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 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 HYDROCHLORIC ACID**.

2. SUMMARY OF METHOD

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

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

3. EQUIPMENT/ SUPPLIES

   3.1. 1 L, Volumetric flask,

   3.2. 500 mL Graduated cylinder (Class A)

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

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

   3.5. 250 mL 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 12 N hydrochloric acid (NOTE: Bottle may be labeled as 12.1 N Hydrochloric Acid))

   4.2. Sodium hydroxide (NaOH), ACS grade

   4.3. Deionized (DI) water

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5. METHOD

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

5.1.1. To prepare 1 L of 10% (1.2 N) HCl, add 800 mL of DI water to the 1-L 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 1 L of 10% (1.2N) HCl, **slowly** add 100 mL of 12N HCl to the 1L volumetric flask. Use a stirring rod to mix the solution well. Handle the HCl with care; strong acid.

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

5.1.4. Label the **1L flask** with "1.2N HCl Acid Stock Solution", batch number, the date of preparation, an expiration date of 1 year after the preparation date and the preparer's initials. The batch number for the 1 L of HCl acid stock solution is the date of preparation written as mm/dd/yy.

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 5 L of 10% HCl for the wash party, add 4 L of DI water to the 6 L 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 5 L of 10% (1.2N) HCL for the wash party, slowly, add 500 mL of 12 N HCL to the flask containing 4 L of DI water. Use a stirring rod to mix the solution. Handle the HCl with care; strong acid.

5.2.3. Carefully, bring the total volume in the 6L flask to 5 L by adding 500 mL of DI water. Mix the solution with a stirring rod. Transfer the contents (now 5 L 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% (1.2 N) 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.

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

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

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

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

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

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

5.3.5. Label the flask with "10 N NaOH Base Stock Solution", batch number, the date, and analyst initials. The batch number is the date of preparation 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 1 N NaOH stock solution

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

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

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

5.4.3. Carefully, bring the total volume of the flask to 1 L 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. Any evaporation will result in the NaOH concentration increasing.

5.4.5. Label the flask with "1.0 N NaOH Base Stock Solution", batch number, the date, and analyst initials. The batch number is the date of preparation 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.

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.

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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. 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. Refer to DEP Laboratory Quality Manual for sample disposal

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

8.4. 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 Manual https://floridadep.gov/dear/florida-dep-laboratory/content/dep-laboratory-quality-assurance-manual-and-sops

9.3 DEP Laboratory Health and Safety Manual https://www.fldepnet.org/system/files/Administrative-Services/governing-documents/Health%20and%20Safety%20Manual%20December%202019.pdf

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APPENDIX OF SIGNIFICANT CHANGES

03/03/2008 Added Scope and Application, Summary of the Method and Appendix of Significant Changes. Deleted *media* and added *Record of* Method

02/25/2009 Added *Documentation and Corrective Action*, *Safety*, *Pollution Prevention and Waste Management*, and *References* sections.

11/06/2013 Combined SOPs TA-10.10-2.15 and TA-10.11-2.15. Reformatted the SOP. SOP TA-10.11-2.15 was subsequently removed from the system.

02/11/2015 Formatted for 508 compliance.

09/25/2015 Updated links. Minor formatting adjustments. Added reference SOP for Mettler balance calibration.

10/07/2016 Updated links and sections.

10/14/2016 Added instructions for preparing 10% HCl for WASH PARTY and specified N of the concentrated HCl as found on the label.

08/30/2018 Updated links. Corrected balance information. Changed font to Calibri

09/12/2019 Updated links

09/08/2020 Updated equipment section language. Updated data archival section with universal language. Updated links. Replaced mentions of Tox Record of Preparation logbook with LIMS Standard Preparation Tracker.

07/07/2021 Updated equipment supplies and quality control section for universal language.

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