Preparation of Stock HCl (Acid) and NaOH (Base) Solutions

1. SCOPE AND APPLICATION

    1.1. This procedure is based on general laboratory methods. It is used to produce a solution of dilute hydrochloric acid (HCl) or sodium hydroxide (NaOH), which in turn is used to adjust the pH of various laboratory samples and solutions, including, but not limited to bioassay, algal growth potential, PAAP media, etc. **WARNING DO NOT ADD WATER TO CONCENTRATED HCl OR NaOH**.

2. SUMMARY OF METHOD

    2.1. Concentrated HCl (12N) is carefully added to deionized (DI) water to produce dilute acid (1.2N or ~10%).

    2.2. NaOH (solid) is added to DI water to produce a 10N stock solution of sodium hydroxide. The 10N stock solution is diluted to produce a 1N working solution of NaOH.

3. EQUIPMENT/ SUPPLIES

    3.1. 1L Volumetric flask

    3.2. 500mL Graduated cylinder (Class A)

    3.3. 1L or 2L Graduated cylinder (Class A)

    3.4. 6L Erlenmeyer flask (for 10% HCl used in wash party)

    3.5. 250mL Volumetric flask

    3.6. Mettler Toledo 403TS/00 balance (S/N B815673069), calibrated per SOP TA-06.34

    3.7. Metal spatula

    3.8. Medium weigh boats

    3.9. Teflon or plastic stopper

    3.10. Parafilm®

    3.11. Fume hood

    3.12. Computer with access to the Laboratory Information Management System (LIMS)

4. REAGENTS AND STANDARDS

    4.1. Technical Grade 12N HCl (NOTE: Bottle may be labeled as 12.1N Hydrochloric Acid)

        4.1.1. Concentration available on Fisher may be different, but same method applies for concentration mix. Ex. 10N to be diluted to 1.0 N

    4.2. NaOH, ACS grade

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4.3. Deionized (DI) water

5. METHOD

5.1. Preparation of stock 10% (1.2N) HCl solution

5.1.1. To prepare 1 L of 10% (1.2N) HCl, add 800 mL of DI water to the 1L volumetric flask.

WARNING! For Step 5.1.2 EXOTHERMIC REACTION! HOT! WEAR GLOVES, LAB COATS AND SAFETY GLASSES. USE THE FUME HOOD.

5.1.2. Under the fume hood, for 1L of 10% (1.2N) HCl, **slowly** add 100mL of 12N HCl to the 1L volumetric flask. Use a stirring rod to mix the solution well. Handle the HCl with care. It is a STRONG acid.

5.1.3. Carefully bring the total volume in the 1 L flask up to 1 L by adding 100 mL of DI water. Tightly seal the 1 L flask with a Teflon stopper or acid-resistant plastic.

5.1.4. Label the **1L flask** with "1.2N HCl Acid Stock Solution", LIMS number, the date of preparation (batch number), an expiration date of 1 year after the preparation date, and the preparer's initials. Dates are written as MM/DD/YY.

5.1.4.1. Label as 1.0N if starting with 10N HCl. Still 900 mL to 100 mL ratio.

5.1.5. Record batch information from the 1L of HCl Acid Stock Solution in the LIMS Standard Preparation Tracker.

5.2. Preparation of 10% (1.2 N) HCl solution for **WASH PARTY**

5.2.1. To prepare 5L of 10% HCl for the wash party, add 4L of DI water to the 6L Erlenmeyer flask.

WARNING! For Step 5.2.2 EXOTHERMIC REACTION! HOT! WEAR GLOVES, LAB COATS AND SAFETY GLASSES. USE THE FUME HOOD.

5.2.2. Under the fume hood, for 5L of 10% (1.2N) HCL for wash party, slowly, add 500 mL of 12N HCL to the flask containing 4L of DI water. Use a stirring rod to mix the solution. Handle the HCl with care; it is a strong acid.

5.2.3. Carefully, bring the total volume in the 6L flask to 5L by adding 500mL of DI water. Mix the solution with a stirring rod. Transfer the contents (now 5L of 10% (1.2N) HCl) of the 6L flask to the 15L plastic carboy (labeled 10% HCl) located at the wash party sinks (B205).

5.2.4. Label the **WASH PARTY** 10% (1.2N) HCl 15 L carboy with the date of preparation, the preparer's initials, and an expiration date of 1 year from the preparation date. A batch number is not needed for the WASH PARTY 10% HCl. The WASH PARTY 10% HCl does not need to be recorded in the LIMS Standard Preparation Tracker.

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5.3. Preparation of 1L of 10N NaOH stock solution

5.3.1. Use the Mettler balance to weigh 100g of NaOH into a weigh boat.

5.3.2. Add 100mL of DI water to a 250mL volumetric flask.

WARNING! EXOTHERMIC REACTION! HOT! WEAR GLOVES AND SAFETY GLASSES. USE THE FUME HOOD.

5.3.3. Under the fume hood, **slowly** add 100g of NaOH crystals to the flask, 2-3g at a time. Allow NaOH to dissolve completely before adding more. *Do not allow the flask to get too hot!*

5.3.4. Once all the NaOH crystals are added and dissolved, carefully bring the volume up to 250mL with DI water.

5.3.5. Label the flask with “10N NaOH Base Stock Solution”, LIMS number, the date prepared (batch number), an expiration date of 1 year after the preparation date, and analyst initials. Dates are written as MM/DD/YY.

5.3.6. Record batch information for both stock base solutions in the LIMS Standard Preparation Tracker.

5.4. Preparation of 1L of 1N NaOH stock solution

5.4.1. Add 800mL of DI water to a 1L volumetric flask.

WARNING! EXOTHERMIC REACTION! HOT! WEAR GLOVES AND SAFETY GLASSES. USE THE FUME HOOD.

5.4.2. Under the fume hood, slowly add 100mL of 10N NaOH stock solution to the flask, mixing the solution well. *Do not allow the flask to get too hot!*

5.4.3. Carefully, bring the total volume of the flask to 1L with DI water.

5.4.4. Do not use a glass stopper to seal the volumetric flask, as it will stick to the flask. Use a Teflon or plastic stopper or cover with Parafilm. Seal the flask with Parafilm. Any evaporation will result in the NaOH concentration increasing.

5.4.5. Label the flask with “1.0N NaOH Base Stock Solution”, LIMS number, the date prepared (batch number), an expiration date of 1 year after the preparation date, and analyst initials. Dates are written as MM/DD/YY.

5.4.6. Record batch information for both stock base solutions in the LIMS Standard Preparation Tracker.

6. DATA ARCHIVAL

6.1. Use a black, waterproof pen for all bench sheets and logbooks.

6.2. To correct raw data entries, place a single line through the incorrect or illegible entry, write the corrected entry near the error, date and initial the correction. Do not overwrite entries.

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6.2.1. The corrected entry is written as near as possible to the error or in the comment box on the appropriate bench sheet.

6.2.2. If the correction requires an explanation, write a comment and reference the error with a letter. Initial and date the explanation. Do not attempt to put all information (correction and comments) into a small space.

6.2.3. Use sequential alphabetical annotation to identify errors and corresponding comments (use A for first error and use A for corresponding explanatory comment; use B for second error, etc.).

7. QUALITY CONTROL

7.1. If a problem occurs during the sample processing or testing, the following steps are performed: 1) lab supervisor is notified; 2) client is notified (client makes decision for additional testing; 3) section administrator is notified; and, 4) a non-conformance report (NCR) is submitted describing the problem and the corrective action.

7.2. To create NCR: open LIMS and go to Laboratory/Administrative/Non-Conformance Report. Refer to https://floridadep.gov/dear/quality-assurance/content/dep-sops for sample collection and preservation, and the Laboratory Quality Manual for corrective action and handling out-of-control data.

7.3. Refer to QA manual for corrective action and handling out-of-control data.

8. SAFETY/HAZARDOUS WASTE MANAGEMENT

8.1. Proper laboratory protection, including lab hood or ventilation system, lab coat, gloves, and safety glasses, is required when working with chemicals and unprocessed samples.

8.2. Only ≤20% HCl mixtures may be disposed down the sink. Greater concentrations should go through waste disposal.

8.3. Refer to DEP Laboratory Quality Assurance Manual for sample disposal.

8.4. Refer to the DEP Health and Safety Manual and Hazardous Waste Management.

8.5. Read MSDS information for reagent handling and disposal.

9. REFERENCES

9.1. DEP SOP TA-06.34, *Calibration and Use of Mettler Toledo 403TS/00 Balance*.

9.2. DEP Laboratory Quality Assurance Manual

9.3. DEP Health and Safety Manual

9.4. MSDS information sheets

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APPENDIX OF SIGNIFICANT CHANGES

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