

Ban Hydrogen Hydroxide: An Introduction to Chemicals and Laboratory Safety

Some material borrowed from the following website:

<http://www.lhup.edu/~dsimanek/dhmo.htm>

NFPA Chemical Hazard Label information was found in following site:

<http://www.uwplatt.edu/chemep/chem/saf/nfpa-d.htm>

Fire Diamond image was borrowed from the following website:

www.nmsu.edu/safety/programs/

Other images and information borrowed from the following site:

<http://www.ee.byu.edu/cleanroom/NFPA.phtml>

http://www.rivcoeh.org/export/download/Environmental-Health/HMM/NFPA_Rating.pdf

http://www.compliancesigns.com/media/NFPA-Chart_1_600.gif

Grade: 7/8

Time: 1 class period

Lesson Plan: Ban Hydrogen Hydroxide: An Introduction to Chemicals and Laboratory Safety

Materials:

- Smartboard or projector
- Powerpoint Presentation
- Worksheets/Handouts (see attached)

Goals/Objectives:

- Students will read about chemical safety
- Students will be exposed to examples of chemical safety practices in the laboratory
- Students will use the NFPA fire diamond standard to determine chemical hazards
- Students will be introduced to chemical naming practices in chemistry

NJCCCS Addressed

Standards 5.1A, 5.1B, 5.1C, 5.6A, 5.6B, and 5.7B in 7th and 8th grade Science

Activities and Procedures:

Part 1. Have students read the "Hydrogen Hydroxide" handout. It is recommended that the handout be read aloud and students take turns reading to ensure involvement.

Part 2.

Discuss Hydrogen Hydroxide with the class. You questions such as the following to begin the discussion:

- Do you think this chemical is dangerous? If so, explain your answer.
- Should this chemical ever be allowed in a school for a science experiment?
- How would we be able to avoid exposure to this chemical?

- Just by looking at this chemical's name, can it be composed of any elements that are familiar to you?

Part 3. Reveal to students that Hydrogen Hydroxide is another term for water.

Part 4. Give presentation about laboratory safety practices and how they must be used at all times. Emphasize about how important laboratory safety is when working with unknown substances. Cite hydrogen hydroxide as an example.

Part 5. Introduce students to NFPA fire diamond system. Explain what each diamond square refers to and talk about the numbers used to rank the safety of each material.

Accommodations:

SLD/ELL

Students have option to work in groups

Check up on students as they work

Offer help to students as they work

Students will be allowed to work with bilingual students

Offer translations if possible

Visuals will be used

Assessment:

Students' work will be collected and reviewed

Students will share their work with others upon completion

Follow-up:

Students will be reminded of this activity before any experiment involving chemicals

This lesson will be part of a series of lessons

Ban Hydrogen Hydroxide!
The Invisible Killer

Hydrogen hydroxide is colorless, odorless, tasteless, and kills uncounted thousands of people every year. Most of these deaths are caused by accidental inhalation of this compound, but the dangers of hydrogen hydroxide do not end there. Prolonged exposure to its solid form causes severe tissue damage. Symptoms of Hydrogen hydroxide ingestion can include excessive sweating and urination, and possibly a bloated feeling, nausea, vomiting and body electrolyte imbalance. For those who have become dependent, Hydrogen hydroxide withdrawal means certain death.

Hydrogen hydroxide:

- also known as hydroxyl acid or dihydrogen monoxide
- is the major component of acid rain.
- contributes to the "greenhouse effect."
- may cause severe burns.
- contributes to the erosion of our natural landscape.
- accelerates corrosion and rusting of many metals.
- may cause electrical failures and decreased effectiveness of automobile brakes.
- has been found in excised tumors of terminal cancer patients.

Contamination Is Reaching Epidemic Proportions!

Quantities of hydrogen hydroxide have been found in almost every stream, lake, and reservoir in America today. But the pollution is global, and the contaminant has even been found in Antarctic ice. Hydrogen hydroxide has caused millions of dollars of property damage in the midwest, and recently California.

Despite the danger, hydrogen hydroxide is often used:

- | | |
|---|---|
| - as an industrial solvent and coolant. | - in many forms of cruel animal research. |
| - in nuclear power plants. | - in the distribution of pesticides. |
| - in the production of styrofoam | - as an additive in certain "junk-foods" |
| - as a fire retardant. | |

Companies dump waste Hydrogen hydroxide into rivers and the ocean, and nothing can be done to stop them because this practice is still legal. The impact on wildlife is extreme, and we cannot afford to ignore it any longer!

The Horror Must Be Stopped!

The American government has refused to ban the production, distribution, or use of this damaging chemical due to its "importance to the economic health of this nation." In fact, the navy and other military organizations are conducting experiments with Hydrogen hydroxide, and designing multi-billion dollar devices to control and utilize it during warfare situations. Hundreds of military research facilities receive tons of it through a highly sophisticated underground distribution network. Many store large quantities for later use.

Name _____

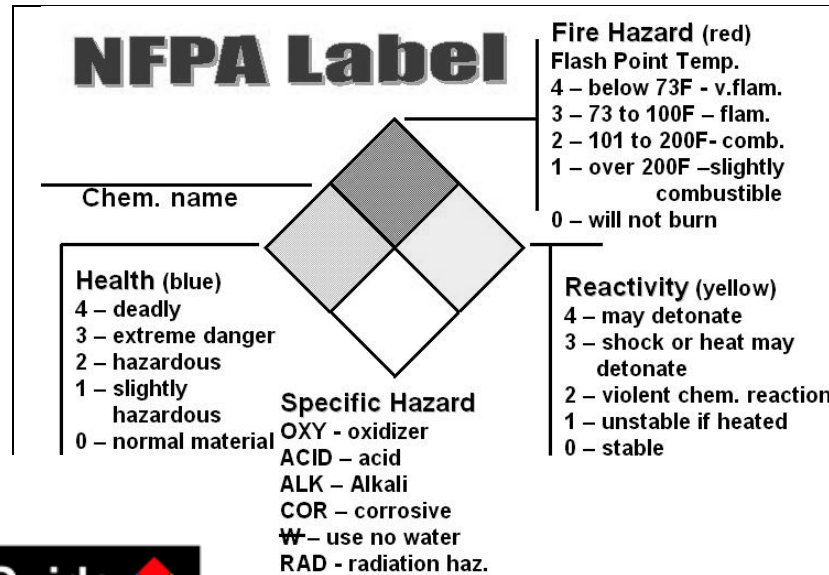
Date _____

Laboratory Safety

Look at the items listed below. Use or two sentences to explain the purpose of each of these items when practicing laboratory safety.

1. goggles-
2. gloves-
3. laboratory coat-

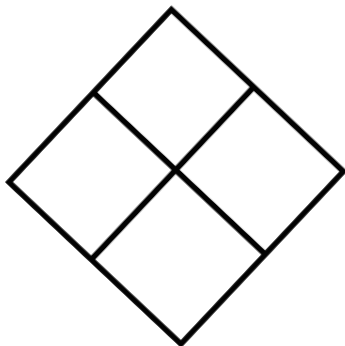
The NFPA, the National Fire Protection Association, created the “fire diamond” labeling system standard that is used in every laboratory today. This labeling standard is very useful in the laboratory, because it allows scientists to quickly know how dangerous a chemical is just by looking at its container. Use these diagrams to answer the next few questions.



NFPA Rating Explanation Guide					
RATING NUMBER	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD	RATING SYMBOL	SPECIAL HAZARD
4	Can be lethal	Will vaporize and readily burn at normal temperatures	May explode at normal temperatures and pressures	ALK	Alkaline
3	Can cause serious or permanent injury	Can be ignited under almost all ambient temperatures	May explode at high temperature or shock	ACID	Acidic
2	Can cause temporary incapacitation or residual injury	Must be heated or high ambient temperature to burn	Violent chemical change at high temperatures or pressures	COR	Corrosive
1	Can cause significant irritation	Must be preheated before ignition can occur	Normally stable. High temperatures make unstable	OX	Oxidizing
0	No hazard	Will not burn	Stable	☸	Radioactive
				W	Reacts violently or explosively with water
				W OX	Reacts violently or explosively with water and oxidizing

This chart for reference only - For complete specifications consult the NFPA 704 Standard
 NFPA-Chart_1 www.ComplianceSigns.com

Question 1: The NFPA fire diamond uses different colors to distinguish different types of hazards. Draw a line to match each color with the hazard it represents and then color in fire diamond.



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|-----------|-------------------|
| 1. Blue | Fire Hazard |
| 2. Red | Health Hazard |
| 3. Yellow | Specific Hazard |
| 4. White | Reactivity Hazard |

Question 2. You are cleaning your cell culture tools after class and a classmate passes you a bottle of ethanol to rinse your tools. Using the NFPA fire diamond on the bottle, explain the types of hazards and hazard levels associated with ethanol.

Question 3. Check off the types of hazards associated with ethanol.

- Health Hazard
- Fire Hazard
- Reactivity Hazard
- Specific Hazard

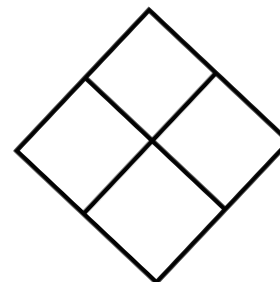
Question 4. Is ethanol a fire hazard? Explain why or why not in the space below.



Question 5. Is ethanol a health hazard? Explain why or why not in the space below.

NFPA 704 RATINGS and ID NUMBERS for COMMON HAZARDOUS MATERIALS					
	Blue (Health)	Red (Fire)	Yellow (Reactivity)	White	UN/NA#
Acetone	1	3	0		1090
Acetylene	0	4	3		1001
Alcohol, Ethyl	0	3	0		1170
Alcohol, Methyl	1	3	0		1230
Ammonia, Anhydrous	3	1	0		1005
Antifreeze (Ethylene Glycol)	1	1	0		1142
Butane	1	4	0		1011
Calcium Hypochlorite	3	0	1	OX	2880
Cal Hypochlorite, solid	3	0	1	OX	2208
Carbon Dioxide, Liquid CO ₂	3	0	0		2187
Chlorine Gas	4	0	0	OX	1017
Diesel Fuel	1	2	0		1993
Epoxy resins	2				
Formaldehyde, solutions	3	2	0		2209
Formaldehyde, flammable sol.	3	4	0		1198
Gas, Natural	1	4	0		1971
Gasoline, Automotive	1	3	0		1203
Hydrogen Chloride, anhydrous	3	0	1		1050
Hydrogen Chloride, refrigerated	3	0	1		2186
Jet Fuels (Jet A & Jet A-1)	0	2	0		
Jet Fuels (Jet B & JP-4)	1	3	0		
Jet Fuels (JP-5)	0	2	0		
Kerosene	0	2	0		1223
Lacquer Thinner	0	2	0		

Question 6. Acetone is also used to clean materials in laboratories. Use the table above to make a fire diamond for acetone. Don't forget to color in the diamond and fill in the appropriate numbers.



Question 7. Explain the types of hazards associated with acetone. Use the NFPA Rating Explanation Guide (found on the first page of this packet) as a guide.

Question 8. What are 3 precautions you can take in the laboratory when using potentially hazardous chemicals.

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