



University of Al-Qadisiyah  
College of Medicine  
**Biosafety and Biosecurity**  
**(Lab)**



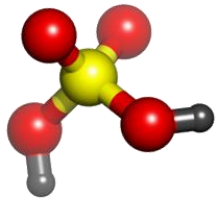
2nd Semester

**Chemical Waste Management and  
Disposal**

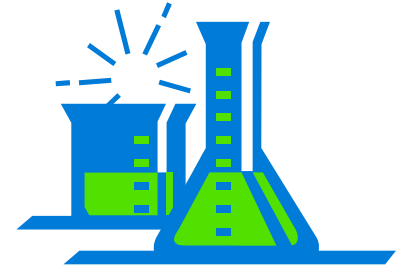


Prof. Dr. May Jaleel



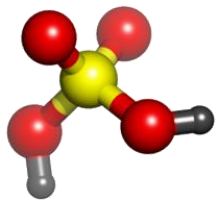


# Waste Management



- ▶ Nonhazardous waste
- ▶ General guidelines– Storage – Packaging
- ▶ Special categories
  - Metal waste
  - Radioactive and mixed waste
  - Biological waste
  - Unknown waste
- ▶ Treat on-site



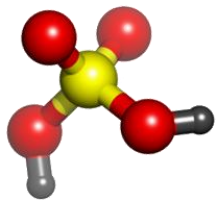


# Waste management: nonhazardous waste



- ▶ Used oil (uncontaminated) is not considered hazardous waste. Label Containers "USED OIL", not "hazardous waste."
- ▶ Uncontaminated PPE (personal protective equipment) (gloves, wipes)
- ▶ Triply rinsed glassware (bottles, droppers, pipettes)
- ▶ Salts ( $\text{KCl}$ ,  $\text{NaCl}$ ,  $\text{Na}_2\text{CO}_3$ )
- ▶ Sugars – Amino acids
- ▶ Inert materials (uncontaminated resins & ...)



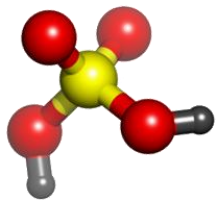


# Waste management: General guidelines



- ▶ Secure and lock waste storage area
- ▶ Post signs to warn others
- ▶ Keep area well ventilated
- ▶ Provide fire extinguishers and alarms, spill kits
- ▶ Provide suitable PPE
- ▶ Provide eye wash, safety showers
- ▶ Do not work alone

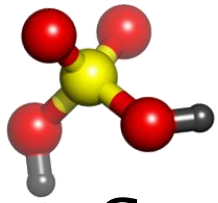




# Waste management: General guidelines

- ▶ Insure against leakage; dyke area if possible
- ▶ Label all chemicals, containers, vials
- ▶ Separate incompatible chemicals
- ▶ Keep gas cylinders separate
- ▶ Keep radioactive material separate
- ▶ Know how long waste can be stored



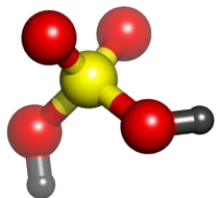


# Waste : Storage guidance

- ▶ Container should not react with the waste being stored (e.g. no hydrofluoric acid in glass).
- ▶ Similar wastes may be mixed if they are compatible
- ▶ Whenever possible, *wastes from incompatible hazard classes should not be mixed* (e.g. organic solvents with oxidizers).
- ▶ Containers must be kept closed except during actual transfers. Do not leave a funnel in a hazardous waste container.
- ▶ Chemical containers that have been triple-rinsed and air-dried in a ventilated area can be placed in the trash or recycled.



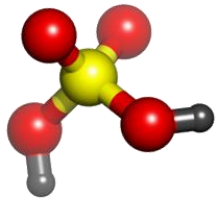




# Waste : General guidance

- ▶ Certain metals cause disposal problems when mixed with flammable liquids or other organic liquids
- ▶ Pressure can build up in a waste vessel
- ▶ Corrosion can occur in storage vessel
- ▶ Secondary containment is necessary
- ▶ Glass waste containers can break

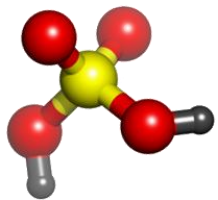




# Dangerous waste management



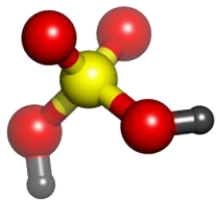




# Best practice : Orphan control



- ▶ Before moving to new job meet with new lab occupant
  - This can be a new employee or new student
  - Label all chemicals and samples carefully
  - Make notations in common lab book
- ▶ Dispose of all unneeded or excess chemicals
  - Put into chemical exchange program
  - Dispose of as hazardous waste
- ▶ Do not leave any chemicals behind except by agreement

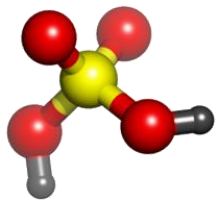


# Waste management



- ▶ Recycle, reuse, redistill, if possible
- ▶ Dispose by incineration, if possible
- ▶ Incineration is NOT the same as open burning



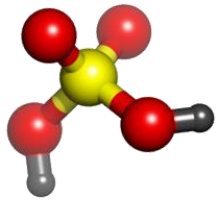


# Laboratory wastes are packaged in small containers

- ▶ Lab packs consists of small containers of compatible waste, packed in absorbent materials.



- ▶ Lab packs segregated at hazardous waste facility

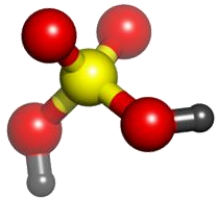


# Waste management: Waste disposal service

- ▶ Is disposal service licensed?
- ▶ How will waste be transported?
- ▶ How will waste be packaged?
- ▶ Where will material be disposed?
- ▶ How will it be disposed?
- ▶ Maintain written records



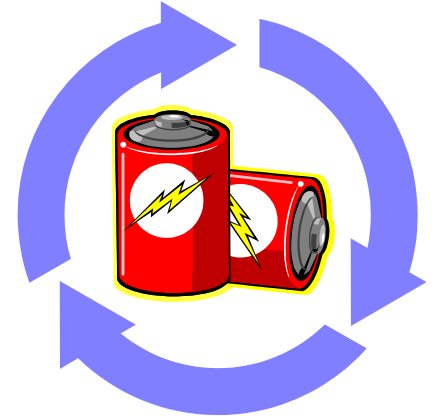




# Battery recycling and disposal

## Hazardous waste

- Lead acid (Pb) – recycle (90% car batteries)
- Sealed lead (Pb) – recycle
- Mercury-oxide (HgO) button, silver-oxide (AgO) button – recycled by jewelers
- Nickel Cadmium (NiCd) recycle

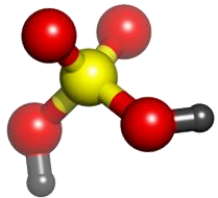


## Nonhazardous waste

- Nickel Metal Hydride (Ni-MH) recycle
- Carbon – zinc
- Alkaline
- Zinc-air button



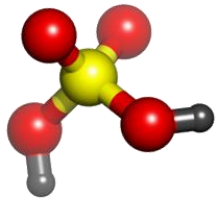




# Mercury metal disposal

- ▶ Collect pure liquid mercury in a sealable container. Label as "MERCURY FOR RECLAMATION"
- ▶ Place broken thermometers and mercury debris in a sturdy sealable plastic bag, plastic or glass jar. Label the container "Hazardous Waste – MERCURY SPILL DEBRIS".
- ▶ Never use a regular vacuum to clean up a mercury spill – contaminates vacuum, heat evaporates the mercury
- ▶ Never use a broom to clean up mercury – spreads smaller beads – contaminates the broom.

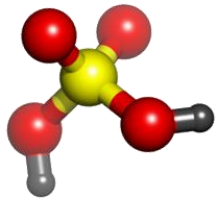




# Mixed Waste (chemical radioactive)

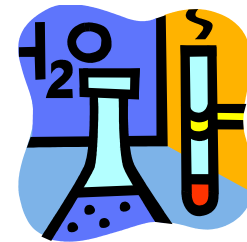
- ▶ These wastes must be minimized – heavily regulated
  - Universities, hospitals
    - Low level radioactive with chemical
      - Scintillation cocktails
      - Gel electrophoresis waste
  - Nuclear energy research
    - Low and high level radioactive with chemical
    - Lead contaminated with radioactivity

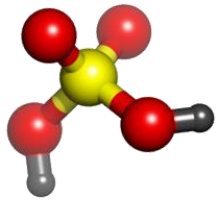




# Mixed Waste (chemical–biological)

- ▶ Medical wastes
  - Blood and tissue
  - Sharps – needles, scalpels
  - Contaminated glassware, PPE
- ▶ Autoclave or sterilize
  - Bleach incompatible with autoclave
  - Do not autoclave flammable liquids
- ▶ Incinerate



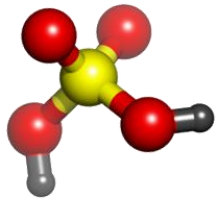


# Mixed Waste (radioactive–biological)

## ▶ Medical wastes

- Often disinfect high biohazard to minimize handling risk
- Let short-lived isotopes decay and then use sanitary sewer
- Refrigerated storage for putrescible waste (carcasses– tissue)
- Autoclave or disinfect lab ware and treat as low level radioactive
- On-site incineration of low level radioactive waste if allowed.





# Unknown “orphan” waste

Avoid if at all possible – requires analysis before disposal!

▶ Pre-screen

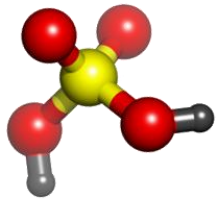
- Crystals present ? (potential peroxide formation)
- Radioactive (Geiger counter)
- Bio waste? (interview history)

▶ Screen

- Prepare for the worst – wear gloves–goggles–hood
- Air reactivity
- Water reactivity
- Flammability
- Corrosivity

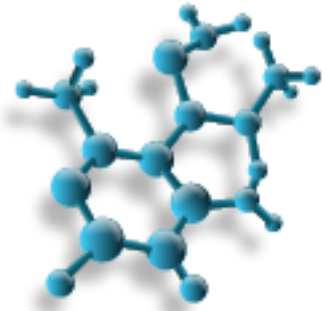


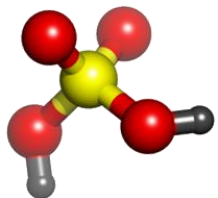




# Unknown waste characterization\*

- ▶ Physical description – Water reactivity – Water solubility
- ▶ pH and neutralization information
- ▶ Presence of:
  - Oxidizer
  - Sulfides or cyanides
  - Halogens
  - Radioactive materials
  - Biohazards
  - Toxics

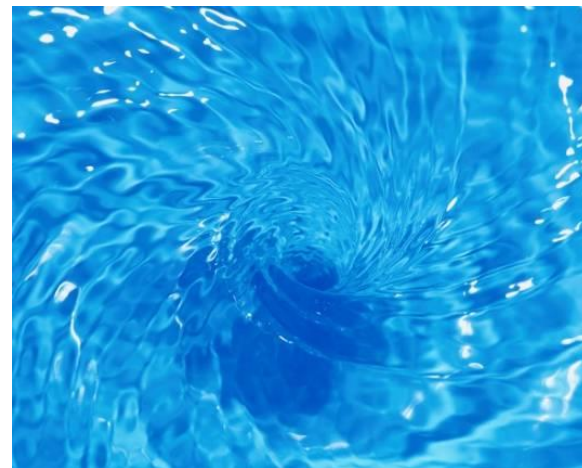




# Waste management: Down the drain?

## ▶ If legally allowed:

- Deactivate & neutralize some liquid wastes yourself
  - e.g., acids & bases
  - Don't corrode drain pipes
- Dilute with lots of water while pouring down the drain
- Be sure that you do not form more hazardous substances
  - Check reference books, scientific literature, internet





**For your listening..**