Working Safely in 2.674

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Safety Overview

- You are the person most responsible for your own safety.

- So:
  - Prepare – get information.
  - Plan your work – before you start.
  - Pay attention – while in the lab.
  - If you don't know, **ASK.**

Emergencies

- What do you do if there is an emergency?
  - Inform Instructor
  - Stay calm
  - Know evacuation routes & assembly areas

Building	**Exterior Assembly Point A**	**Exterior Assembly Point B**
5	Mass Ave towards Memorial Drive - end of Building 1	Kresge Oval
3	Killian Court	Courtyard between 11 & 13
	Interior Assembly Point A	**Interior Assembly Point B**
5	Lobby 7	Lobby 10
3	Lobby 7	Lobby 10

- Are you signed up for MITAlert? emergency.mit.net

Potential Hazards

- What potential hazards will you be working with in the lab?
  - Chemicals (you must complete a web-based training module on General Chemical Hygiene)
  - Nano materials
  - Compressed gases
  - Physical hazards (sharp objects / high voltage)
  - Laser/UV light

Chemical Hygiene aka Working With Chemicals

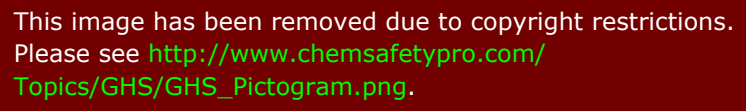
- Be alert and aware
  - Conduct experiments with head firmly attached
- Know the hazards of your experiment
  - Consult SDS and use PPE
- Follow established procedures
- Wear appropriate clothing
- Properly dispose of waste materials

(Material) Safety Data Sheets (MSDS)

- SDS's exist for all chemicals and contain information on:
  - Health, Hazard, Toxicity Data
  - Accident and Disposal Procedures
  - Storage and PPE (personal protective equipment)

- Google: "*chemical name* MSDS"

GHS: Globally Harmonized System



- New system for chemical Hazard Communication and labeling
- New standardized SDS format
- New pictograms
- "Signal Word": Warning or Danger
- Hazard statements
- Hazards 1-5 with 1 as highest hazard

Acetone (M)SDS

SIGMA-ALDRICH sigma-aldrich.com

SAFETY DATA SHEET

Version 4.7
Revision Date 06/21/2014
Print Date 09/08/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Acetone

Product Number : 320110
Brand : Sigma-Aldrich
Index-No. : 606-001-00-8

CAS-No. : 67-64-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Acetone	67-64-1	TWA	500 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye & Upper Respiratory Tract irritation Central Nervous System impairment Hematologic effects Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	750 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye & Upper Respiratory Tract irritation Central Nervous System impairment Hematologic effects Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	1,000 ppm 2,400 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		The acetone STEL does not apply to the cellulose acetate fiber industry. It is in effect for all other sectors.		
		TWA	1,000 ppm 2,400 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	250 ppm 590 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	750 ppm 1,800 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Acetone	67-64-1	Acetone	50 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

How can you be exposed to chemicals?

- Contact with skin or eyes (absorption)
- Inhalation
- Ingestion
- Injection

Avoiding Skin Exposures: 2.674/2.675 Lab Attire

- Wear long pants
- Wear closed toe shoes
- **Avoid:**
  - Loose or torn clothing
  - Dangling jewelry or hair
  - Shorts or skirts
  - Sandals

Figure by MIT OpenCourseWare.

PPE: Personal Protective Equipment

- Head protection
- Eye and Face protection – safety glasses
  - Wear safety glasses in lab at all times
- Hearing protection
- Respiratory protection
- Arm and Hand protection – gloves
- Foot and Leg protection
- Protective clothing – lab coat

Avoiding Inhalation Exposure: Proper Fume Hood Use

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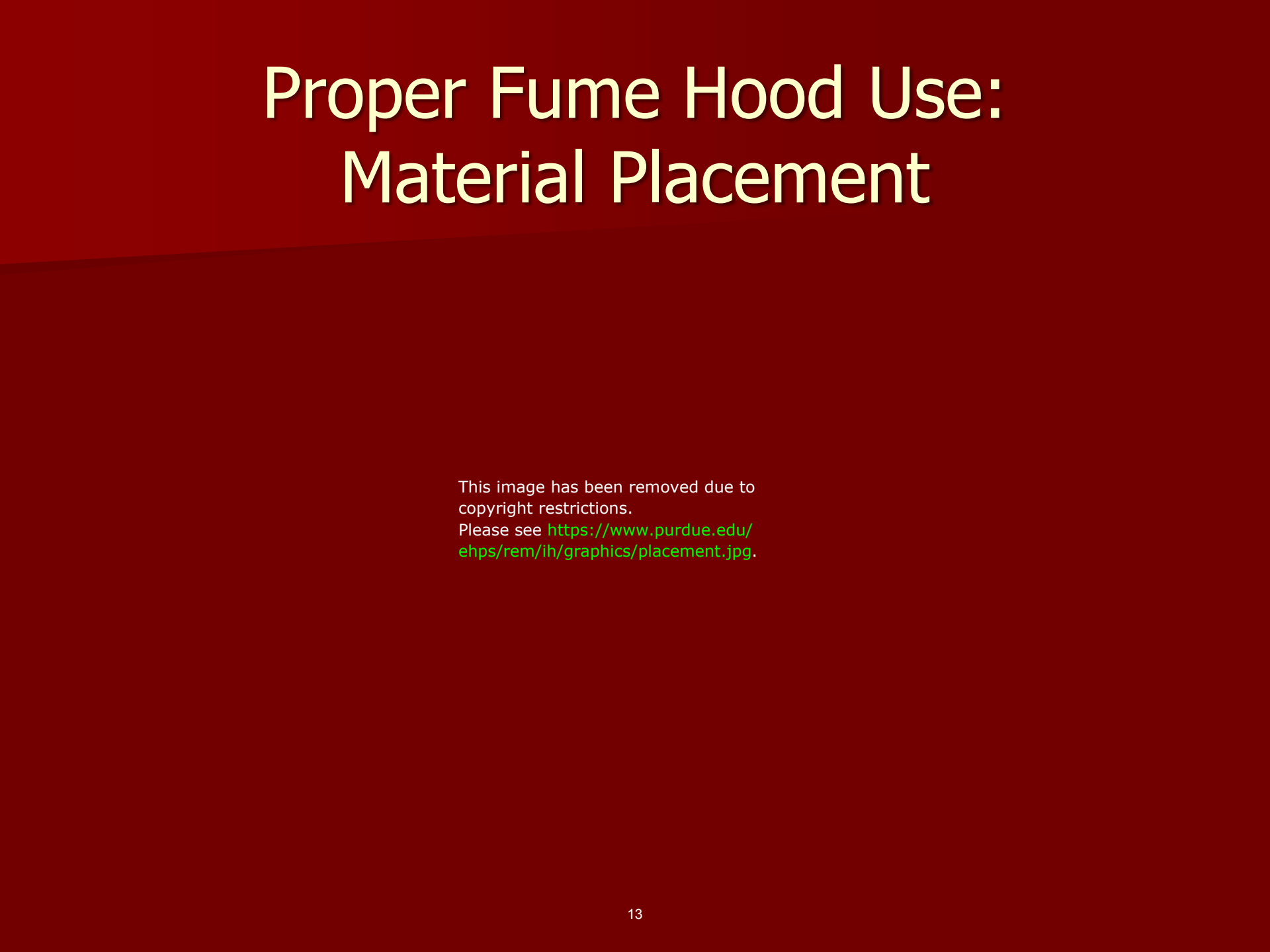
Proper Fume Hood Use: Material Placement



Avoiding Ingestion:

NO FOOD or DRINK ALLOWED in labs at MIT!

Note: This includes gum.

Nanoparticles are smaller than cells

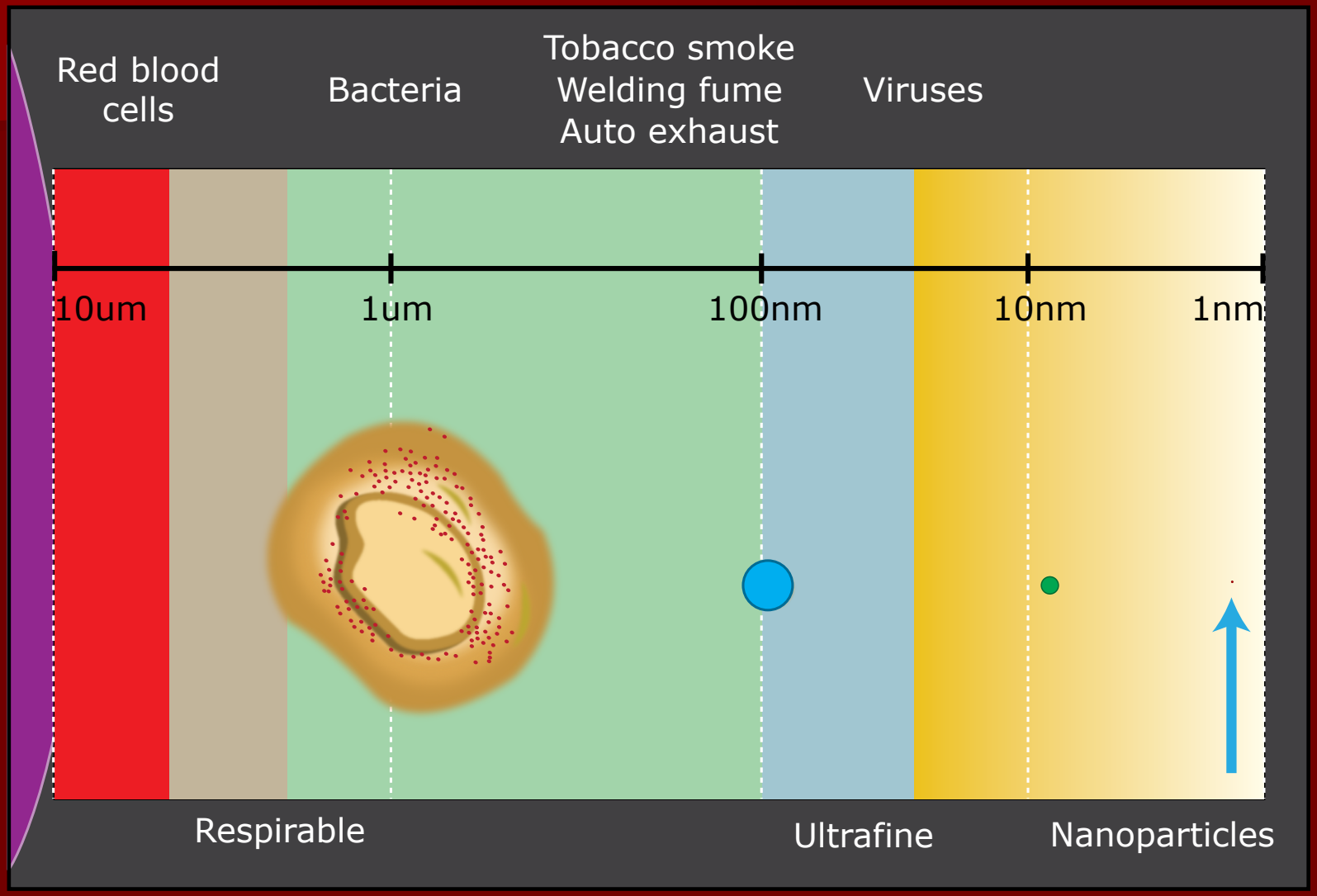


Figure by MIT OpenCourseWare.

Nanotechnology: EHS implications

- Emergent technology - uncertainty about health effects
- Studies suggest
  - inhalation is highest risk (lung damage)
  - nanoparticles can cross cell membranes
- But also
  - HEPA filters and fume hoods are quite effective at collecting nanoparticles

HIGH UNCERTAINTY ≠ HIGH RISK

HIGH UNCERTAINTY = HIGH PRECAUTION

Inhalation Risk: Least ⇒ Greatest

- solid material with embedded nanostructure
- solid material with nanostructure bound to surface
- liquid suspensions of nanoparticles
- free nanoparticles (dry & dispersible)

Safe handling of dry, particulate Carbon Nanotubes (CNTs)

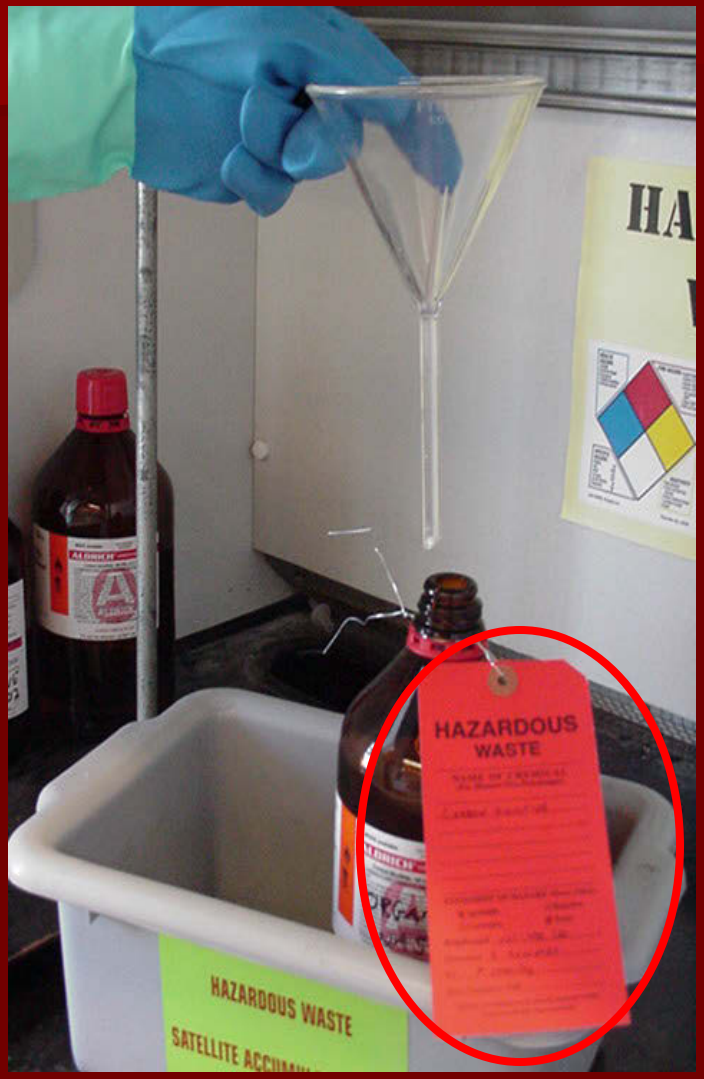
- Sturdy glove with good integrity (eg nitrile)
- Work in fume hood
- CNTs removed from furnaces, reactors, or other enclosures should be put in sealed containers for transport
- Wet wipe surfaces of fume hoods or other enclosures after each use or at end of day

CNT Waste Management

The following nanomaterial/CNT waste should be collected in a plastic bag or other sealed container, labeled as hazardous waste, and placed in the lab's Hazardous Waste Collection area:

- Pure CNTs
- Items contaminated with loose CNTs (e.g., wipes/PPE)
- Solid matrixes with CNTs that are friable or have a nanostructure loosely attached to the surface

Hazardous Waste Area



Compressed Gas Cylinders

- Pressure hazard
- May contain hazardous materials
- Safe when handled properly
- Tanks should always be secured
- Do not adjust valves or regulators without proper instruction

Cutting Safety

- Use the correct tool for the job
- ALWAYS cut AWAY from the body
- Know where your non-cutting hand is
- Use a guide
- Dispose used sharps in a sharps container

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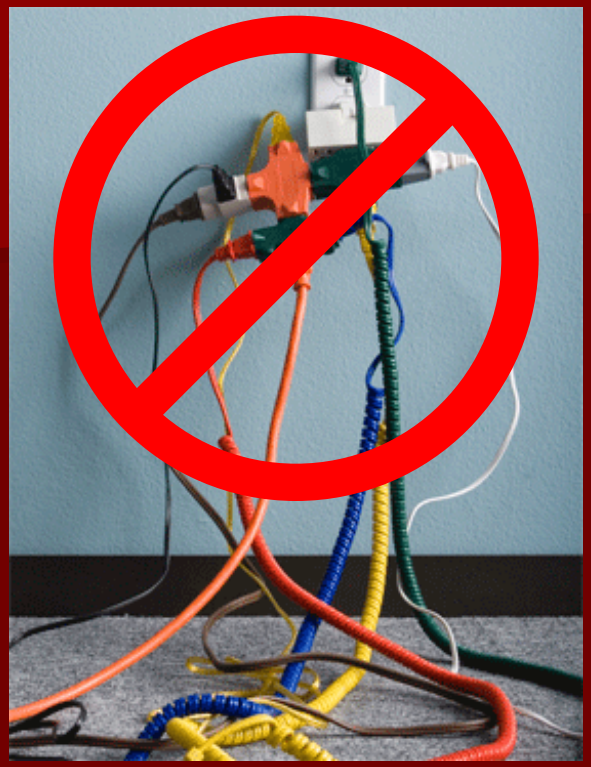
Electrical Safety



- Insulate electrical conductors.
  - ceramic, glass, rubber
- Elevate / Shield conductors.
  - Reduce personal exposure
- Guard conductors by enclosing them.
  - Receptacle covers, boxes, & conduit
- Inspect electrical systems prior to energizing.
  - Look for: Loose or frayed wires/cords/plugs
    Missing guards or broken outlets/fixtures
  - Only specially trained workers are authorized to make electrical repairs.
  - MIT Facilities maintains building power supply and electrical distribution equipment.

- Don't overload circuits.
- Inspect and maintain temporary power (extension cords).

- Develop safe work practices.
  - Know what circuits are closed (live!)
  - Tools/jewelry/exposed body parts make good conductors
- Housekeeping!

Laser/UV Safety

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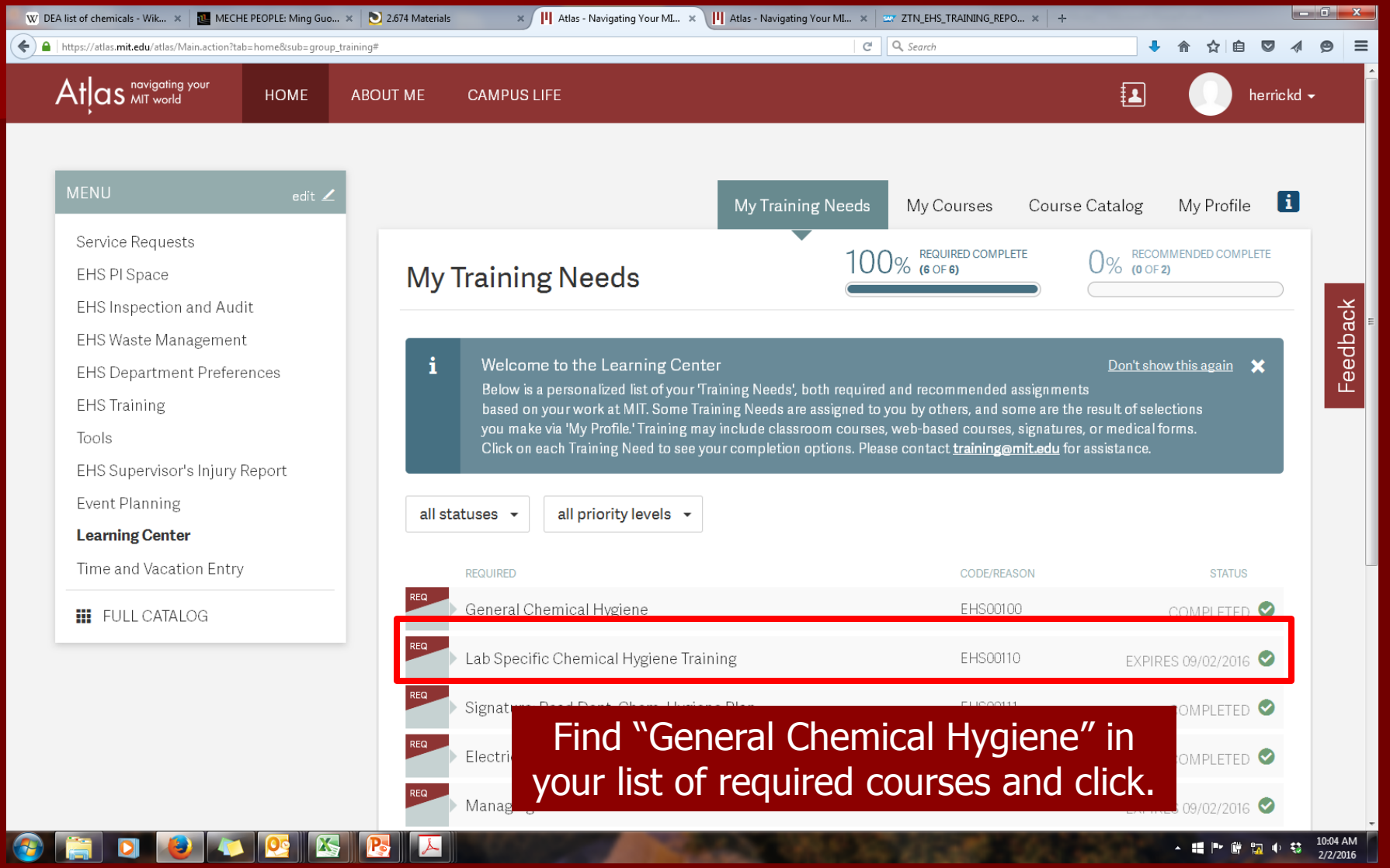
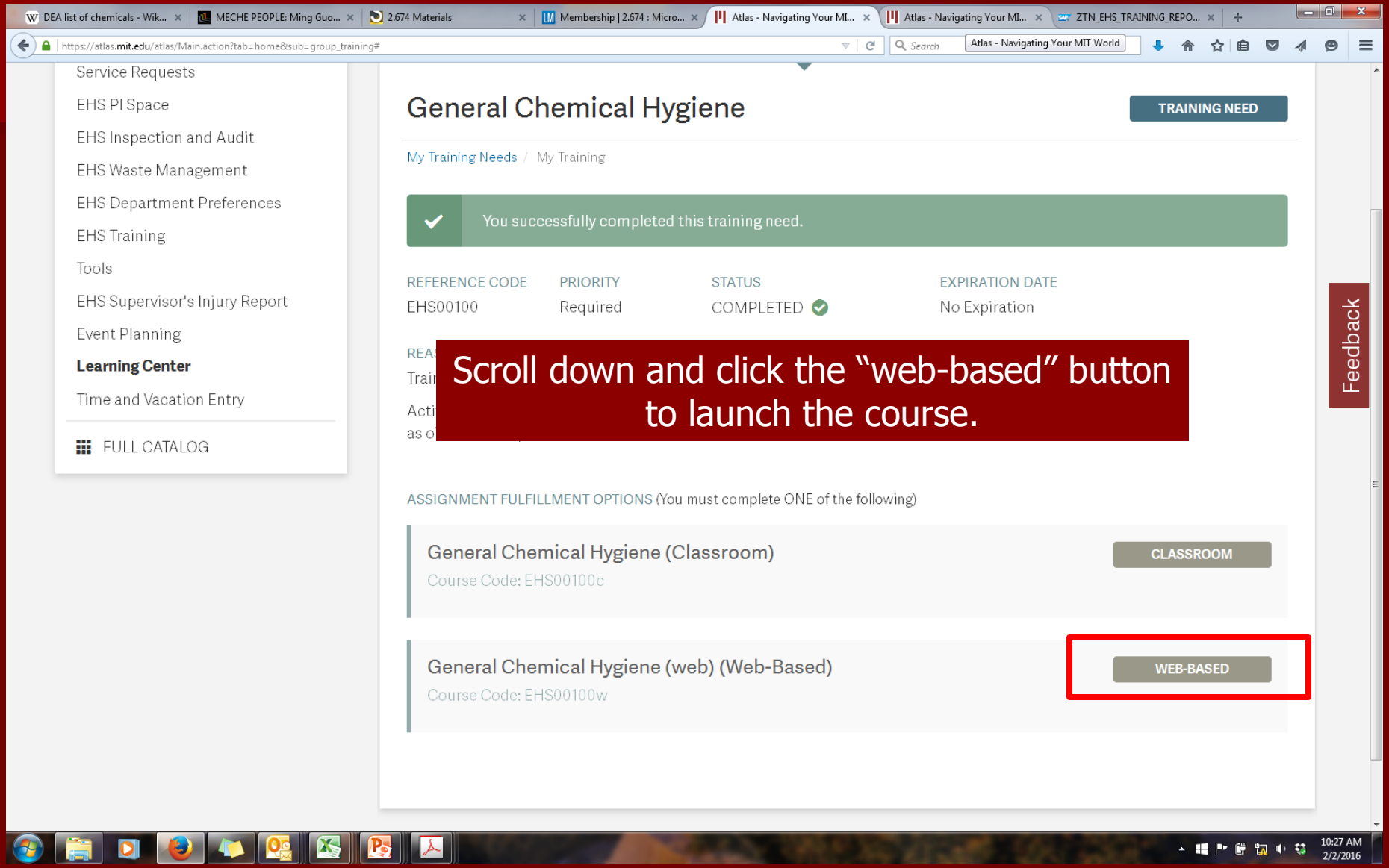
- You will use a class 3R laser.
  - 635nm at 5mW (milliwatt).
  - >5mW may damage eye, >1mW may irritate.
  - Do not stare into beam.
  - If eyes become irritated, avert your eyes.
- You will use UV lamps.
  - Unshielded UV can damage eyes and skin.
  - Don't point UV lamps at eyes or defeat shields.
  - Cover all skin; wear protective goggles/shield.
  - Don't remove goggles/shield to get closer look.

General Chemical Hygiene Web Training



General Chemical Hygiene Web Training



General Chemical Hygiene Web Training

- **You must complete Course 100 – General Chemical Hygiene by February 10, 2016 (before 1st lab)!**
- Note: The EHS list is populated by an automatic feed from MITSIS (the Registrar). Until they release their list the EHSD list will not be updated. There may be a 1 to 2 day delay for changes to appear.
- Firefox is the preferred browser for the eLearning System. Safari will also work; Chrome might…
- You will need to turn off pop-up blockers and have up-to-date versions of Flash and Java.
- For technical assistance visit http://ehs.mit.edu/site/training

Review of Topics Covered

- Emergency Information
- Lab Specific Chemical Hygiene
  - (M)SDS sheets, GHS system
  - PPE - safety glasses, gloves, lab coat
  - Fume hood
- Nanomaterials
- Compressed Gas Cylinders
- Cutting Safety, Electrical and Laser/UV Safety
- Training Course: complete by Feb 10 2016

Remember:

- You are the person most responsible for your own safety.

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  - Prepare – get information.
  - Plan your work – before you start.
  - Pay attention – while in the lab.

2.674 / 2.675 Micro/Nano Engineering Laboratory

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