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AN IMPORTANT SAFETY ASPECTS TO CONSIDER WHILE WORKING IN A CHEMISTRY LABORATORY

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Lab Safety

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الساعة الثامنة والنصف مساءً

Aim of workshop

- Some important practices important to know.
- Covering the most important aspects the researcher might involve while working in a chemistry lab.
- the safety rules that scientists should follow in the laboratory

Working in a lab is an exciting venture, full of promise, creativity, and new discoveries. It's also not the easiest thing to accomplish. Considerable deliberation goes into working in a lab, including mountains of paperwork and countless decisions that you need to make.

This workshop aim to factors to consider when working in the laboratory that can help it become more productive, efficient, and above all, successful.

LABELLING

All containers must be labelled with:

- Product name
- Ingredients, if applicable
- HAZARDOUS or words that indicate the severity of the hazard, like dangerous poison, warning, caution.

Chemical Storage Area ACS Guidelines

- Shelving for chemicals, organized to account for hazards and incompatibility.
- Separate, designated, enclosed cabinets for acids, bases, oxidizers, organics, and other flammables.
- Equipment should be stored in separate cabinets from chemicals.
- If chemical storage is near a classroom with emergency equipment and no physical barrier, then no additional safety equipment is needed in the chemical storage area.

Incompatible compounds

-Incompatible chemicals are combinations of substances, usually in concentrated form, that react with each other

-produce very exothermic reactions that can be violent and explosive and/or can release toxic substances, usually as gases."

-Example ; Acetone with Hydrogen peroxide, Iodine with Ammonia…etc

Note: There have been many explosions from inappropriate or inadvertent mixing of nitric acid with organic chemicals in waste containers.

- Care must be used to avoid mixing incompatible chemicals such as
  - Acids with Bases
  - Oxidizers and Flammables
  - Water reactive and aqueous solutions
  - Cyanides and acids

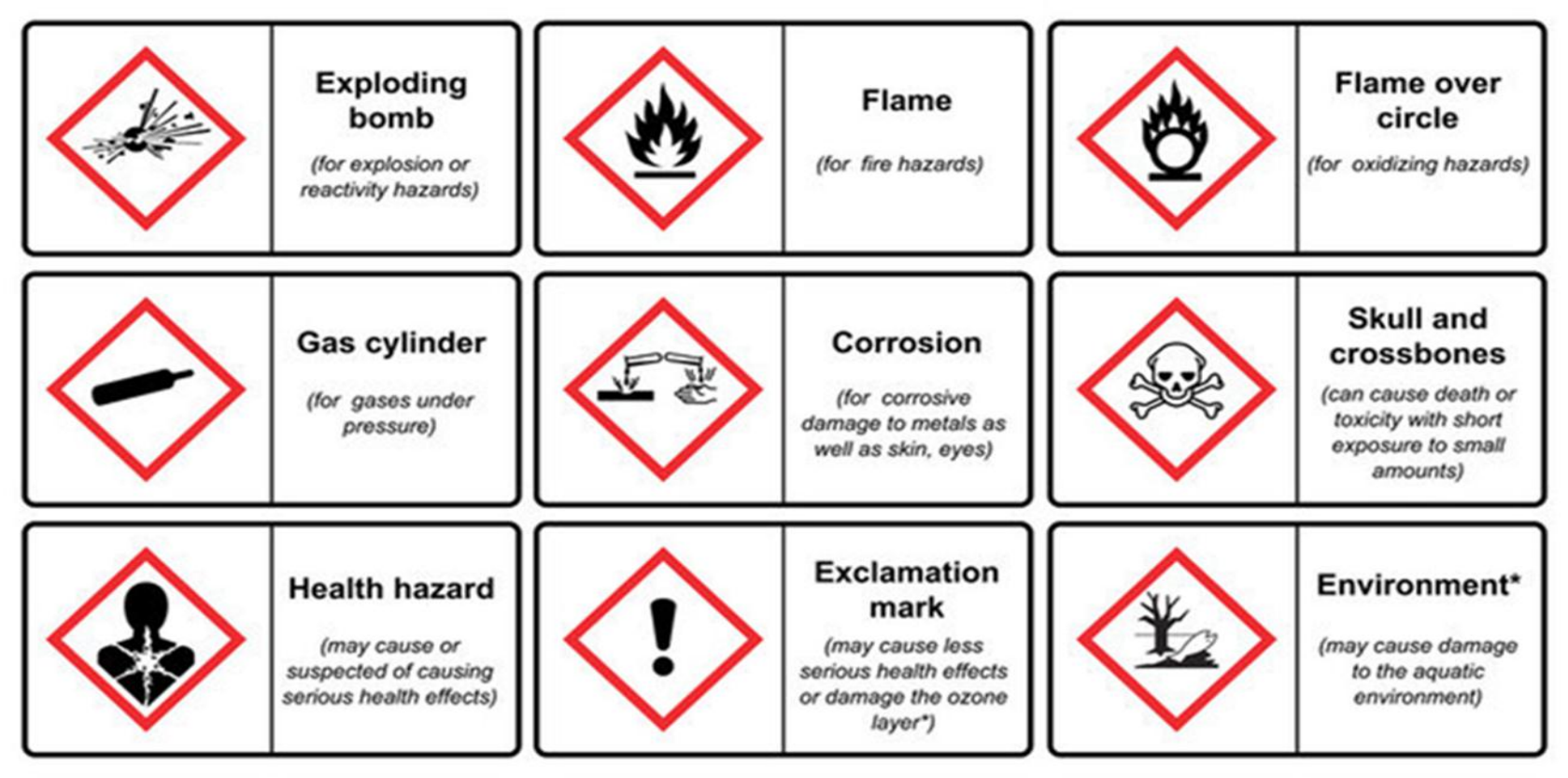
Incompatible chemicals	
Acetic acid	Chromic acid, nitric acid, peroxides, permanganates
Acetic anhydride	Hydroxyl group containing compounds, ethylene glycol, perchloric acid
Acetone	Concentrated nitric and sulfuric acid mixtures, hydrogen peroxide
Acetylene	Bromine, chlorine, copper, fluorine, mercury, silver
Ammonium nitrate	Acids, chlorates, flammable liquids, nitrates, powdered metals, sulfur, finely divided organic or combustible materials
Aniline	Hydrogen peroxide, nitric acid
Calcium oxide	Water
Carbon, activated	Calcium hypochlorite, other oxidants
Chlorates	Acids, ammonium salts, metal powders, sulfur, finely divided organic or combustible materials
Chromic acid	Acetic acid, camphor, glycerol, naphthalene, turpentine, other flammable liquids
Chlorine	Acetylene, ammonia, benzene, butadiene, butane and other petroleum gases, hydrogen, sodium carbide, turpentine, finely divided metals
Copper	Acetylene, hydrogen peroxide
Hydrazine	Hydrogen peroxide, nitric acid, other oxidants
Hydrocarbons	Bromine, chlorine, chromic acid, fluorine, peroxides
Hydrocyanic acid	Alkalis, nitric acid
Hydrofluoric acid, anhydrous	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Aniline, chromium, combustible materials, copper, Iron, most metals and their salts, nitromethane, any flammable liquid
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Iodine	Acetylene, ammonia (aqueous or anhydrous)
Mercury	Acetylene, ammonia, fulminic acid
Nitric acid, concentrated	Acetic acid, acetone, alcohol, aniline, chromic acid, flammable gases, flammable liquids, hydrocyanic acid, hydrogen sulfide, nitratable substances
Nitroparaffins	Amines, inorganic bases
Oxalic acid	Mercury, silver
Oxygen	Flammable liquids, solids, or gases, grease, hydrogen, oils
Perchloric acid	Acetic anhydride, alcohol, bismuth and its alloys, grease, oils, paper, wood
Peroxides, organic	Acids (organic or mineral)
Phosphorus (white)	Air, oxygen
Potassium chlorate	Acids (also refer to chlorates)
Potassium perchlorate	Acids (also refer to perchloric acid)
Potassium permanganate	Benzaldehyde, ethylene glycol, glycerol, sulfuric acid
Silver	Acetylene, ammonium compounds, fulminic acid, oxalic acid, tartaric acid
Sodium	Carbon dioxide, carbon tetrachloride and other chlorinated compounds, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Any oxidizable substances (e.g., acetic anhydride, benzaldehyde, carbon disulfide, ethanol, ethyl acetate, ethylene glycol, furfural, glacial acetic acid, methanol, methyl acetate)
Sulfuric acid	Chlorates, perchlorates, permanganates

A chemical **hazard** is any substance that can cause a health problem when ingested ,inhaled, exposed to dermal absorption or through accidental Injection.

Types of chemical hazards

Asphyxiants, Corrosives, Irritants, Flammable and Carcinogens.

The Globally Harmonized System (GHS) is an internationally adopted system for the classification and labeling of hazardous chemicals.



Example

Isopropanol (propan-2-ol)

DANGER

Highly flammable liquid and vapor. Causes serious eye irritation. May cause drowsiness or dizziness.

PREVENTION

Keep away from heat, sparks, and open flames. — No smoking. Keep container tightly closed.

Avoid breathing vapors. Use only outdoors or in a well-ventilated area. Wear eye protection.

RESPONSE

If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a doctor if you feel unwell.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

In case of fire: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide for extinction.

Provides procedures for **handling or working with the substances** in a **safe** manner through knowledge of;

- melting point, boiling point, flash point, etc.
- toxicity, health effects, first aid.
- reactivity, storage, disposal.
- protective equipment, & spill-handling procedures.

RAMP concept

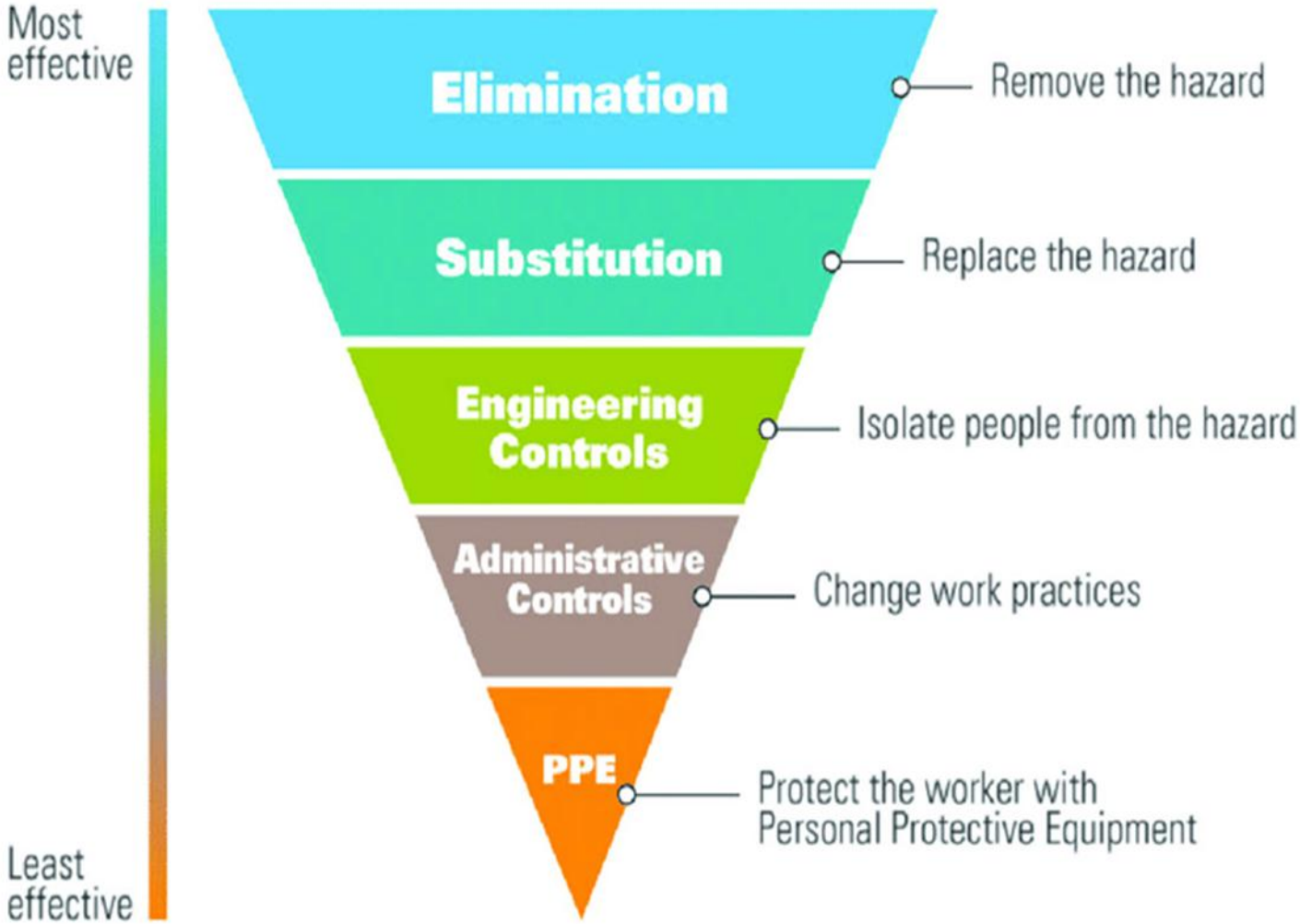
R **Recognize the hazards**

A **Assess the risks of the hazards**

M **Minimize the risks of the hazards**

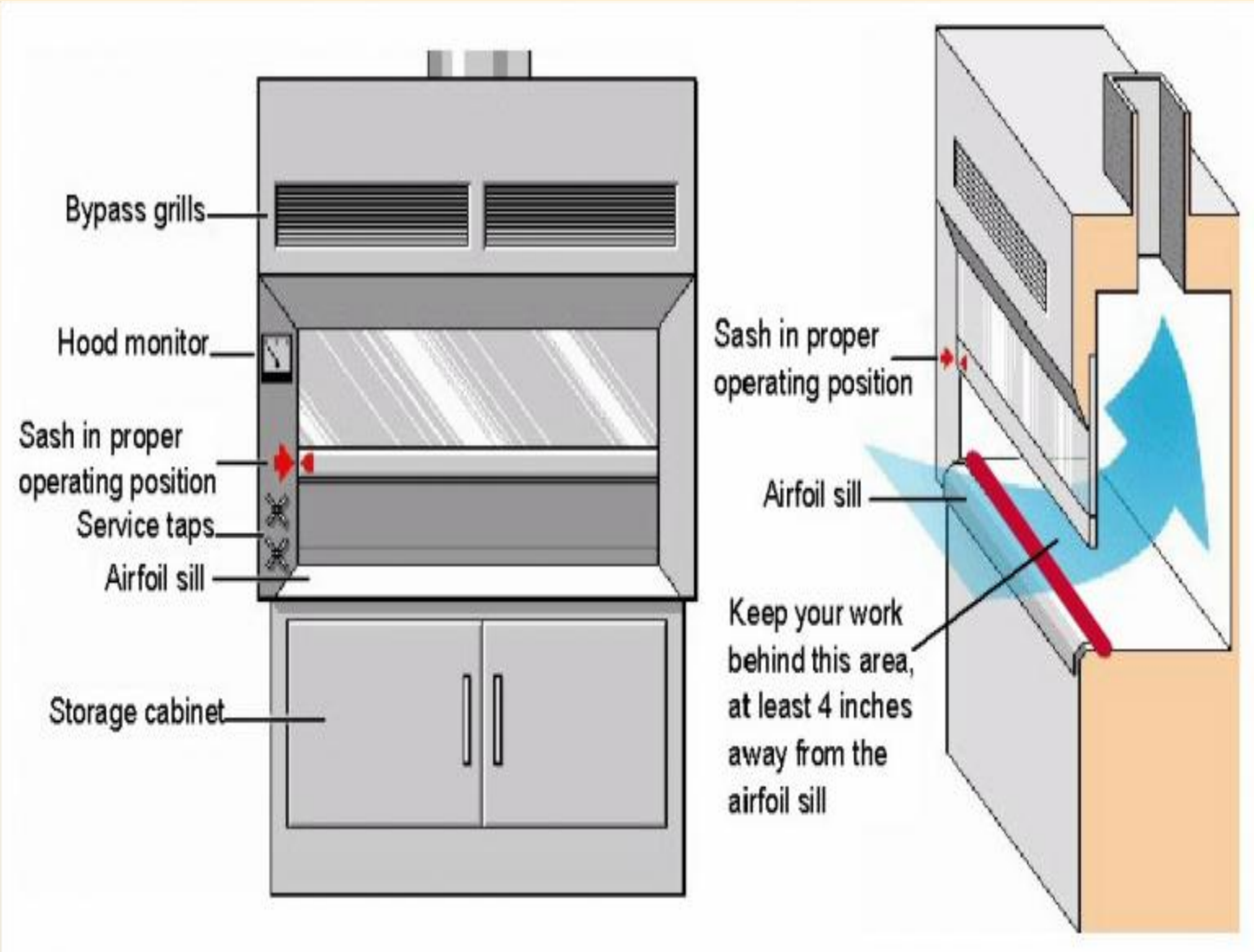
P **Prepare for emergencies from uncontrolled hazards**

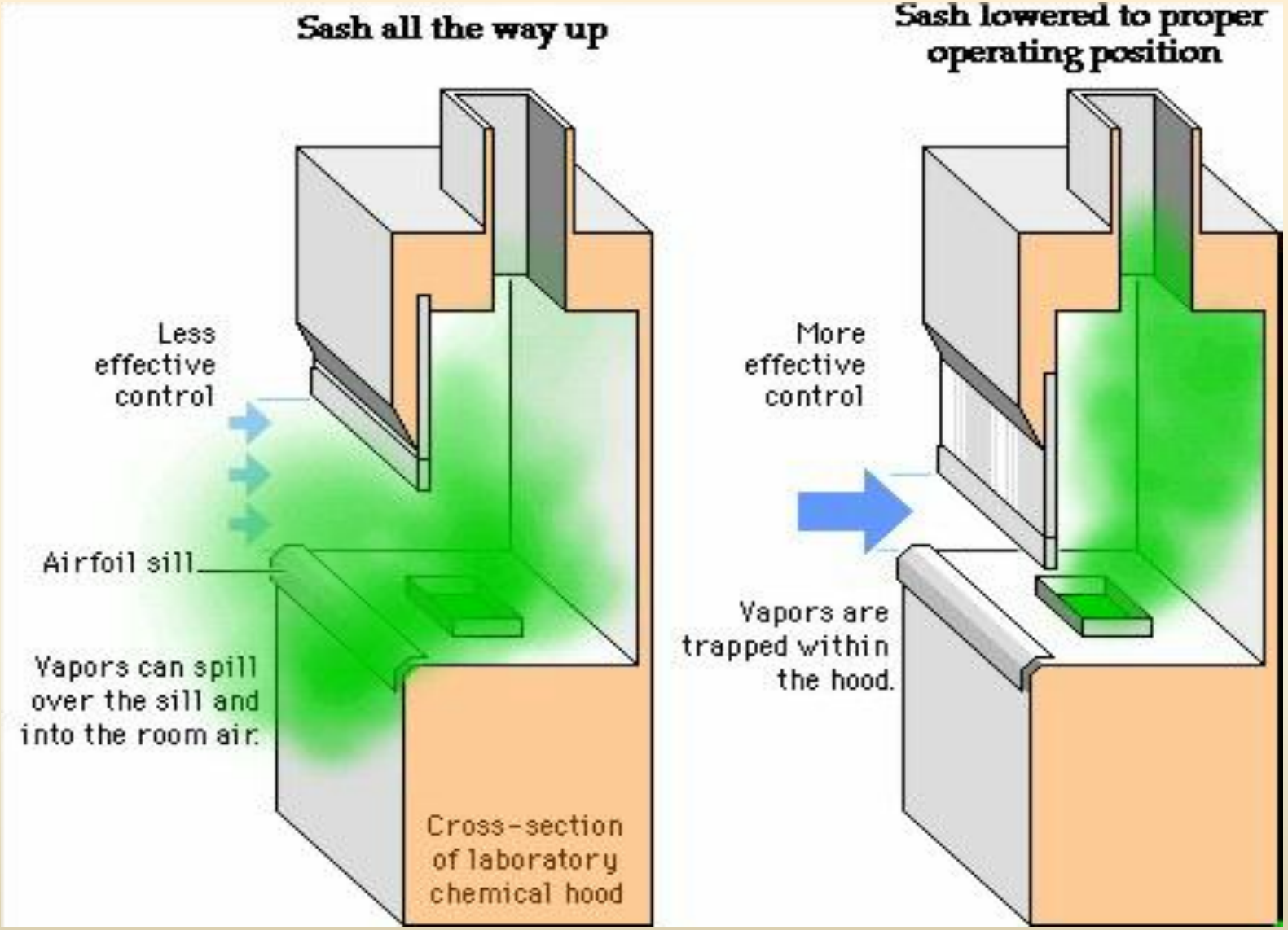
Hierarchy of Controls



Fume Hood Use

- When using a laboratory hood, set the equipment and chemicals back at least 6 inches.
- Never lean in and/or put your head in the hood when you are working. This is worse than doing the experiment with no hood at all.
- Keep liquid reagent containers in trays to catch all spills and drips.


Bypass grills
Hood monitor
Sash in proper operating position
Service taps
Airfoil sill
Storage cabinet
Sash in proper operating position
Airfoil sill
Keep your work behind this area, at least 4 inches away from the airfoil sill


Sash all the way up
Less effective control
Airfoil sill
Vapors can spill over the sill and into the room air.
Cross-section of laboratory chemical hood
Sash lowered to proper operating position
More effective control
Vapors are trapped within the hood.

Personal protective equipments(PPE)

Dress appropriately ,No sandals, no cloth love more than life, no contact lenses, and long pants are preferable to shorts or short skirts. Tie long hair back. Wear safety goggles(polycarbonate eye wear),breathing mask, gloves and a chemical and flame lab coat.

- know how to use safety equipments:

-Eye wash station

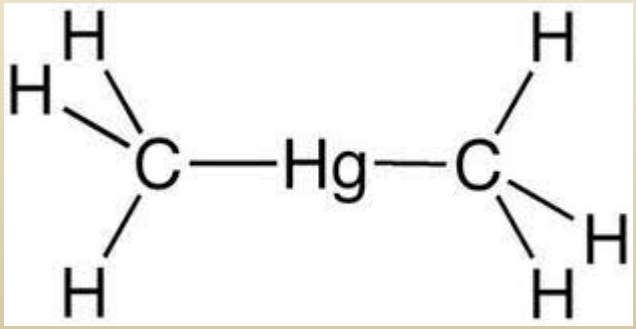
- Fire Blanket
- Fire Hose

- Safety Shower

- Fire Extinguisher
- First Aid Station

Importance of choice of appropirate PPE

Karen Wetterhahn Jennette, was an American professor of chemistry at Dartmouth College, New Hampshire, who specialized in toxic metal exposure. She died of mercury poisoning at the age of 48 due to accidental exposure to the extremely toxic organic mercury compound dimethylmercury (Hg(CH3)2). Protective gloves in use at the time of the incident provided insufficient protection, and exposure to only a few drops of the chemical absorbed through the gloves proved to be fatal after less than a year.



Choose the appropirate gloves

Glove Material	Intended Use	Example Picture
Latex	**Not allowed** in labs	
Nitrile	Disposable ones for incidental contact only. Thicker reusable ones can be used for extended contact.	
Butyl Rubber	✓ Mostaggressivechemicals including aldehydes, ketones, esters and concentrated mineral acids. ✗ Gasoline and aliphatic, aromatic, and halogenated hydrocarbons.	
Neoprene	✓ Acids, bases, alcohols, fuels, peroxides, hydrocarbons, and phenols. Good for most hazardous chemicals. ✗ Halogenated and aromatic hydrocarbons.	

Glove Material	Intended Use	Example Picture
Viton	✓ Chlorinated and aromatic solvents. Good resistance to cuts and abrasions. ✗ Ketones.	
Polyvinyl chloride (PVC)	✓ Acids, bases, oils, fats, peroxides, and amines. Good resistance to abrasions. ✗ Most organic solvents.	
Stainless Steel Kevlar Leather SuperFabric™	✓ Cut-resistant gloves. Sleeves are also available to provide protection to wrists and forearms. If potential for biological or chemical contamination: wear appropriate disposable gloves on top of your cut-resistant gloves and discard after use.	Recommendation: Manufacturer: HexArmor Cut-resistant gloves 
SuperFabric® brand material	✓ Needle-stick resistant gloves. Recommended use as an under-glove solution with the appropriate top-glove combination Washable	Recommendation: Manufacturer: HexArmor PointGuard® Ultra 6044 

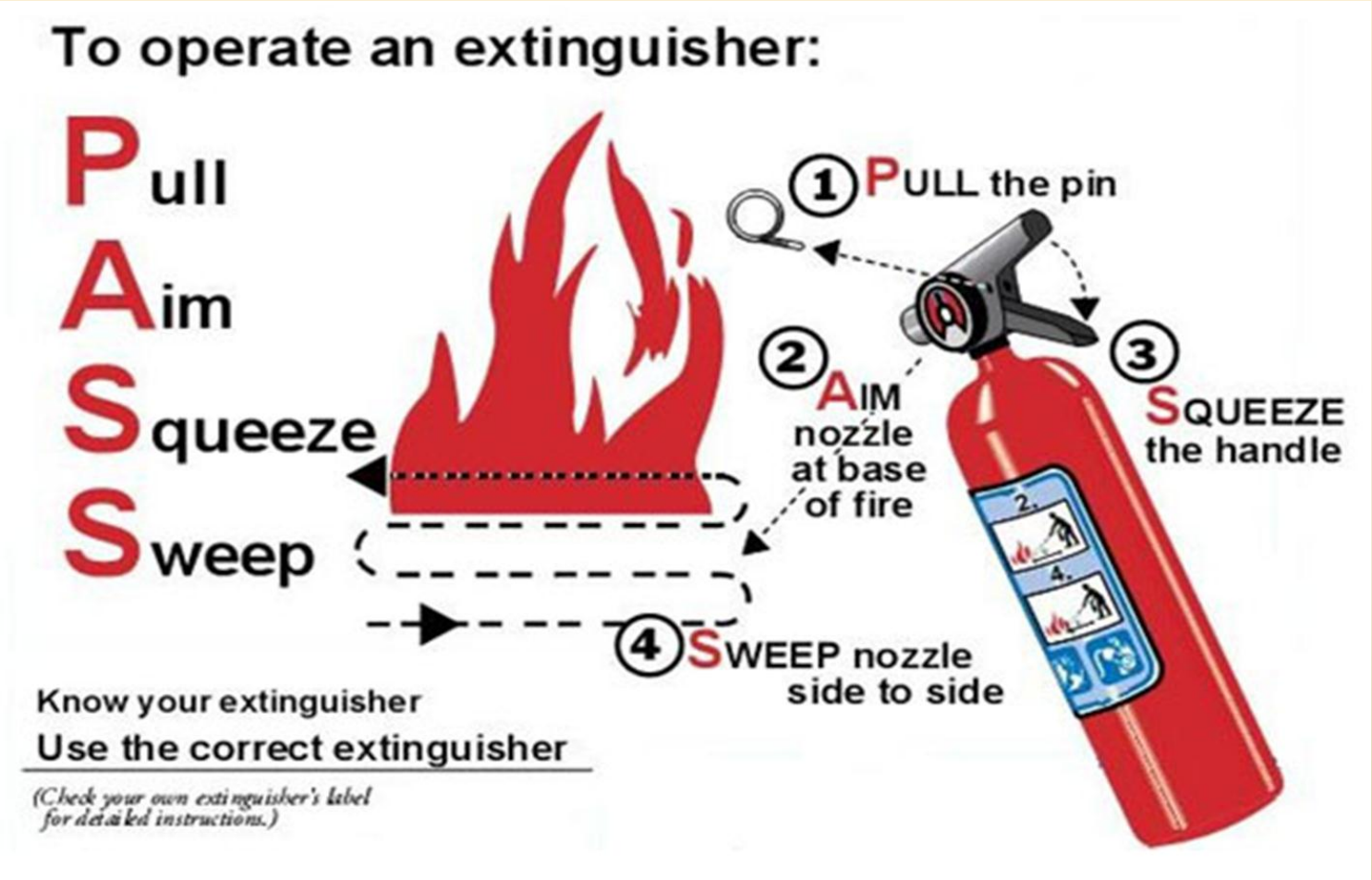
Preparation for emergencies from chemical spills

- For a small liquid spill or splash that affects only a small area of skin, you should immediately flush the skin with flowing water for at least 15 minutes (30 minutes for bases).

- If skin or clothing is contaminated with larger spills of a liquid, you may have more serious consequences. You should go to the nearest safety shower immediately.

- If a solid chemical spilled on skin, it is advisable to brush the solid off before applying water.

- In case of fire a catch to body , it is important to lye on the floor , roll over and apply a Fire blanket.
- Use Fire extinguisher in case of fire.
- Broken glasses should not handled by hand, use a brush and a dustpan and convert them to broken glass disposal container.


To operate an extinguisher:
Pull
Aim
Squeeze
Sweep
1 PULL the pin
2 AIM nozzle at base of fire
3 SQUEEZE the handle
4 SWEEP nozzle side to side
Know your extinguisher
Use the correct extinguisher
(Check your own extinguisher's label for detailed instructions.)

Try to take Triple'S approach in case of emergency

Triple S Approach

- • Step Up.
- • Speak Out loud.
- • Stand Firm, for Safety.

Learning from UCLA accident

fatal accident that occurred in the chemistry laboratory of Patrick Harran at the University of California at Los Angeles (UCLA). Research assistant Sheharbano "Sheri" Sangji suffered severe burns from a fire that occurred on December 29, 2008 when a plastic syringe she was using to transfer the pyrophoric reagent tert-butyllithium from one sealed container to another came apart, spilling the chemical, and igniting a fire. Sangji was not wearing a protective lab coat and her clothing caught fire

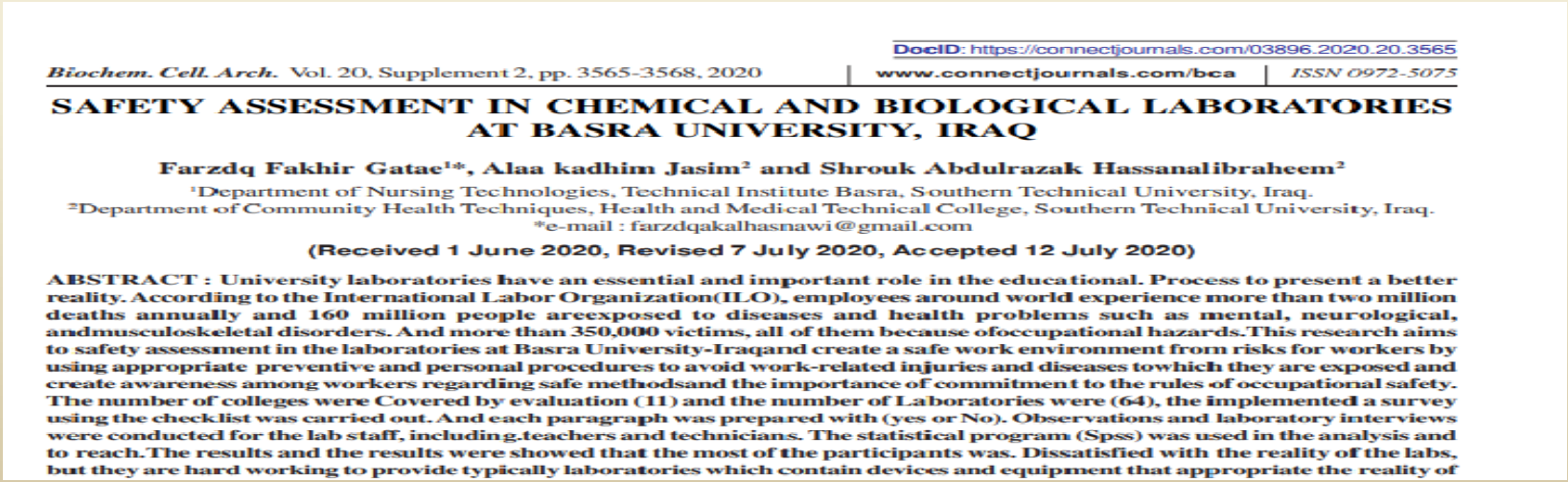
Aspects Important to take in consideration

- Do not work alone in the lab.
- Consider all chemicals and specimens to be dangerous.
- Read the label before using the chemical.
- Do not remove anything out of the lab.
- Turn off heat sources where not in use.
- Do not handle broken glass with bare hand.

- Wash Hands regularly.
- Don't Taste or Sniff Chemicals, they [illegible] food!
- Eating,Drinking and smoking are Prohibited.
- Do not wear earbuds in the lab.
- Do Not Pipette By Mouth – Ever!
- Don't Dispose of Chemicals Down the Drain and follow the waste disposal instructions.
- No Pacemakers or Metallic Implants: like in NMR instrument area.
- keep the workplace clean .

Don’t leave things **on the floor** because someone will trip over it.

This research aims
to safety assessment in the laboratories at Basra University-Iraq and create a safe work environment from risks for workers by using appropriate preventive and personal procedures to avoid work-related injuries and diseases



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SAFETY ASSESSMENT IN CHEMICAL AND BIOLOGICAL LABORATORIES AT BASRA UNIVERSITY, IRAQ

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ABSTRACT : University laboratories have an essential and important role in the educational. Process to present a better reality. According to the International Labor Organization(ILO), employees around world experience more than two million deaths annually and 160 million people areexposed to diseases and health problems such as mental, neurological, andmusculoskeletal disorders. And more than 350,000 victims, all of them because ofoccupational hazards.This research aims to safety assessment in the laboratories at Basra University-Iraqand create a safe work environment from risks for workers by using appropriate preventive and personal procedures to avoid work-related injuries and diseases towhich they are exposed and create awareness among workers regarding safe methodsand the importance of commitment to the rules of occupational safety. The number of colleges were Covered by evaluation (11) and the number of Laboratories were (64), the implemented a survey using the checklist was carried out. And each paragraph was prepared with (yes or No). Observations and laboratory interviews were conducted for the lab staff, including.teachers and technicians. The statistical program (Spss) was used in the analysis and to reach.The results and the results were showed that the most of the participants was. Dissatisfied with the reality of the labs, but they are hard working to provide typically laboratories which contain devices and equipment that appropriate the reality of

- The laboratory staff use as much as they can the safety stuff, which is available from personal equipment to protect themselves from occupational hazards, but theshortage of some important safety personal protection in a laboratory.
- The walls (structures) are made of flammable materials, not found alarm devices, the shortage of all types of fire extinguishers near the laboratories.
- Also, there are no laundries, as well as eye shower.
- The incinerator was not there, and most of the employees were dissatisfied with the reality of the laboratories. But they are hard working to provide what mentioned.

SUMMERY

- Having a strong set of overall laboratory safety rules is essential to avoid disasters in the lab.
- safety rules are only effective when they are enforced, which is why strong lab management is so important to a safe laboratory as well.


Thank you!