CHEMICAL SAFETY TRAINING

NFPA 704 for Benzene

Center for Innovative Materials and Architectures
Ho Chi Minh City, Vietnam
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NFPA 704

NFPA 704: National Fire Protection Association, Standard System for the Identification of the Hazards of Materials for Emergency Response

Chemical Inventory

- We need to create a spreadsheet that lists ALL the chemicals in the lab.
  - This is necessary for the following reasons:
    1. Safety – it is very important to know what chemicals are present in the facilities
    2. Location – assist you in finding chemicals
    3. Save money – If you know we have chemicals and where to find them, we can prevent ourselves from unnecessarily purchasing extra chemicals

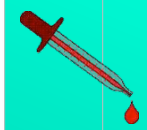
Buying Chemicals

Before chemicals are ordered, the following questions should be asked:

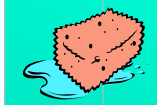
NFPA 704

What is the least hazardous chemical available that can be used?

How should the chemical be stored?



What is the minimum quantity needed to complete the experiment?



Is the laboratory equipped to handle a spill? Spill kits will be available in each lab.

Is the chemical already available? Check with me for chemical inventory.

Are personnel trained on how to safely handle the chemical?

Chemical Storage

- Chemical containers **must be labeled** with a minimum of chemical name, hazard warnings, and target organs. If label is worn and old, replace it with a handwritten label

- **Containers shall be dated when received and opened**. Accompanying MSDS must be kept.

Purchased Chemical Container Labels

Personal Chemical Container Labels

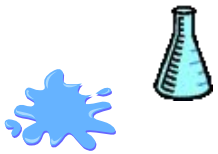
- Personal sample vials should be labeled with: **Chemical name** (i.e. MOF-5), **notebook reference number** (Initial-Book #-Pg #; KC-1-1), Date

- **Minimize the long-term storage of personal chemicals**

- Store: In personal drawer or lab bench shelf that has your name on it and has a label stating personal, **non-toxic chemicals are stored here**

Chemical Storage

GENERAL CONSIDERATIONS



- Plan ahead for spills, accidents, or emergencies!

- Be aware of special storage conditions such as temperature, relative humidity, or limited shelf life (These are big issues for VN)

- Segregate chemicals by hazard class or compatibility

Why is recognizing chemical incompatibilities so important?

Storing incompatible chemicals together can result in harmful gases/ vapors, heat, fire and explosions

Chemical Storage

- When available, use **ventilated cabinets** for volatile **toxic**s and **odor-producing** chemicals

- Use **approved flammable storage cabinets** for flammable liquids

- **Always use secondary containers** or **trays** for corrosives and toxic solvents

Chemical Storage: Refrigerators

- When refrigerating flammables, only use refrigerators specifically designed for flammables

- **Do not store food** in chemical storage refrigerators

- Need to label chemical storage refrigerators with the following:

  "No Food – Chemical Storage"

Chemical Storage

- Avoid storing liquid chemicals above eye level
- Avoid storing chemicals in aisles, or on the floor
- Avoid over stocking shelves
- Avoid storing heavy containers above shoulder level
- Avoid storing chemicals in fume hood or on counter tops (always in secondary container)
- Avoid storing chemicals near sources of heat or in direct sunlight

Chemical Storage

At a minimum, chemicals should be segregated as:

Corrosives

Oxidizers

Flammable Liquids

Poisons or Toxic Chemicals

Reactive (water or time sensitive)

Corrosives

- Store concentrated acids and bases separately!

- Keep corrosives away from organic chemicals and combustible materials

- Use secondary containers for ALL corrosives (including acids and bases)

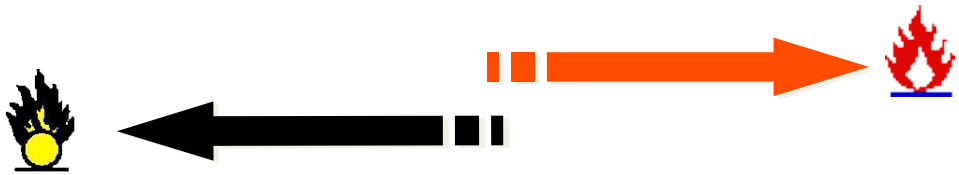
Flammable Liquids

- Always store in approved safety cans or cabinets (yellow)
- Segregate from oxidizing acids or oxidizers
- Keep away from any source of ignition (heat, sparks, open flame)
- A maximum of 10 L of flammable liquid can be stored outside of a flammable cabinet per laboratory
- Fire extinguisher (class ABC) nearby

Oxidizers

- Store oxidizers away from flammable and combustible materials
- Store oxidizers away from reducing agents
- Maintain the minimum quantity needed and dispose any unnecessary material immediately

Examples: 30% (or greater) hydrogen peroxide, Silver nitrate, Ammonium persulfate, Potassium permanganate, Nitric acid



Reactive

Examples of reactive chemicals would include, but is not limited to:

1. Water reactive chemicals 

2. Pyrophors, which react with air 

3. Peroxide forming chemicals, which form shock sensitive explosives

Reactive

- Consult MSDS and labels for storage information
- Bring only quantities needed for immediate use in laboratory
- DATE ALL REACTIVE CHEMICALS AS SOON AS THEY ARE RECEIVED!
- Store peroxidizable (ether, THF, etc.) materials away from heat and light
- Do not open material after the expiration date

Can You Spot the Mistake?

Can You Spot the Mistake?

Flammable liquid can't be stored with acids (HCl) unless it's in a secondary container

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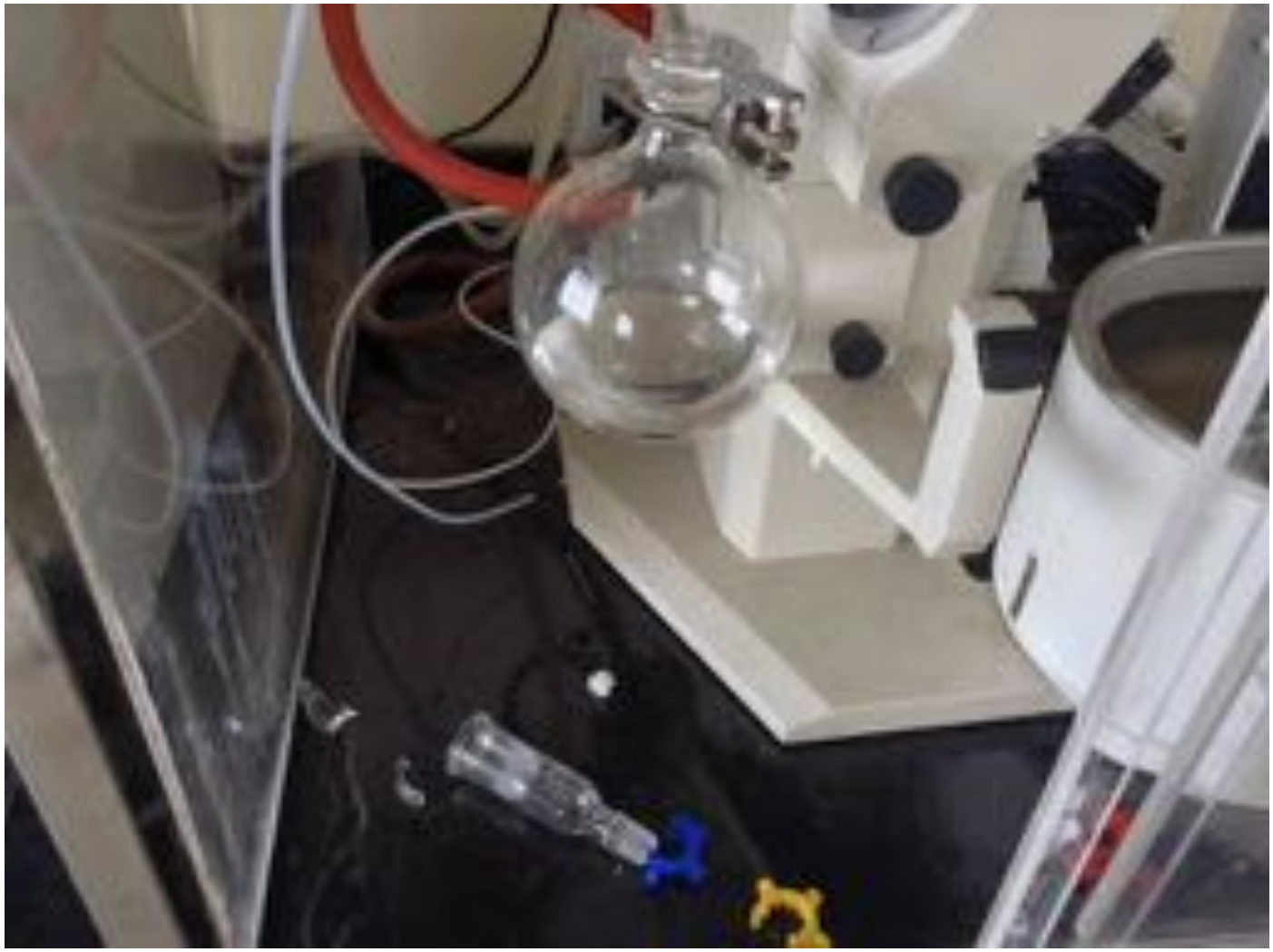

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Chemical Storage Rules

- Chemical Stock Room:
  - Store excess chemicals (including both solids and liquids)

- Each lab will have two storage cabinets that you can store the chemicals you need for your personal short-term use (remember, <10 L of flammable liquids, and chemicals need to be segregated according to compatibility)

- No more using the area under the hoods for your personal storage; personal chemicals that you are currently using can be stored in a secondary container on the shelf of your lab bench

Chemical Storage Rules

- In chemical stock room: flammables and other non-corrosive liquids
- The area under each fume hood will be separately designated for: inorganic acids, strong organic acids (i.e. trichloroacetic acid, formic acid, etc.) , oxidizers, carcinogens, toxic/poisons, bulk solids (any others?) – NEED TO LABEL ("Corrosive – Acid")
- The shelves in each room will be used for miscellaneous inorganic salts and miscellaneous organics – Alphabetized for ease of locating
- Your personal drawer will be used to store your own synthesized solid compounds (must be in a labeled vial, not RB flask, beaker, etc.)