

## Standard Operating Procedures for Preparing Buffered Solutions using Bases

Revised: March 11, 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) (c).

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

### Definitions:

**Base:** A substance that when dissolved, increases the concentration of hydroxide ion,  $\text{OH}^-(\text{aq})^*$

**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 ( $< \text{pH } 7.0$ ), basic ( $> \text{pH } 7.0$ ) or neutral ( $\text{pH } 7.0$ )\*

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

**Autoclave:** A pressurized chamber ( $>15\text{psi}$ ) in which extreme temperatures are reached ( $121^\circ\text{C}$ ) 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. Harmful if swallowed. Causes severe burns.

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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).

### 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 basic chemicals. This includes wearing a lab coat, chemical splash goggles, gloves and closed toe shoes. 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 separate cupboards. See MSDS sheets for storage requirements and materials to avoid.
6. Dilute solutions of bases can be made in the fume hood. Follow protocols for base 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.
7. NEVER AUTOCLAVE STRONG BASIC SOLUTIONS
8. Prepare buffered solutions according to protocol.
9. Turn on pH meter and gently remove probe from storage solution. Rinse probe clean with ddH<sub>2</sub>O, 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.
10. The meter will read the pH of your solution. Add the appropriate acid or base drop-wise using the Pasteur 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.
11. When finished, remove the acid or base back to its appropriate storage location. Rinse off probe with ddH<sub>2</sub>O allowing the water to collect in a beaker. Blot the probe with a tissue and replace the probe into its storage solution.
12. 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

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

### Waste disposal procedures

DO NOT POUR BASES DOWN THE DRAIN

Follow McMaster University Hazardous waste disposal procedures

### Decontamination of Equipment

Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

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### Handling and Storage Requirements (refer to MSDS)

Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure. Keep tightly closed.  
Use only in a chemical fume hood.

**Materials to Avoid:** Strong oxidizing agents.

### 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 critical injury or major spill Dial 88 and EOHSS 24352.**

### Accident response (refer to MSDS)

**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 (refer to MSDS)

Wear appropriate PPEs.

For major spills call 88 for Security Services or EOHSS at ext. #

Evacuate area.

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal.

Ventilate area and wash spill site after material pickup is complete.

### 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 5<sup>th</sup> edition chpt 15

\*\*1996 Ebbing, D. General Chemistry 5<sup>th</sup> edition chpt 12

\*\*\*1999 Black, J. Microbiology: Principles and Exploration 4<sup>th</sup> edition chpt. 12