

Standard Operating Procedures for Preparing Buffered Solutions using Acids

Revised: February 21, 2008

Reviewed by EOHSS May 2008

Effective: Immediately

Applicable Legislation:

Occupational Health and Safety Act (OHSA), R.S.O. 1990, Sections 27 (2) (a), 27 (2) (c) & 28 (1) (a), 28 (1) (b), 28(1).

Intent: To outline safe handling procedures of acids and bases, including any equipment that is used in conjunction with acids and bases, and to outline potential hazards and first aid measures should incidences occur.

Definitions:

Acid: A substance that when dissolved, increases the concentration of hydrogen ion, (H^+) (aq)* Acids can have a strong odour similar to vinegar.

Liquid Solution: A mixture of a solid or gas that is dissolved in a solvent (the liquid).**

pH of a Solution: Defines the concentration of hydrogen ions in a solution. Solutions can be acidic (< pH 7.0), basic (> pH 7.0) or neutral (pH 7.0)*

pH meter: Measures the concentration of hydrogen ions in solution, and converts the ions into the pH value. (conversion: $pH = -\log [H^+]$)*

Autoclave: A pressurized chamber (>15psi) in which extreme temperatures are reached (121°C) for sterilisation of liquids, equipment etc.***

Qualified person: A person who, in respect of a specific duty, is qualified by knowledge, training and experienced to perform the duty safely and properly.

Requirements of OHSA, Section 27 (2) a, c and Section 28(1) a, b, c

27. (2) (a) A supervisor shall advise a worker of the existence of any potential or actual danger to the health or safety of the worker of which the supervisor is aware.

27. (2) (c) Take every precaution reasonable in the circumstances for the protection of a worker.

Duties of workers

28. (1) A worker shall,

- (a) work in compliance with the provisions of this Act and the regulations;
- (b) use or wear the equipment, protective devices or clothing that the worker's employer requires to be used or worn;
- (c) report to his or her employer or supervisor the absence of or defect in any equipment or protective device of which the worker is aware and which may endanger himself, herself or another worker

Potential Hazards

Corrosive.

Causes burns.

Irritating to respiratory system.

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Autoclave: High Pressure & High Temperatures. Burn hazard due to high temperatures. Explosion hazard of improperly capped bottles/containers (all bottles/containers should be loosely capped). **DO NOT AUTOCLAVE CONCENTRATED (PURE) ACID SOLUTIONS!!!**

Description of Procedures

1. All persons shall read the Material Safety Data Sheet on the specific acidic and SOPs, including pH meter and other equipment prior to beginning any procedure.
2. All users will have WHMIS, Fire Safety, Chemical handling and Spills training. Autoclave training may be required. Check with your supervisor.
3. All persons shall wear personal protective equipment when handling acids, or using the pH meter and autoclave. This includes wearing a lab coat, gloves, long pants and closed toe shoes when working with acids. Other personal protective equipment (such as goggles, thermal gloves) maybe required (see specific MSDS). Leave lab coats, gloves, and other personal protective equipment in the lab once your work is complete to prevent the spread of this or other chemicals outside of the lab.
4. All persons shall know Life Sciences Building Emergency Procedures including the location of Fire pull stations, eye wash stations and safety showers.
5. Acids must be stored in a separate cupboard. See MSDS sheets for storage requirements and materials to avoid.
6. Know where your spill kits and clean up materials are located and have them readily available.
7. Dilute solutions of acids can be made in the fume hood. Follow protocols for acid solutions. The dilute solutions should be stored on a tray in an appropriate manner by the pH meter. Do not store acids and bases next to each other as a reaction could occur.
8. **NEVER AUTOCLAVE CONCENTRATED OR STRONG ACID SOLUTIONS**
9. Prepare buffered solutions according to protocol.
10. Turn on pH meter and gently remove probe from storage solution. Rinse probe clean with ddH₂O, allowing the water to collect into a beaker, and blot the probe dry carefully with a tissue. Place probe into solution. Solution should be agitated, e.g. with a magnetic stir bar.
11. The meter will read the pH of your solution. Add the appropriate acid or base drop-wise using the Pastuer pipette. Allow the solution to stabilize between each addition of acid or base. Continue to add acid or base until the desired pH level is reached.
12. When finished, remove the acid or base back to its appropriate storage location. Rinse off probe with ddH₂O allowing the water to collect in a beaker. Blot the probe with a tissue and replace the probe into its storage solution.
13. Check the pH of the rinse water collected in the beaker using pH paper. If the pH is neutral the solution may be discarded in the sink using copious amounts of running water. If the solution is acidic or basic, correct the pH to a neutral level using the appropriate acid or base and then discard the solution.

Waste Management and Environmental Responsibility s

Hazardous Decomposition Products: Hydrogen chloride gas.

Waste Disposal Procedure

NEVER POUR CONCENTRATED ACIDS DOWN THE DRAIN

Follow McMaster University Hazardous Waste disposal procedures

Decontamination of Equipment

Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Follow McMaster University waste disposal procedures

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Handling and Storage Requirements

Do not breathe vapor. Do not get in eyes, on skin, on clothing.
Keep tightly closed.
In closed container, contents may develop pressure over time Open carefully.
Use only in a chemical fume hood.

Materials to Avoid: Bases, Amines, Alkali metals, Metals, Potassium permanganate, Fluorine, concentrated sulfuric acid, Hexalithium disilicide, Metal acetylides or carbides.

Contingency Plan and Reporting

All accidents and spills will require persons involved to fill out an "incident report" after the situation has been contained. **In case of emergency Dial 88 and EOHSS ext 24352**

Accident response (consult and follow MSDS recommendations)

ORAL EXPOSURE If swallowed, wash out mouth with water provided person is conscious. Call a physician. Do not induce vomiting.

INHALATION EXPOSURE If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Spill clean up

Wear PPE and for major spills wear rubber boots, and heavy rubber gloves.

Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Follow McMaster University Hazardous Waste disposal procedures for all materials.

References:

Material Safety Data Sheets: Sigma Aldrich

Risk Management Manual (RMM) McMaster University

Occupational Health and Safety Act (OHSA)

Cameron Lab Protocols (2008)

*1996 Ebbing, D. General Chemistry 5th edition chpt 15

**1996 Ebbing, D. General Chemistry 5th edition chpt 12

***1999 Black, J. Microbiology: Principles and Exploration 4th edition chpt. 12