

LABORATORY SAFETY PROCEDURES

for

Biological Sciences and Physical Science Departments

HOWARD PAYNE UNIVERSITY

Brownwood, Texas

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1st Revision June 2005

With contributions from the Laboratory Safety and Chemical Waste Disposal for Texas
Science Instructors Workshop at Corpus Christi State University's National Spill Control
School

MSDS information Revised August 2007
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2nd Revision July 2009

SAFETY AND LABORATORY RULES

The scientific laboratory is a place of adventure and discovery. Some of the most important events in scientific history have happened in laboratories. The antibiotic powers of penicillin were discovered in a laboratory. The plastics used today for clothing and other products were first made in a laboratory. The list is almost endless.

One of the first things any scientist learns is that working in the laboratory can be an exciting experience. However, the laboratory can also be quite dangerous if proper safety rules are not followed at all times. In order to prepare yourself for a safe year in the laboratory, read over the following safety, rules. Then read them a second time. Make sure you understand each rule.

Dress Code

1. **Everyone** must wear chemical splash goggles (not safety glasses) **at all times**, even when not performing a chemical operation while the **laboratory class** is in session.
2. **Laboratory aprons or coats** should also be worn whenever working with chemicals or heated substances. An **apron** should offer protection from splashes & spills, should be easily removable in case of accident & fire-resistant. Nonflammable, nonporous aprons should be worn. A **lab coat** should have snap fasteners instead of buttons.
3. Tie back long hair in order to keep it away from any chemicals, burners, and candles, or other laboratory equipment.
4. **Clothing**—shorts, cutoffs & miniskirts unnecessarily expose your skin and are not safe. Any article of clothing or jewelry that can hang down and touch chemicals and flames should be removed or tied back before working in the laboratory. Sleeves should be rolled up.
5. Sandals will **not** protect the feet. They should **not** be worn in the lab. Closed toed and closed heeled shoes are required in the laboratory—the entire foot must be covered, including the wearing of socks.
6. **Gloves**—Your instructor will require their use when appropriate. Always check gloves to ensure the absence of cracks & holes. Remove your gloves before leaving the work area, before handling telephones, doorknobs, writing instruments, lab notebooks & textbooks. **Do not reuse gloves.**
7. When working w/reduced pressure or other experiments where the potential exists for dynamic reactions, etc., use appropriate laboratory bench shields, safety goggles & face shields.

General Safety Rules

1. **NO HORSEPLAY OR LOUD TALKING IN THE LABORATORY**
2. Read all directions for an experiment several times. Follow the directions exactly as

they are written. If you are in doubt about any part of the experiment, ask your instructor for assistance.

3. **Variations**—Ask your instructor before making any variations in procedures of any kind. Never perform activities that are not authorized by your instructor.
4. Never handle any equipment unless you have specific permission.
5. Take extreme care not to spill any material in the laboratory. If spills occur, ask your instructor immediately about proper clean-up procedure. Never simply pour chemicals or other substances into the sink or trash container.
6. Never consume food or beverage in lab. Do not chew gum, apply cosmetics, smoke—they can absorb chemical vapors.
7. Wash your hands with soap and water before and after each experiment.
8. When performing a lab, make sure the work area (bench, aisle, etc.) has been cleared of purses, books, jackets, etc. Please place these items out of the main traffic areas in a place designated by your instructor. Also, keep workspaces clear of broken glassware, leftover chemicals and scraps of paper.
9. Know the location and use of all safety equipment (goggles, aprons, eyewash, fire blanket, fire extinguishers, etc.)
10. Read your assignment before coming to class and be aware of all safety precautions. Follow directions.
11. Never remove chemicals from lab.
12. Never work alone in the lab.
13. **Visitors**—all visitors should wear eye protection.
14. Keep Drawers and cabinets closed.

First Aid

1. Report all accidents to your instructor immediately.
2. Learn what to do in case of specific accidents, such as getting acid in your eyes or on your skin. (Rinse acids from your body with lots of cold water.)
3. Become aware of the location of the first aid kit. However, your instructor should administer any required first aid due to injury. Your instructor may suggest sending you to the school nurse or calling a physician.

Heating and Fire Safety

1. Again, never use any heat source such as a candle or burner without wearing safety goggles.
2. Never heat any chemical that you are not instructed to heat. A chemical that is harmless when cool can be dangerous when heated.
3. Always maintain a clean work area and keep all materials away from flames. Never leave a flame unattended.
4. Never reach across a flame.
5. Make sure you know how to light a Bunsen burner. (Your instructor will demonstrate the proper procedure for lighting a burner.) If the flame leaps out of a burner towards

- you, turn the gas off immediately. Do not touch the burner. It may be hot. And never leave a lighted burner unattended!
6. Always point a test tube that is being heated away from you and others. Chemicals can splash or boil out of a heated test tube.
 7. Never heat a liquid in a closed container. The expanding gases produced may blow the container apart, injuring you or others.
 8. Never pick up any container that has been heated without first holding the back of your hand near it. If you can feel the heat on the back of your hand, the container may be too hot to handle. Always use a clamp or tongs when handling hot containers. Hot glassware looks the same as cool glassware.

Using Chemicals Safely

1. Never mix chemicals for the "fun of it". You might produce a dangerous, possibly explosive substance. No unauthorized experiments should be performed.
2. Never touch, taste, or smell any chemical in the laboratory unless specifically instructed to do so by your instructor (even then exercise extreme caution!). If you are instructed to note the fumes in an experiment, always gently wave your hand over the opening of a container and direct the fumes toward your nose. Do not inhale the fumes directly from the container.
3. Use only those chemicals needed in the activity. Keep all lids closed when a chemical is not being used. Notify your instructor when chemicals are spilled.
4. Dispose of all chemicals as instructed by your instructor or the laboratory procedure. Chemicals, etc. should be neutralized or deactivated as part of your procedure. **Every student is responsible** for ensuring that chemicals, reaction byproducts, surplus and contaminated materials are handled in a manner that minimizes personal hazard and recognizes the potential for environmental contamination.
5. Be extra careful when working with acids or bases. Pour such chemicals over the sink, not over your workbench.
6. When diluting an acid, always pour the acid into water. Never pour water into the acid ("always do what you oughta, add acid to water"). When adding acids and bases together, add the acid to the base ("if you want to save your face, add acid to base").
7. Rinse any acids or bases off your skin or clothing with cold water. Immediately notify your instructor of any acid or base spill.
8. Never pipet by mouth.
9. Be sure you use the correct chemical. Read the label twice.
10. Do not return any excess back to the reagent bottle.
11. Do not contaminate the chemical supply.
12. Keep combustible materials away from open flames (alcohol, carbon disulfide, and acetone are examples of combustible materials). You should assume that organic chemicals are flammable unless otherwise indicated.
13. **DO NOT** use the same spatula to remove chemicals from two different containers. Each container should have a different spatula.
14. When you remove the stopper from a bottle, **DO NOT** lay it down on the desk, but

place the stopper between your two fingers and hold the bottle so the label is in the palm of your hand so drips won't ruin the label, etc. Both the bottle and the stopper will be held in one hand. Be sure and rinse any drips that might have gotten on the outside of the bottle.

15. Be careful not to interchange stoppers from two different containers.
16. Replace all stoppers and caps on the bottle as soon as you finish using it.
17. Mercury spills must be cleaned up immediately. Use the new mercury sponge clean up kits put out by various companies.

Inhaling Harmful Chemicals

18. Read the label on the container or Material Safety Data Sheet – even if a chemical has no odor it can have harmful vapors. Do not work with such substance on a lab bench. Dispense & handle these chemicals in a laboratory hood.

Distillations

19. Hot plates—do not use when distilling a flammable liquid unless you are sure the hot plate is spark-proof.
20. Do not heat material above temperature directed in the procedure.
21. Never distill organic compounds or evaporate them to dryness unless they are known to be free of peroxides.

Extractions

22. Extractions can present a hazard because of potential buildup of pressure from a volatile solvent and an immiscible aqueous phase.
23. Glass separatory funnels used are particularly susceptible to problems.
24. Do not vent separatory funnel near a flame or other ignition source.

Using Glassware Safely

1. Glass tubing should never be forced into a rubber stopper. A turning motion and lubricant will be helpful when inserting glass tubing into rubber stoppers or rubber tubing. Your instructor will demonstrate the proper way to insert glass tubing.
2. When heating glassware, use a wire or ceramic screen to protect glassware from the flame of a Bunsen burner.
3. If you are instructed to cut glass tubing, always fire polish the ends immediately to remove sharp edges.
4. Never use broken or chipped glassware. If glassware breaks, notify your instructor and dispose of the glassware in the proper trash container.
5. Never eat or drink from laboratory glassware.
6. Always thoroughly clean any glassware before putting it away. Clean soiled glassware at the lab sink or lab dishwashers. Use hot water & environmentally acceptable cleaning agents.
7. Avoid accumulating too many articles in the clean-up area. Clean as you go.

Using Sharp Instruments

1. Handle scalpels or razor blades with extreme care. Never cut any material towards you: always cut away from you.
2. Notify your instructor immediately if you are cut in the laboratory.
3. Properly secure dissecting specimens to the dissecting pan before making a cut.

Please refer to the Blood borne Pathogen Plan for more information

Electrical Equipment Rules

1. Batteries should never be intentionally shorted. Severe burns may result by the heat generated in a bare copper wire placed directly across the battery terminals. If a mercury type dry cell is shorted, an explosion can result.
2. **Never deliberately shock yourself or another person.** Susceptibility to shock and possible resulting injury is unpredictable because of the many physical and physiological variables.
3. Turn off all power when setting up circuits or repairing electrical equipment.
4. Never use such metal articles as metal rulers, metal pencils or pens, nor wear rings, metal watchbands, bracelets, etc. when doing electrical work.
5. When disconnecting a piece of electrical equipment, pull the plug and not the wire.
6. Use caution in handling electrical equipment which has been in use and has been disconnected. The equipment may still be hot enough to produce a serious burn.
7. Never connect, disconnect, or operate a piece of electrical equipment with wet hands or while standing on a wet floor.

End-of-Experiment Rules

1. When an experiment is completed, always clean up your work area and return all equipment to its proper place.
2. Wash your hands with soap and water before and after each experiment.
3. Make sure all candles and burners are turned off before leaving the laboratory. Check that the gas line leading to the burner is off as well.

Refrigerators

1. Refrigerators should be explosion-proof. Never use household refrigerators for chemical storage.
2. Chemicals stored in refrigerators should be placed on a spill tray with edges sufficiently high to contain the spilled contents of any containers that are placed in the tray.
3. Always seal, and if possible, double-package all chemicals to be stored in refrigerators.

4. Label each chemical with name, date, and name of person who stored material.
5. Dispose of old chemicals after a specified storage period.
6. Store radioactive materials only in a designated refrigerator that can be locked and properly labeled for such storage.
7. **Never** store food or beverages in a refrigerator used for lab chemicals.

SAFETY QUIZ

Write the letter of the correct answer on the line.

1. When diluting an acid, always pour
 - a. water into the acid.
 - b. the acid into water.
 - c. the base into water.
 - d. water into the base.

2. When inserting glass tubing into a rubber stopper,
 - a. use a turning motion.
 - b. apply a lubricant.
 - c. force the tubing into the stopper.
 - d. both a and b.

3. To protect glassware from the flame of a Bunsen burner,
 - a. use a wire screen or ceramic gauze pad.
 - b. immerse the glassware in water.
 - c. hold the glassware over the flame.
 - d. none of these.

4. Always point a test tube that is being heated
 - a. away from you and toward others.
 - b. toward you and away from others.
 - c. toward you and others.
 - d. away from you and others.

5. When working with chemicals and burners, always wear
 - a. safety goggles
 - b. laboratory apron or coat.
 - c. both a and b.
 - d. neither a or b.

6. To test the odor of fumes,
 - a. inhale the fumes directly from the container.
 - b. gently wave the fumes toward your nose.
 - c. heat the substance before smelling it.
 - d. take a deep breath and Inhale.

7. When using scalpels or razor blades, cut the material
 - a. away from you.
 - b. on a right angle.
 - c. toward you.
 - d. in your hand.
8. To dispose of all chemicals
 - a. follow the instructions of your instructor.
 - b. throw them in the trash.
 - c. burn them in a burner.
 - d. flush them down the sink.
9. You should know the location of safety equipment in the laboratory and
 - a. where it is produced.
 - b. use it once a week.
 - c. use it twice a year.
 - d. how to use it properly.
10. After cutting glass tubing, always fire polish the ends
 - a. to remove impurities.
 - b. for easier insertion into stoppers.
 - c. to remove sharp edges.
 - d. and place in cold water.

On the line, write T if the statement is true and F if the statement is false.

- _____ 11. Never perform activities that are not authorized by your instructor.
- _____ 12. When diluting an acid, add the acid to the water.
- _____ 13. You may heat liquids in a closed container.
- _____ 14. When you have finished an experiment, leave all of the equipment in your work area clean and well organized.
- _____ 15. Always use a clamp or tongs when handling hot containers.
- _____ 16. If you spill any material, quickly clean it up.
- _____ 17. Rinse any acids off your skin or clothing with water.
- _____ 18. In an experiment, use more chemicals than you need.
- _____ 19. Always keep the lids of all chemical containers open.

_____ 20. When measuring amounts of liquid using a pipet, mouth suction is the best method.

Name: _____ Class _____ Date _____

SAFETY QUIZ

1. Fill in the table below by describing how and when to use the safety equipment listed. Describe the location of each item in your school lab.

Safety Equipment	How to Use	When to Use	Location
goggles			
apron			
fire extinguisher			
fire blanket			
eyewash			
shower			
fume hood(s)			
gloves			

2. Fill in the table below by explaining the correct safety rule or guideline associated with each topic. Also, provide a brief rationale for each.

Topic	Rule/Guideline	Rationale
eating, drinking, smoking in lab		
long hair		
loose or bulky clothing		
running/playing in lab		
combustible materials		
hot glassware		
heating in test tube		
prelab preparation		
sloppy work space		
unused chemicals		

First Aid Quiz

REPORT ALL ACCIDENTS, INJURIES, AND SPILLS TO YOUR INSTRUCTOR IMMEDIATELY.

YOU MUST KNOW: Safe laboratory techniques
Where and how to report an accident, injury or spill
Location of first aid equipment, fire alarm, phone, school nurse's office
Evacuation procedure

DIRECTIONS: list safe response for each situation.

SITUATION	SAFE RESPONSE
burns	
cuts and bruises	
fainting/collapse	
fire	
foreign matter in eyes	
poisoning	
severe bleeding	
spills, general acid burns, base burns	

Material Safety Data Sheets (MSDS)

Definitions

The Occupational Health and Safety Administration (OHSA) has the following definitions:

Chemical Identity

The identity of the substance as it appears on the label.

Section I. Manufacturer's Name and Contact Information

Manufacturer's name, address, telephone number and emergency telephone number. Date the MSDS was prepared and an optional signature of the preparer.

Section II. Hazardous Ingredients/Identity Information

Lists the hazardous components by chemical identity and other common names. Includes OSHA PEL (Permissible Exposure Limit), ACGIH TLV® (Threshold Level Value) and other recommended exposure limits. Percentage listings of the hazardous components is optional.

Section III. Physical/Chemical Characteristics

Boiling point, vapor pressure, vapor density, specific gravity, melting point, evaporation rate, solubility in water, physical appearance and odor.

Section IV. Fire and Explosion Hazard Data

Flash point (and method used to determine it), flammability limits, extinguishing media, special firefighting procedures, unusual fire and explosion hazards.

Section V. Reactivity Data

Stability, conditions to avoid, incompatibility (materials to avoid), hazardous decomposition or byproducts, hazardous polymerization (and conditions to avoid).

VI. Health Hazard Data

Routes of entry (inhalation, skin, ingestion), health hazards (acute = immediate and chronic = build up over time), carcinogenicity (NTP, IARC monographs, OSHA regulated), signs and symptoms of exposure, medical conditions generally aggravated by exposure, emergency and first aid procedures.

VII. Precautions for Safe Handling and Use

Steps to be taken in case material is released or spilled, waste disposal method, precautions to be taken in handling or storage, other precautions.

VIII. Control Measures

Respiratory protection (specify type [see respirators], ventilation (local, mechanical exhaust, special or other), protective gloves, eye protection, other protective clothing or equipment, work/hygienic practices.

Disadvantages

OHSA's definitions are a good idea but there is no standard about the format—the information as described above must be present but there is no requirement as to the order so that finding the information can be difficult for professionals let alone novices.

ANSI MSDS

The American National Standards Institute (ANSI) defined a format that contains all the OSHA requirements with a few additions and a standardized format shown below:

1. Substance identity and company contact information
2. Chemical composition and data on components
3. Hazards identification
4. First aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls and personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulations
16. Other information

Most businesses have adopted the ANSI standard on newer MSDS's. Formatting such as boldface, italics, etc., is up to the compiler of the MSDS sheet, so long as these sections are present with the appropriate safety information in each section.

Investigation: Material Safety Data Sheet Interpretation

Objective: Students will be able to read and interpret various Material Safety Data Sheets.

Materials: Sample Material Safety Data Sheets (MSDS), from various suppliers; Answer sheets.

Procedure: A. Read and interpret an MSDS on Sodium Hydroxide.

1. Use the information given on MSDS on sodium hydroxide to complete the blanks on the MSDS answer sheet.

State the:

- | | |
|--------------------------------|-------------------------|
| (1) chemical name and synonyms | (6) health hazards |
| (2) formula | (7) fire hazards |
| (3) appearance and odor | (8) spills and leaks |
| (4) reactivity | (9) special precautions |
| (5) conditions to avoid | (10) first aid |

2. Why is the information listed on the answer sheet in #1 of importance to you in a laboratory situation? (Be specific!)

3. What "number disposal" is the best disposal process for this chemical? (see back of original MSDS)

B. Interpret an MSDS.

1. What is the name of this chemical?

2. What is the chemical formula?

3. What condition must be avoided with this chemical?

4. What first aid must be administered upon contact with this chemical?

5. How would you take care of a spill or leak of this chemical?

MATERIAL SAFETY DATA SHEET

**SX074, SX075, SX076
SXA77, SX077, SX217, SX078
SO148, SO149, R-5200A, R-5**

CHEMICAL NAME AND SYNONYMS		FLYNN CATALOG NUMBER
Sodium Hydroxide		R-5200C, R-5200D, R-5200E R-5200F, R-5200G
FORMULA	FORMULA WEIGHT (F.W.)	CAS NO.
NaOH	40.00	1310-73-2
PHYSICAL DATA (DENSITY, SOLUBILITY, ETC.)		
Sp. Gr. 2.13 Soluble in water, alcohol and glycerol		
APPEARANCE AND ODOR		
White pellets or flakes. Absorbs CO ₂ and water from air.		
COMPATIBLE CHEMICAL FAMILY	DOT CLASS	REACTIVITY
Inorganic	Corrosive solid	Stable
CONDITIONS TO AVOID (IF ANY): Avoid all body contact		
HEALTH HAZARDS (IF ANY): Strong tissue irritant; particularly hazardous to eye tissue. Damage occurs very quickly.		TOLERANCE LIMIT VALUE (TLV) (IF ESTABLISHED) 2 Mg/M ³
FIRE HAZARDS (IF ANY): Non flammable		
SPILLS AND LEAKS: Gather up material in a pile (do not sweep); place in a suitable container. As solution: absorb on sand or vermiculite; place in a suitable container and use suggested disposal method at right.		DISPOSAL NO. 10 See Flinn chemical catalog Reference Manual
SPECIAL PRECAUTIONS (IF ANY): Chemical gloves and chemical splash goggles a must!		
FIRST AID (IF SUBSTANCE DANGEROUS): External: Wash affected parts with copious quantities of water. Internal: Wash mouth; see a physician.		

N/A = NOT APPLICABLE

Example of an ANSI Standard MSDS
(Downloaded from Iowa State University)
Material Safety Data Sheet
Acetic anhydride
ACC# 00130

Section 1 - Chemical Product and Company Identification

MSDS Name: Acetic anhydride

Catalog Numbers: AC400060000, AC400060010, AC400060040, S70072, S70078, S71903, A10-1, A10-100, A10-4, A10-500, A10J4, NC9556617, S75249, XXA10207LI

Synonyms: Acetic oxide; Acetyl oxide; Ethanoic anhydride; Acetic acid anhydride.

Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-24-7	Acetic anhydride	> 97.0	203-564-8

Hazard Symbols: C

Risk Phrases: 10 20/22 34

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. **Flash Point:** 126 deg F. **Danger!** Corrosive. Causes digestive and respiratory tract burns. **Flammable liquid and vapor.** May be harmful if swallowed. May cause central nervous system depression. Causes eye and skin burns. Harmful if inhaled. Moisture sensitive.

Target Organs: Central nervous system, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Eye damage may be delayed. Contact with liquid is corrosive to the eyes and causes severe burns. When substance becomes wet or comes in contact with moisture of the mucous membranes, it will cause irritation. May cause chemical conjunctivitis and corneal damage.

Skin: Contact with skin causes irritation and possible burns, especially if the skin is wet or moist. Prolonged skin contact may be painless with reddening of the skin followed by a white appearance of the skin. Skin burns may be delayed. May cause cyanosis of the extremities. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the digestive tract. May be harmful if swallowed. Ingestion of large amounts may cause CNS depression. May cause systemic effects.

Inhalation: Harmful if inhaled. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Causes chemical burns to the respiratory tract. May cause lung damage. Aspiration may lead to pulmonary edema. Vapors may cause dizziness or suffocation. May cause systemic effects. May cause burning sensation in the chest.

Chronic: Effects may be delayed. Prolonged skin contact may be painless and cause redness and subsequently a white appearance of the skin accompanied by wrinkling. Skin burns may be delayed.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Water Reactive. Material will react with water and may release a flammable and/or toxic gas. Use water spray to keep fire-exposed containers cool. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Containers may explode in the heat of a fire. Flammable liquid and vapor. May ignite or explode on contact with steam or moist air.

Extinguishing Media: Use dry sand or earth to smother fire. If water is the only media available, use in flooding amounts. DO NOT USE WATER! Do NOT use straight streams of water. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

General Information: Use proper **personal protective equipment** as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Do not expose spill to water. Spill may be neutralized with lime. Cover with material such as dry soda ash or calcium carbonate and place into a closed container for disposal. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Remove contaminated clothing and wash before reuse. Do not allow water to get into the container because of violent reaction. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid contact with heat, sparks and flame. Use with adequate ventilation. Discard contaminated shoes. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Keep from contact with moist air and steam.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Do not store in direct sunlight. Keep container closed when not in use. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from water. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acetic anhydride	5 ppm TWA	200 ppm IDLH	5 ppm TWA; 20 mg/m ³ TWA

OSHA Vacated PELs: Acetic anhydride: C 5 ppm; C 20 mg/m³

Personal Protective Equipment

Eyes: Wear chemical goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: colorless liquid

Odor: strong odor - pungent odor - acetic odor

pH: Not available.

Vapor Pressure: 3.9 mm Hg @68F

Vapor Density: 3.5 (air=1)

Evaporation Rate:0.46 (n-butyl acetate=1)

Viscosity: Not available.

Boiling Point: 137 deg C

Freezing/Melting Point: Not available.

Autoignition Temperature: 630 deg F (332.22 deg C)

Flash Point: 126 deg F (52.22 deg C)

Decomposition Temperature: Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 2; Reactivity: 1

Explosion Limits, Lower:2.9%

Upper: 10.3%

Solubility: Decomposes.

Specific Gravity/Density:1.0820g/cm³

Molecular Formula:C₄H₆O₃

Molecular Weight:102.09

Section 10 - Stability and Reactivity

Chemical Stability: Stable. However, may decompose if exposed to moist air or water. Substance is readily hydrolyzed. Reacts with water to form corresponding acid.

Conditions to Avoid: Ignition sources, contact with water, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Strong oxidizing agents, strong reducing agents, bases, alcohols, metal powders, moisture.

Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 108-24-7: AK1925000

LD50/LC50:

CAS# 108-24-7:

Inhalation, rat: LC50 = 1000 ppm/4H;

Oral, rat: LD50 = 1780 mg/kg;

Skin, rabbit: LD50 = 4 mL/kg;

Carcinogenicity:

CAS# 108-24-7: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No information found.

Teratogenicity: No information found.

Reproductive Effects: No information found.

Neurotoxicity: No information found.

Mutagenicity: No information found.

Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.

Environmental: Terrestrial: Will readily infiltrate downward toward ground water. Aquatic: Will react slowly and become miscible, and will produce an irritating vapor. Mixing takes place and the spill is diluted. In rivers, the principal mixing agent is stream turbulence. Atmospheric: Since acetic anhydride is a relatively non-volatile liquid, direct venting of the vapor to the atmosphere from a hole in a ruptured vessel does not constitute a significant hazard downwind. Only vapor released from a liquid pool spilled on a ground or water surfaces is important.

Physical: Not expected to bioconcentrate or biodegrade.

Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada
TDG					
Shipping Name:	ACETIC ANHYDRIDE				ACETIC ACID SOLUTION
Hazard Class:	8				8(9.2)
UN Number:	UN1715				UN2790
Packing Group:	II				II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 108-24-7 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 108-24-7: final RQ = 5000 pounds (2270 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 108-24-7: acute, chronic, flammable, reactive.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 108-24-7 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 108-24-7 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives**

Hazard Symbols:

C

Risk Phrases:

R 10 Flammable.

R 20/22 Harmful by inhalation and if swallowed.

R 34 Causes burns.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 108-24-7: 1

Canada

CAS# 108-24-7 is listed on Canada's DSL List. CAS# 108-24-7 is listed on Canada's DSL List.

This product has a WHMIS classification of B3, D1B, D2B, E.

CAS# 108-24-7 is listed on Canada's Ingredient Disclosure List.

Exposure Limits

Section 16 - Additional Information

MSDS Creation Date: 10/09/1998

Revision #11 Date: 10/05/2001

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect,

incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

HAZARD RATING INDEX

HEALTH HAZARD (BLUE)

- 4 EXTREME: Highly toxic - May be fatal on short-term exposure. Special protective equipment required.
- 3 SERIOUS: Toxic - Avoid inhalation or skin contact. Can cause serious injury on short exposure.
- 2 MODERATE: Moderately Toxic- May be harmful if inhaled or absorbed. Can cause temporary incapacitation or injury without prompt medical attention.
- 1 SLIGHT: Slightly Toxic- May cause slight irritation and can cause only minor residual injury.
- 0 MINIMAL: All chemicals have some degree of toxicity.

FLAMMABILITY HAZARD (RED)


- 4 EXTREME: Extremely flammable gas or liquid. Flash point below 73 °F.
- 3 SERIOUS: Flammable- Flash Point 73 °F to 100 °F.
- 2 MODERATE: Combustible - Requires moderate heating to ignite. Flash Point 100 °F to 200 °F.
- 1 SLIGHT: Slightly Combustible - Requires strong heating to ignite.
- 0 MINIMAL: Will not burn under normal conditions.


STABILITY HAZARD (YELLOW)


- 4 EXTREME: Materials that are readily explosive at room temperature and pressure.
- 3 SERIOUS: May explode if shocked, heated under confinement or mixed with water.
- 2 MODERATE: Materials that are normally unstable; may react with water; does not detonate.
- 1 SLIGHT: Materials that are normally stable; may react if heated or mixed with water, but not violently.
- 0 MINIMAL: Normally stable, does not react with water.

ADDED INFORMATION ON HAZARD RATING INDEX

SPECIAL INFORMATION (WHITE) ITEMS ARE (along with alternative symbol):


W  For a substance that is highly reactive with water.

OX  For a substance that reacts violently with air under normal conditions producing gas explosive decomposition.

AIR  For a substance that is highly reactive with air.



For a substance that is radioactive.

Cancer causing  For a substance that is cancer-causing.

Most burning occurs when the substance is in the gaseous state. Any substance which exists as a gas or a vapor will burn more readily than a liquid. Liquids that are volatile (change to a gas readily at ambient conditions) will ignite extremely easily.

Health Hazards:

Definition of Terms:

toxic: poisonous or cause of cancer.

irritant: irritates tissue or membrane, causes rash.

corrosive: attacks skin and burns severely.

Name: _____

INTERPRETING CHEMICAL LABELS WORKSHEET*

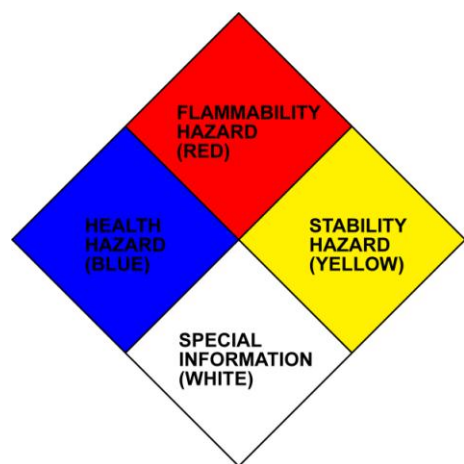
RATIONALE: The Texas Hazard Communication Act has established that beginning January 1, 1986 all students must be able to interpret chemical labels.

OBJECTIVE: The purpose of this exercise is to read and to interpret a chemical label.

MATERIALS: Hazard coding system MSDS

PROCEDURE:

1. Interpret a chemical label, (diamond shape):



These diamonds will contain numbers indicating the hazard rating index (pages 25–26).

The following colors on a chemical label alert a user regarding what hazard:

(a) red _____

(b) yellow _____

(c) blue _____

(d) white _____

2. Interpret numbers on the Hazard Coding System:

(a) Note the number system; a number _____ is the most serious and a number _____ is the least serious.

(b) In your own words, what does the number 4 for flammability hazard indicate to the user?

(c) Zero flammability means

3. What information on the chemical label is also on the MSDS?

4. Under "Special Information":

(a) What symbol represents a substance that is highly reactive with water?

(b) What symbol represents a Substance that reacts violently with air?

5. (a) A chemical that caused severe burns on your hand would be called

(b) A chemical that caused your skin to itch would be called a(n)

(c) A chemical that caused cancer would be called

6. Ether is much more volatile than gasoline. Which would have a higher flammability rating?

7. Of what value to a student do you think the information in the colored area of a chemical label is?

***Developed by Dr. Sandra S. West, Southwest Texas State University. Please do not copy without credit given to author.**



Howard Payne University's Blood borne Pathogen Plan assumes that all blood and body fluids are hazardous (HIV/AIDS, Hepatitis B, and/or other pathogens). The following precautions should be followed when there is possible contact with human blood or blood products in the laboratory.

1. Students should handle only their own blood and supplies, for example: lancet, blood slide, cotton swabs, etc.
2. Laboratory instructors or helpers should wear disposable latex gloves if they handle specimens or supplies that have come into contact with blood. Gloves are available for students that choose to wear them. Hands should be washed immediately after removing the gloves.
3. Use only sterile lancets and clean unused slides, capillary tubes, toothpicks, tissues, etc. **NEVER REUSE THESE SUPPLIES!**
4. Used lancets, needles, and contaminated glass slides/cover slips should be placed in a sharps container. **DO NOT RECAP NEEDLES** or remove them from syringes.
5. Contaminated wipes, cotton, toothpicks, etc. should be placed in a biohazard bag, sealed, and double autoclaved.
6. If procedures produce splashing, protective eyewear, mask and lab coats must be worn.
7. Blood spills should be wet down with a disinfectant prior to removal.
8. Household bleach or disinfectant (EPA registered tuberculocide) may be used to disinfect and clean surfaces, hemocytometer, reusable glassware, and reusable pipettes.
9. **NEVER USE MOUTH PIPETTING!** Use mechanical devices.
10. In case of an accident, a student will be expected to tend to themselves if possible, including dressing wounds and applying bandages. If help is needed, the person helping should wear appropriate protective gear (gloves, mask, eyewear and/or coat).
11. In case of severe bleeding, call the school nurse immediately and notify building supervisor as soon as possible.



SCIENCE LAB SAFETY CONTRACT

Students **will not** be allowed to work in science lab if:

- a. Their personal appearance or dress is such that they can cause injury to themselves or other students.
- b. They engage in activities that can cause injury to themselves or other students.
- c. They fail to follow prescribed safety rules for the lab.
- d. They conduct or attempt to conduct unauthorized experiments.
- e. They have not completed the assigned pre-experiment work which will allow them to work safely in the lab.

I, _____
Student's Signature

have read and understand all of the assigned safety rules, including those in the Howard Payne Lab Safety Manual. I will keep the safety rules for reference and easy access.

I would like to inform the school that I have the following medical or physical situations that could affect my learning in a science class, or which could result in a health or safety hazard. Any additional conditions which develop during the semester will be reported to the instructor. Examples: vision problems, hearing problems, allergies (please list), pregnancy.

I, _____ have received a signed copy of
Instructor's signature

this form from _____ on _____
Student's name printed Date