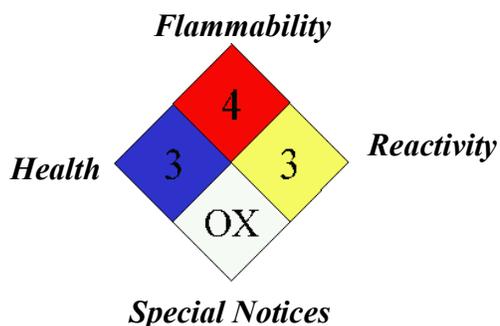


## NFPA FIRE DIAMONDS & GHS SYMBOLS SAFETY DATA SHEETS (SDS)

The **NFPA** (National Fire Protection Association) 704 or *NFPA Diamond* is the standard for the identification of hazardous materials and emergency response. These signs can be found on reagent bottles, gas tanks, vehicles that transport chemicals, and doors to rooms containing certain chemicals. Their main purpose is to quickly indicate to first responders the dangers presented by the substances present. However, the fire diamond is useful for anyone, especially a student, who is handling chemicals.



This diamond shaped sign is divided into 4 sections: health (blue, left), flammability (red, top), reactivity (yellow, right), and specific warnings (white, bottom). For the first three categories, the severity of the danger is indicated by a scale of 0 (minimal hazard) to 4 (extreme hazard).

<b>Flammability</b>			<b>Reactivity</b>		
<i>Materials with</i>			<i>Material Behavior:</i>		
	Flashpoint	Boiling Point		Reactivity	Conditions
4	< 23 °C (73 °F)	> 38 °C (100 °F)	4	explosion	normal pressure & temperature
3	< 23 °C > 23 °C	≥ 38 °C < 38 °C	3	explosion	strong initiating source
2	38 to 93 °C		2	chemical change	elevated pressure & temperature
1	> 93 °C (200 °F)		1	unstable	elevated temperature
0	Material normally doesn't burn		0	stable	
<b>Health</b>			<b>Special</b>		
<i>Materials with an oral LD50</i>					
4	≤ 5 mg / kg		<b>W</b>	water reactive	
3	5 – 50 mg / kg		<b>OX</b>	oxidizer	
2	50 – 500 mg / kg		<b>COR</b>	corrosive	
1	500 – 2000 mg / kg			radioactive	
0	> 2000 mg / kg				

Definitions of terms used in the table above:

**Flash point:** the lowest temperature at which a substance will vaporize and catch fire.

**LD50** (median lethal dose): the amount of a substance needed to kill 50% of the population.

**Oxidizer** (oxidizing agent): a chemical that will take electrons away from another chemical (thereby oxidizing that other chemical). *Examples:*  $\text{KMnO}_4$ ,  $\text{H}_2\text{O}_2$ ,  $\text{NaOCl}$  (bleach),  $\text{K}_2\text{Cr}_2\text{O}_7$ .

**Corrosive** (caustic): a chemical that will damage or destroy another substance. *Examples:* strong acids ( $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ) & bases ( $\text{NaOH}$ ), strong oxidizers (concentrated  $\text{H}_2\text{O}_2$ ).

The **Global Harmonized System (GHS)** was created by the United Nations in the 1990s. The goal was to create a set of symbols that would be universally understood. Nine pictograms are used to depict the classes of hazards associated with chemicals.

 <p><b>Flammables, Self Reactives, &amp; Pyrophorics</b></p>	 <p><b>Skin, Eye, &amp; Metal Corrosives</b></p>	 <p><b>Irritants &amp; Sensitizers</b></p>
 <p><b>Oxidizers</b></p>	 <p><b>Gases under Pressure</b></p>	 <p><b>Carcinogen, Mutagen, Teratogen</b></p>
 <p><b>Explosives &amp; Peroxides</b></p>	 <p><b>Environmental Effects</b></p>	 <p><b>Acute Toxicity / Fatal</b></p>

The best information source for the NFPA values (numerical values, the colored diamond is not displayed) and the GHS symbols is a chemical's **Safety Data Sheet (SDS)**. A SDS provides more detailed information on a chemical's reactivity - containing guidelines for the chemical's

handling, storage, and disposal. Furthermore, the health effects of and the emergency procedures for exposure to a chemical are an integral part of a SDS. Always look up the SDSs for the chemicals you will use in lab. Note: Only neutral compounds have SDS, ions do not. To start, look up chemicals you are familiar with - like table salt (NaCl), sucrose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>), ethanol (C<sub>2</sub>H<sub>5</sub>O, drinking alcohol), and sodium cyanide (NaCN). This activity will help give you the perspective needed when evaluating a SDS. The two links below provide online access to these documents:

UC Irvine's Environmental Health & Safety SDS website:

<http://www.ehs.uci.edu/msds.html>

(If off-campus, go through the Library's website and use the "Connect from off-campus" link.)

Chemical Manufacturer with User-Friendly website:

Sigma-Aldrich: <http://www.sigmaaldrich.com/united-states.html>

(Type chemical name into the search field in the upper right corner. When the chemical comes up, click on MSDS on the right side just before the price.)

Other websites:

**NFPA: National Fire Protection Association website:**

<http://www.nfpa.org/faq.asp?categoryID=928>

**GHS 1<sup>st</sup> Edition (2003) website:**

[http://www.unece.org/trans/danger/publi/ghs/ghs\\_rev00/00files\\_e.html](http://www.unece.org/trans/danger/publi/ghs/ghs_rev00/00files_e.html)