

Step 1 of 3: Hazard Score

Hazard	Indicators	Less Hazardous Less Risky				More Hazardous More Risky	Score
		1	2	3	4	5	
Flammability	Flash Point (°F/°C)	>200/>93	>140-200/>60-93	>100-140/>38-60	73-100/23-38	<73/<23	
	Flammable Range (0-100%)	Narrow flammable range; higher percentage range		Intermediate flammable range; middle percentage range		Broad flammable range; lower percentage range	
	NFPA (Red)	0	1	2	3	4	
Corrosivity	pH	>6-8	>5-6 or >8-9	>3-5 or 9-10	2-3 or >10-11.5	<2 or >11.5	
	Oxidizer	Not an oxidizer		Moderate oxidizer		Strong oxidizer	
Reactivity	NFPA (Yellow)	0	1	2	3	4	
	Water Reactive, Polymerizes, Self Reactive or forms Peroxides	No				Yes	
Toxicity	LD ₅₀ oral, rat (mg/kg)	>2000	>300-2000	>50-300	5-50	<5	
	or LC ₅₀ inhalation, rat (ppm)	>20,000	>2,500-20,000	>500-2,500	100-500	<100	
Chronic Health Hazard	Carcinogen	OSHA	No			Yes	
		IARC	4	3	2B	2A	1
		ACGIH	A5	A4	A3	A2	A1
	Reproductive Hazard (Teratogen or Mutagen)	No Evidence		Animal Evidence, but no Human Evidence		Yes – Human Evidence	
Health Effects	Exposure Limits (PEL, OEL)	>1000 ppm*	>100 – 1000 ppm*	>10 – 100 ppm*	1 – 10 ppm*	<1 ppm*	
	NFPA (Blue)	0	1	2	3	4	
Add all above scores						Hazard Score	

*Or: $mg/m^3 = (24.45/MW)/ppm$

IARC: <http://monographs.iarc.fr/ENG/Classification/index.php>

NTP: <http://ntp.niehs.nih.gov/?objectid=72016262-BDB7-CEBA-FA60E922B18C2540>

ACGIH: <http://www.acgih.org>

NOTE: If a chemical has not been tested or information on hazards is not available, the indicator must be scored as a “4” or “5”. The term “No Evidence” means that a study was conducted and there is no evidence the chemical is a carcinogen or reproductive hazard. This is different than “no data or information” which implies the health effects of the chemical have not been studied.

Step 2 of 3: Exposure Score

Exposure Indicator	Less Hazardous Less Risky				More Hazardous More Risky	Score
	1	2	3	4	5	
Quantity	Small quantity		Intermediate quantity		Large quantity	
Concentration	Low concentration		Intermediate concentration		High concentration	
Physical Form	Solid; pellets	Liquids; granules	Mists	Vapors/fumes; Fine powders	Gas; Nanoparticles	
Vapor Pressure (mmHg@20°C)	<1	1 – 10	>10 – 100	>100 – 760	>760	
Boiling Point (°F/°C)	>302/>150		122 – 302/50 – 150		<122/<50	
Route of Exposure	Ingestion		Skin contact and ingestion		Inhalation, skin contact and ingestion	
Detection	Appearance	Established odor/irritation levels	Odor/irritation threshold	Odor/irritation levels not established	Analytical methods	
Warning Properties	Odor/irritation threshold is below PEL/TLV			Odor/irritation threshold is above PEL/TLV		
<i>Add all above scores</i>					Exposure Score	

Step 3 of 3: Risk = Hazard Score x Exposure Score

	Hazard	x	Exposure =	Risk	Safety
Low	15		8	120	Acceptable – use standard lab practices
Medium	42		24	1008	Take Action – reduce exposure
High	75		40	3000	Unacceptable – reduce hazard and exposure
Your Score:					

How to Use the Hazard & Risk Evaluation Matrix

This matrix will help you determine if the chemical that you are working with poses an acceptable or unacceptable risk to you, your laboratory and/or the university. This matrix gives you a tool to evaluate the hazards and the exposure potential for the chemical you are using. Once you have rated the hazards and exposures, you can determine the risk. The risk score will then let you know if you need to reduce your exposure or re-evaluate and reduce the hazard.

NOTE: This matrix is only one tool to help assess the relative hazard of a chemical. It does not replace the general safety practices that must be in place in the laboratory. If the chemical hazards have not been evaluated by the manufacturer or other available scientific studies, you must consider the material to be hazardous and implement precautionary measures. Everyone working with chemicals must receive chemical safety training.

Procedure:

Prepare: Obtain the Material Safety Data Sheet (MSDS) for the chemical you will be working with.

Step 1: Locate the *Indicators* listed on the Hazard matrix on the MSDS. Determine the score (1-5).

If an *Indicator* is not listed on the MSDS:

1. "No Evidence" is not the same as "No Information"; Score 4 or 5 for "No Information"
2. The NFPA rating is not always provided on the MSDS; No Score
3. Attempt to locate any missing basic information using additional resources:
 - Review another manufacturer's MSDS
 - NIOSH (<http://cdc.gov/niosh/ipcs/icstart.html>)
 - TOXNET (<http://toxnet.nlm.nih.gov/>)

Step 2: Rate the *Exposure*. Some of these indicators are inherent to the material you are using and some indicators depend on how you are using it.

Step 3: Multiply the Hazard score and the Exposure score to determine the Risk.

- Action:**
- If the Risk is "Low", standard laboratory practices are acceptable.
 - If the Risk is "Medium", re-evaluate how you are using the material.
 - Can you use a smaller quantity?
 - Can it be purchased and used in a lower concentration?
 - Can it be used in another form (e.g., liquid vs. gas)?
 - Ensure fume hoods and other engineering controls are working and used correctly.
 - If the Risk is "High", you must reduce the hazard and exposure.
 - Consider using a different chemical with lower hazards (e.g. *Substitution*).
 - Institute high hazard safety protocols.

Review the Stony Brook University Chemical Hygiene Plan, EH&S Policy 4-2, for work practices for Low, Medium and High Hazard chemicals. (<http://naples.cc.sunysb.edu/Admin/HRSForms.nsf/pub/EHSD0221>)

For additional work practices and safety procedures, review the training and handouts available on the EH&S web site. (<http://www.stonybrook.edu/ehs/training/courses.shtml?els002>)