rinse using a solvent capable of removing the chemical. All rinses must be collected in a hazardous waste disposal container; deface the label, re-label as “empty,” and dispose with bio-hazardous waste.



Waste must be disposed of in accordance with federal, state, and local environmental control regulations.

Unit 5: Protective Clothing & Equipment

Module 1
Safety and
Scientific Methods

PPE Fact Sheet from OSHA:

http://www.osha.gov/OshDoc/data_General_Facts/ppe-factsheet.pdf

PPE article from OSHA

<http://www.osha.gov/Publications/osa3151.html>




Inspect all protective equipment prior to use.

Do not use if the equipment is broken, scratch up, abused, defective, or missing parts.

Unit 5: Protective Clothing & Equipment

Module 1
Safety and
Scientific Methods

Eye Protection

- Depending on your application or lab, you may use safety glasses, chemical-resistant goggles, or face shields.
- Eye protection should be worn at all times in the laboratories where chemicals are being used, and this includes visitors.
 -  Ordinary prescription glasses are not considered effective eye protection since they lack the necessary shielding. There are goggles that can be worn over glasses or prescription safety glasses.
- The wearing of contact lenses in the laboratory is very controversial. Consult with an optometrist prior to wearing in the laboratory. Safety glasses or chemical resistant goggles must be worn over contacts at all times.



Unit 5: Protective Clothing & Equipment

Module 1
Safety and
Scientific Methods

Gloves

No one glove can protect against all hazards.
Check for pinholes, tears, or rips.

- Cloth gloves can protect against light, abrasive materials and moderate temperature changes, but they are not appropriate for use around liquids.
- Synthetic or rubber gloves are good against corrosives, solvents, and poisons.
- Leather gloves can protect against sparks, heat, and rough abrasives (great for welders).
- Gloves that will resist penetration of the chemical being handled should be worn.



Unit 5: Protective Clothing & Equipment

Module 1
Safety and
Scientific Methods

Attire

- **SHOES:** Low-heeled, fully-covered uppers are required.
 - Leather shoes are better than cloth and mesh shoes.
 - Shoes or sandals with open toes are discouraged.
- **PANTS:** Long pants and long sleeves should be worn when working with or around chemicals.
 - No dresses or capris (short pants) are allowed in the lab.
 - Lab coats are highly encouraged at all times.
 - Loose pants, baggy sleeves, and neckties should not be worn in the laboratory.
- **HAIR:** Long hair should be tied back behind the head.
- **APRON:** A full-body length rubber, plastic, or neoprene apron appropriate for the material being handled should be worn if there is a risk of splash or spill.

Unit 5: Protective Clothing & Equipment

Module 1
Safety and
Scientific Methods

Protective Equipment

- A fume hood should be used if the chemical is harmful if inhaled. You may have to weigh out the chemical in the fume hood. Please see MSDS/SDS for details.
- If you do not have access to a fume hood, then a proper respirator must be worn whenever the exposure by inhalation is likely to exceed the action level or Personnel Exposure Limit (PEL).



The MSDS Hyper Glossary: PPE
<http://www.ilpi.com/msds/ref/ppe.html>

End of Module 1A

Forensic Science Teacher Professional Development