



Oct 07, 2020

Reagent Safety & PPE

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This document is published without a DOI.

UCSC BME 22L

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DOCUMENT CITATION

2020. Reagent Safety & PPE. **protocols.io**
<https://protocols.io/view/reagent-safety-amp-ppe-bk7nkzme>

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CREATED

Sep 09, 2020

LAST MODIFIED

Oct 07, 2020

DOCUMENT INTEGER ID

41934

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SAFETY IN-HOME BIOHACKING

Goal

For you to understand the safety precautions necessary to follow when biohacking at home.

Learning plan

You will understand:

- How to keep good lab practices at home
- How to maintain a clean home workspace
- How to dress in proper PPE
- How to interpret commonly found chemicals in the lab

Background

In a traditional laboratory course on campus, students have a teacher assistant or Professor in the lab who will help guide and remind you of safety procedures and practice. This is not the case for you in this course because you will be the only person in your

lab and are responsible for your safety and that of others in your home. This is why it is vitally important for you to know how to conduct experiments at home safely.

PPE- Personal Protective Equipment

It can be easy to not dress for the part when being at home, but still important to maintain this habit with integrity. Performing experiments in PPE (personal protective equipment) is a must in any laboratory environment, as it is the only line of protection between a scientist and potentially hazardous chemicals.

PPE is any form of equipment that is used to protect yourself from immediate threats given your work environment. The biggest concern is getting unwanted chemicals anywhere on your skin because they can cause harm. One of the biggest concerns in the laboratory is protecting your eyes. Wearing goggles is the only form of protection for your eyes, as they limit almost all incidental contact between chemicals and the eye. Lab coats are necessary to protect your skin from contact with harmful chemicals. You should also always wear closed-toed shoes in the work environment. PPE should always be worn and should not be taken lightly. It is important to note again that even though you are in a remote lab setting, safety and protection is to not be taken lightly. Every precaution taken in a laboratory should be taken in your remote lab.

Rules for PPE

- Avoid distracting or startling people working in the laboratory by setting up a lab in a quiet setting.
- Wash exposed areas of the skin prior to leaving the laboratory.
- Long hair and loose clothing must be pulled back and secured from entanglement or potential capture.
- No contact lenses should be worn around hazardous chemicals – even when wearing safety glasses.
- All equipment should be regularly inspected for wear or deterioration.
- No cell phone or earphone usage in the active portion of the laboratories, or during experimental operations.
- Avoid wearing jewelry in the lab as this can pose multiple safety hazards.

Knowing Your Lab

Since everyone in this course is working in their own lab setting it is important to note where all safety materials for emergencies are located. Right now, we will have you find this emergency equipment and note where they are in your home lab:

- Fire Extinguisher:

- Shower:

- Sink:

- Emergency Exits:

- First Aid Kit:

- Broken Glassware Box:

- Dust Pan:

- Spill Control Reagents:

Reagents and Equipment:

In the chart below, you will fill out the necessary information regarding each reagent and equipment. You phosphate buffer will need to know the hazards and storage associated and also provide a Safety Data Sheet for the necessary reagent/equipment. The chart holds materials found in and outside of this laboratory course. It is important to be aware of reagents that are commonly found in a

biomolecular laboratory.

Reagents and Equipment with ** next to are materials that are not found in this lab course.

Rules for reagents and Equipment:

- All reagents and equipment should be stored far out of children's reach.
- Lab equipment should have it's own designated space, free from clutter.
- Organize with thought and caution.

Never leave containers of chemicals open.

- Assume that all chemicals of unknown toxicity are highly toxic.
- All containers must have appropriate labels. Unlabeled chemicals should never be used.
- Do not taste or intentionally sniff chemicals.
- Never consume and/or store food or beverages or apply cosmetics in areas where hazardous chemicals are used or stored.
- If an unknown chemical is produced in the laboratory, the material should be considered hazardous.
- Do not pour chemicals down drains. Do NOT utilize the sewer for chemical waste disposal.
- Designated and well-marked waste storage locations are necessary.

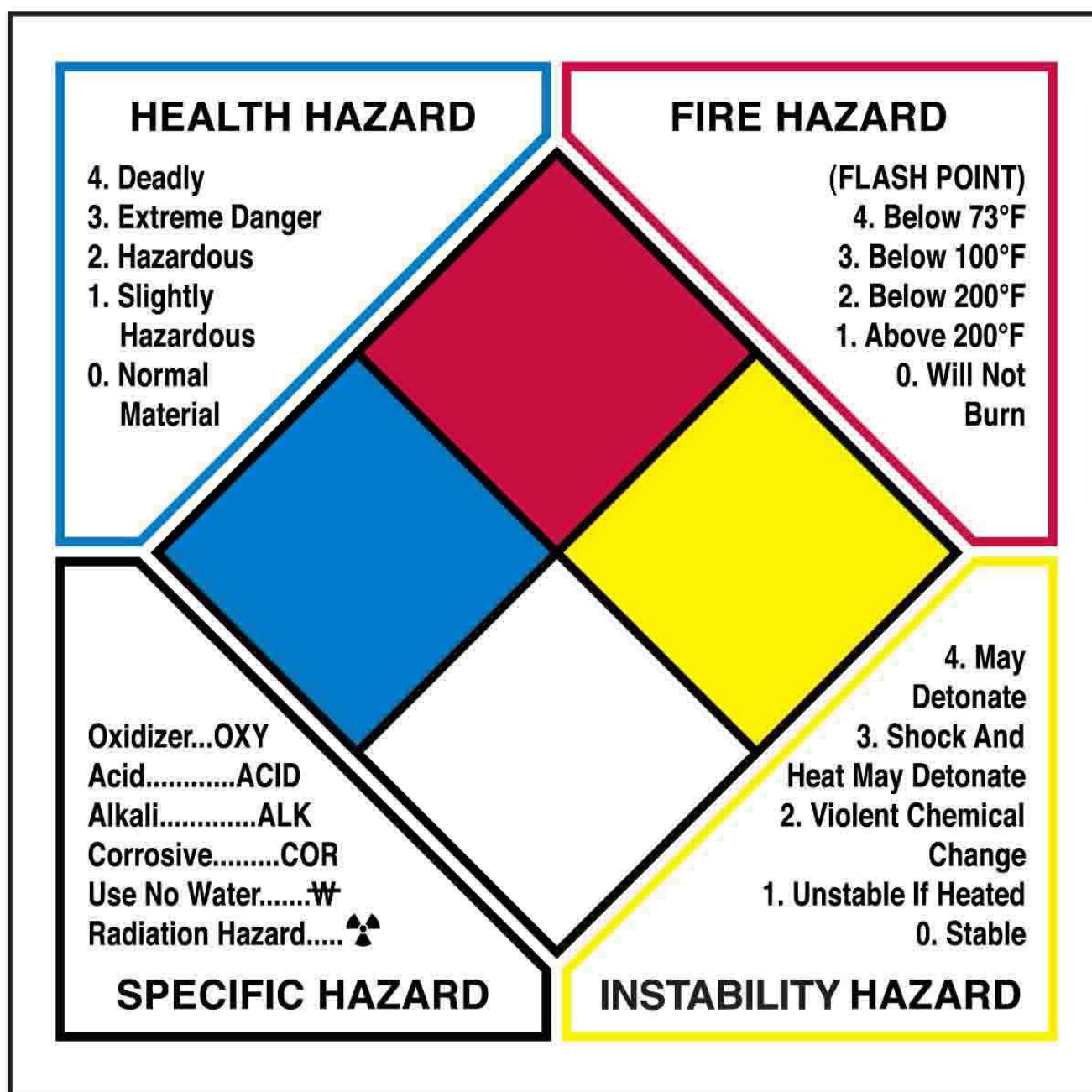
Reagents	Lab Number Associated	Hazard warning (y/n, description)	Storage (temp/grouping)	SDS (link)
LB Agar	Oligomer/CRISPR	no	Room temp	
LB Strep/Kan/Arab	Oligomer/CRISPR	no	Room temp	
Bacterial Transformation Buffer	Oligomer/CRISPR	no	Room temp	
LB Broth	Oligomer/CRISPR	no	Room temp	
Cas9 Plasmid Kan	Oligomer/CRISPR	no	Freezer	
gRNA Plasmid Amp	Oligomer/CRISPR	no	Freezer	
Template DNA	Oligomer/CRISPR	no	Freezer	
Non-pathogenic E. coli bacteria (DH5a)	Oligomer/CRISPR	no	Fridge	
PCR beads, lyophilised master mix	PCR	no	Fridge	
TBE Buffer 10X	PCR	no	Room Temp	
Primers	PCR	no	Fridge	
Safe DNA stain (gel green)	PCR	no	Room temp	
Loading Dye	PCR	no	Room temp	
100bp DNA ladder	PCR	no	fridge	
Agarose tablet	PCR	no	Room temp	
**Chloroform	--	yes	Room temp; Cool/dry/well ventilated area	
**Ethanol	--	yes	Room temp;Cool/dry/ventilated ; acid group	
**Nitrogen (liquid)	--	yes	Freezer(-20°C)	
**Compressed Nitrogen (gas)	--	yes	Room temp, store with other compressed gasses	
**Hydroclauric Acid (HCl)	--	yes	Room temp, cool/dry; acid group	
**Sulfuric Acid	--	yes	Room temp, cool/dry; acid group	
**Compressed Oxygen	--	yes	Room temp, store with other compressed gasses	

**Sucrose	--	no	Room temp, cool/dry/ventilated	
**Propidium iodide	--	yes	Stock solution (4°C); aliquot (-20°C); store in dark	
**PBS (phosphate- buffer saline)	--	yes	Room temperature; dry/cool	

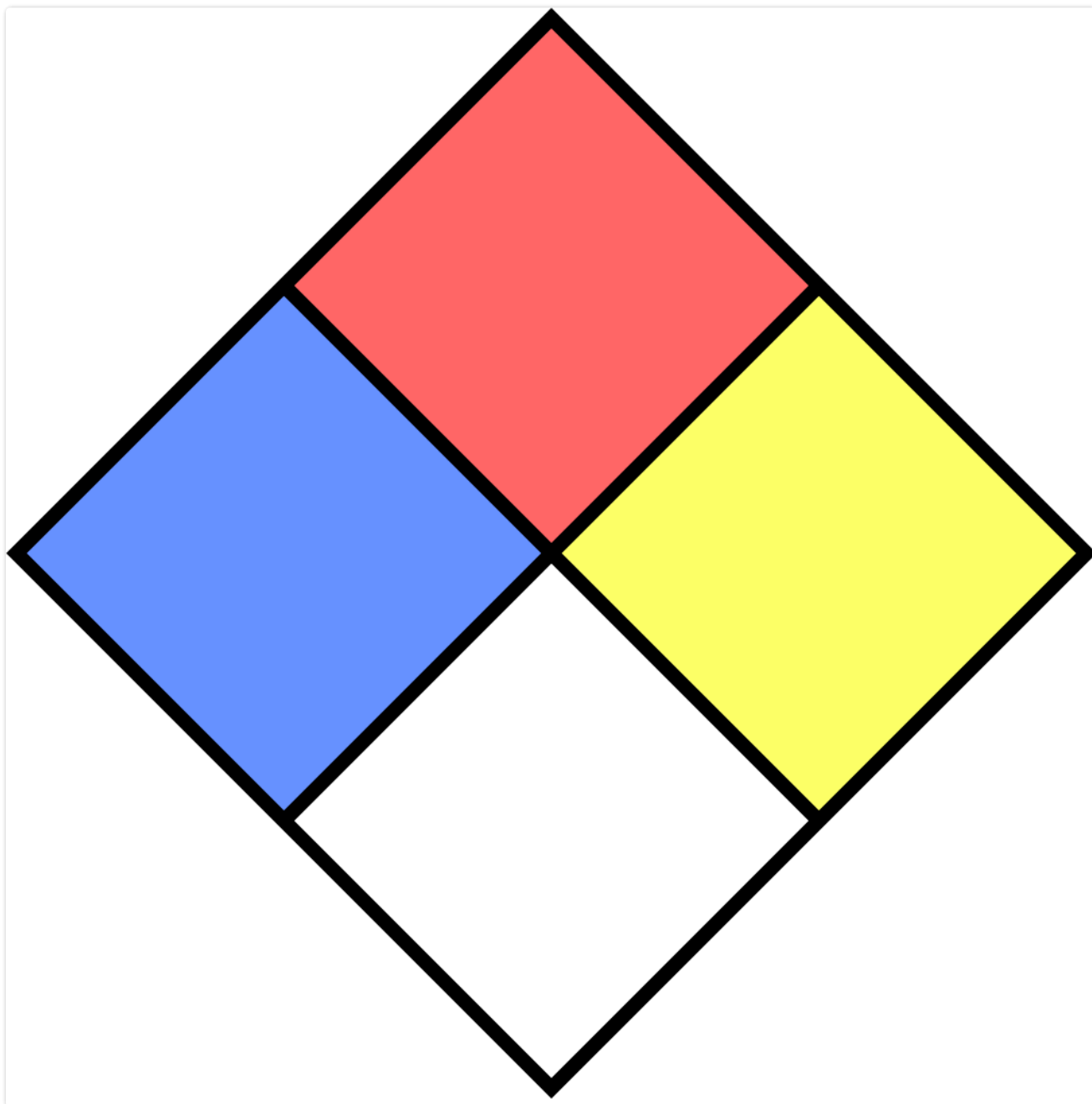
NFPA Labels

In any laboratory, researchers will find National Fire Protection Association (NFPA) Hazard Identification labeling. NFPA labeling identifies hazards found in specific reagents. Each quadrant in the diamond displays a different type of potential hazard.

The NFPA diamond provides a quick visual representation of the health hazard, flammability, reactivity, and special hazards that a chemical may pose during a fire. The NFPA diamond consists of four color-coded fields: blue, red, yellow, and white. The blue, red, and yellow fields—which represent health hazard, flammability, and reactivity, respectively—use a numbering scale ranging from 0 to 4. A value of 0 means that the material poses essentially no hazard, whereas a rating of 4 indicates extreme danger. The white field is used to convey special hazards [\[acs\]](#). The white diamond poses specific symbols for faster identification of the type of chemical.



Now we will have you fill out the necessary NFPA labeling for the following chemicals: Chloroform and Sulfuric Acid.



STORAGE

Where you store your reagents is very, very important. Improper storage can potentially pose harmful to the integrity of the reagent or could contaminate non-lab equipment. Store like reagents with each other and separate non like reagents. For example, potentially flammable materials should be together in their own storage containers/area to reduce the spread of a fire. Furthermore, acids remain with acids and separate from bases which also remain with like bases.

It is important to unplug or turn off the hardware equipment when not in use. When storing the equipment such as hardware it is important to place it where it would not be exposed to accidental spills.

SPILLS AND CLEAN-UP

This lab is designed where there should be no issues with harmful chemicals being spilled; however, it is good practice and good judgment to follow the below practices.

- In case of a chemical spill, clean up thoroughly with paper towels and dispose of chemicals out of the reach of children and pets.
- If chemical spills occur on people or clothing, rinse thoroughly with lots of running water, and seek medical attention if necessary.
- Be sure to thoroughly clean up the lab site and all utensils used after working on labs.
- In case of chemical touches your eye, rinse thoroughly with water for 15 minutes, and if eye irritation persists, call 911.

EMERGENCIES

In the case of an emergency, make sure you have the following materials; fire extinguishers, water, first aid kit, and a telephone. If any harm has occurred call 911.

If any reagents have been ingested or have irritated your body, you may call your doctor as well as poison control (800-222-1222).

Resources

[Proper Dress and PPE/ Lab Safety Video Part 1](#) (video)

[What is the NFPA 704 Fire Diamond?](#) (video)