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 (12.1N) is carefully added to deionized water to produce dilute acid (1.21N or ~10%).

   2.2. Sodium hydroxide (solid) is added to deionized 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. Volumetric flask, 1 L

   3.2. Graduated cylinder 500ml (Class A)

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

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

   3.5. Volumetric flask, 250 mL

   3.6. Mettler PB403 S/FACT balance (S/N 1123052001), calibrated per SOP TA-06.31

   3.7. Metal spatula

   3.8. Medium weigh boats

   3.9. Teflon or plastic stopper

   3.10. Parafilm

   3.11. Fume hood

4. REAGENTS AND STANDARDS

   4.1. Technical Grade 12.1N hydrochloric acid (order 12N from supplier)

   4.2. Sodium hydroxide (NaOH), ACS grade

   4.3. Deionized (DI) water

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5. METHOD

5.1. Preparation of stock 10% (1.21N) HCl Solution

To prepare 1L of 10% (1.21N) HCl, add 800 mL of DI water to the 1-L volumetric flask. WARNING! For Step 5.1.1 EXOTHERMIC REACTION! HOT! WEAR GLOVES, LAB COATS AND SAFETY GLASSES. USE THE FUME HOOD.

5.1.1. Under the fume hood, for 1 L of 10% (1.21N) HCl, **slowly** add 100 mL of 12.1N HCl to the 1L volumetric flask. Use a stirring rod to mix the solution well. Handle the HCl with care; strong acid.

5.1.2. 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.

5.1.3. Label the **1L flask** with "1.21N 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.

5.1.4. Record batch information (from the 1L of *HCl Acid Stock Solution* in the *Tox Record of Preparation* logbook.

5.2. Preparation of 10% (1.21N) 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% (1.21N) HCL for the wash party, slowly, add 500 mL of 12.1N HCL to the flask containing 4L 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 5L of 10% (1.21N HCl) of the 6 flask to the 15L plastic carboy (labeled 10% HCl) located at the wash party sinks (B205)

5.2.4. Label the **WASH PARTY** 10% (1.21N HCl) 15L 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 *Tox Record of Preparation* logbook.

5.3. Method to make 1L of 10N NaOH stock solution

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

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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 100g of NaOH crystals to the flask, 2-3g 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 "10N 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 *Tox Record of Preparation* book.

5.4. Method to make 1L of 1N 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 10N 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 "1.0N 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 *Tox Record of Preparation* book.

6. DATA ARCHIVAL

6.1. 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.

6.1.1. The corrected entry is written as near its appropriate space as possible or else in the comment box on the appropriate bench sheet.

6.1.2. If the correction requires an explanation, write a comment and reference the error. Initial and date the explanation.

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6.2. 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.).

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

6.4. If a problem occurs during sample processing, a nonconformance report (NCR) is submitted describing the problem and the corrective action.

7. QUALITY CONTROL

7.1. 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 Laboratory Quality Manual for sample disposal

8.3. Refer to the 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-06.31, Calibration and Use of Mettler Toledo PB403-S/FACT Balance.

9.2 Laboratory Quality Manual http://www.floridadep.org/labs/library/progplan.htm.

9.3 Laboratory Health and Safety Manual and Hazardous Waste Management https://www.fldepnet.org/content/dear/bureau-laboratories-safety-documents

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* to Methods
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.

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