# DISCHARGE MONITORING REPORT - QUALITY ASSURANCE (DMR-QA) STUDY 18

## To Participating Chemistry Laboratories:

In March of 1998, the U.S. Environmental Protection Agency (USEPA) Office of Enforcement and Compliance Assurance sent announcement letters to designated National Pollutant Discharge Elimination System (NPDES) permittees, informing them that the USEPA and related state agencies were continuing the NPDES Discharge Monitoring Report - Quality Assurance (DMR-QA) studies. These announcements contained the chemistry sample ordering form that you subsequently submitted. The purpose of these studies is to evaluate the analytical and reporting ability of laboratories routinely performing chemistry and whole-effluent toxicity self-monitoring analyses required in the designated NPDES permits. For further information, please refer to the Chemistry Laboratory Requirements on page 1 inside.

Participation of NPDES permittees in this program, including proper analyses, reporting and record retention, is mandatory based on the authority of Section 308(a) of the Clean Water Act. The Agency's legal opinions, dated August 11, 1977 and January 9, 1989, reaffirm this authority.

If you have questions regarding the DMR-QA, please contact your state DMR-QA coordinator, whose name address and telephone number are listed in the attached Chemistry Laboratory Instructions. These offices will play an important role in providing any subsequent study follow-up action or guidance. Please include the complete name, address, USEPA Lab Code and telephone number of your laboratory in all correspondence.

Thank you for your cooperation in this national program to improve the quality of NPDES self-monitoring data.

Enclosures (3):
1) Chemistry Laboratory Instructions
2) NPDES Chemistry Laboratory Data Reporting Form
3) Chemistry Samples (per your request)

# DMR-QA CHEMISTRY LABORATORY INSTRUCTIONS

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**DMR-QA STUDY 18**

## CHEMISTRY LABORATORY REQUIREMENTS

1. Some tests you normally perform for your permittee may not be included in the DMR-QA Study. You are only required to perform analyses which have been requested by a permittee, provided they are included in the study. Participating laboratories are required to perform only one of each type of analysis, regardless of the number of permittees that request it. **Review the analytes listed below to determine which analyses must be performed to satisfy the DMR-QA reporting requirements for each NPDES Permittee you support.** To the extent feasible, analyze each DMR-QA sample the same way you would analyze a routine sample, i.e., usual analyst, usual analytical system, usual procedures, etc.

   - **Chemistry Analytes:** aluminum, arsenic, cadmium, (total) chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium, zinc, pH, non-filterable residue (total suspended solids), oil and grease, ammonia nitrogen, nitrate nitrogen, orthophosphate, total Kjeldahl nitrogen, total phosphorus, 5-day biochemical oxygen demand, chemical oxygen demand, total organic carbon, 5-day carbonaceous biochemical oxygen demand, total cyanide, total phenolics (by the 4AAP method), and total residual chlorine.

2. **Ensure that you have received the appropriate study samples, reporting forms and instructions:**

   1. **Replacement samples, reporting forms or instructions** may be acquired by returning the completed Chemistry Sample / Information Replacement Form on the next page. If you have analytical problems, the available concentrate volume in each ampul is usually sufficient to prepare a second sample[1].

   2. **Unused samples** may be handled in one of three ways:
      - Properly dispose of unused samples ensuring compliance with all federal, state and local regulations governing waste management. For more information regarding waste disposal, see the Ampul Disposal Information on page 3.
      - Return unopened ampuls to the USEPA Contractor, ManTech Environmental, in accordance with 49 CFR 173.4, and using the return address on the sample shipment (4907 S. Alston Ave., Durham, NC 27713).
      - Retain samples for internal quality control. If stored at room temperature and out of direct light, unopened samples are stable for at least one year. A complete list of "true"/calculated values may be obtained after the results of the study have been distributed to permittees, which is expected to occur in January, 1999. Your permittees may request a copy by contacting their Regional/State Coordinator. Users of a Personal Computer w/modem may use the USEPA Office of Research and Development Electronic Bulletin Board, modem number (513) 569-7700 or (513) 569-7610. If you need assistance with use of the Bulletin Board, call (513) 569-7272 (do not call this number for general information regarding PE Studies).

3. **Perform the analyses requested by your permittees**; refer to the enclosed NPDES Chemistry Laboratory Data Report Form for a convenient listing of the analyses available in the study.

4. **Report the results of your analyses and additional required information** as specified on page 6, Completing the NPDES Chemistry Laboratory Data Report Form.

5. **Submit your reporting form** to the requesting permittees in accordance with the instructions on page 7, Chemistry Laboratory Reporting Procedure.

6. **After official evaluation of the study data by the USEPA, permittees will receive Performance Evaluation Reports and laboratories will be asked by the supported NPDES permittee(s) to explain reported values that were not within the study acceptance limits.** Permittees will then provide this explanation to the appropriate USEPA or State Agency.

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[1]Not applicable for the pH, demand and residue samples.

**DMR-QA STUDY 18**

**CHEMISTRY SAMPLE / INFORMATION REPLACEMENT ORDER FORM**

**If replacement samples, reporting form or instructions are needed, copy this form, complete the information and return it as indicated below.**

1. **USEPA Chemistry Laboratory Code:** If you are unsure of your USEPA Lab Code, it can be found on the label used to deliver your original shipment or the label on page 1 of your NPDES Chemistry Laboratory Data Report Form.

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

(State Code + 5 digits, for example NC12345)

2. **Shipping Address:**

**Laboratory Name** _____ **Phone (_____)** _____

**Contact Name** _____ **Title** _____

**Laboratory Shipping Address (No PO Boxes)** _____

**City** _____ **State** _____ **Zip Code** _____

3. **Samples: Check the appropriate block(s).** You may order only one of each ampul (*The same analytical result for each analyte may be reported to all your permittees to satisfy their reporting requirements*).

| | |
|---|---|
| ❑ **Demand** | ❑ **Total Cyanide** |
| ❑ **Residue** | ❑ **Total Phenolics** |
| ❑ **Nutrients #1** | ❑ **pH** |
| ❑ **Nutrients #2** | ❑ **Total Residual Chlorine** |
| ❑ **Oil & Grease** | ❑ **NPDES Chemistry Laboratory Data Report Form** |
| ❑ **Trace Metals #1** | ❑ **DMR-QA Chemistry Laboratory Instructions** |

4. **Reason for Request** [check the appropriate block(s)]:

❑ **Broken in shipment**
❑ **Missing in shipment**
❑ **Lab accident**
❑ **Other** _____

5. **Fax completed form to the USEPA Contractor: ManTech Environmental (919) 406-2246 attn: Terry Bundy.**

Reminder: Maintain a copy of completed order form for your records.

# AMPUL DISPOSAL INFORMATION

## U.S. EPA WATER POLLUTION PERFORMANCE EVALUATION SAMPLES

**WP**
**Inorganic**

| Ampul | Solvent | Other Contents | Chemical Formula | Max. Conc. mg/L Ampul |
|---|---|---|---|---|
| **Trace Metals conc-1** | 5%HNO3 / H2O | aluminum | Al | 410 |
| | | arsenic trioxide | As2O3 | 150 |
| | | cadmium | Cd | 110 |
| | | chromium trioxide | CrO3 | 210 |
| | | cobalt | Co | 110 |
| | | copper | Cu | 110 |
| | | iron | Fe | 410 |
| | | lead nitrate | Pb(NO3)2 | 500 |
| | | manganese | Mn | 410 |
| | | mercuric oxide | HgO | 3.2 |
| | | methyl mercury chloride | CH3HgCl | 3.8 |
| | | nickel | Ni | 310 |
| | | selenium dioxide | SeO2 | 300 |
| | | vanadium pentoxide | V2O5 | 2000 |
| | | zinc oxide | ZnO | 260 |
| **Trace Metals conc-2** | 5%HNO3 / H2O | beryllium | Be | 110 |
| | | molybdenum trioxide | MoO3 | 150 |
| | | potassium antimony tartrate | KSbC4H4O7 | 270 |
| | | silver nitrate | AgNO3 | 160 |
| | | strontium nitrate | Sr(NO3)2 | 97 |
| | | thallium nitrate | TlNO3 | 130 |
| | | titanium | Ti | 40 |
| **Minerals conc-1A** | H2O | calcium chloride | CaCl2+2H2O | 41000 |
| | | hydrochloric acid | HCl | 150 |
| | | magnesium chloride | MgCl2+6H2O | 34000 |
| **Minerals conc-1B** | H2O | potassium chloride | KCl | 7800 |
| | | potassium sulfate | K2SO4 | 9100 |
| | | sodium bicarbonate | NaHCO3 | 20000 |
| | | sodium chloride | NaCl | 11000 |
| | | sodium fluoride | NaF | 910 |
| | | sodium sulfate | Na2SO4 | 19000 |
| **pH-Minerals conc-2** | H2O | hydrochloric acid | HCl | 1700 |
| | | potassium dihydrogen phosphate | KH2PO4 | 6800 |
| | | potassium hydrogen phthalate | KHC8H404 | 10000 |
| | | sodium hydroxide | NaOH | 1900 |
| | | sodium borate....."borax" | B4Na2O7+10H2O | 4600 |
| | | tris(hydroxymethyl) aminomethane....."THAM" | H2NC(CH2OH)3 | 6100 |
| **Nutrient-1** | H2O | ammonium chloride | NH4Cl | 7600 |
| | | potassium dihydrogen phosphate | KH2PO4 | 2400 |
| | | potassium nitrate | KNO3 | 30000 |
| **Nutrient-2** | H2O | glycine | NH2CH2COOH | 19000 |
| | | sodium B-glycerolphosphate | (HOCH2)2CHOPO(ONa)2 +5H2O | 11000 |
| **Phenolics** | H2O | 2-chlorophenol | ClC6H4OH | 210 |
| | | 2,4-dichlorophenol | Cl2H3OH | 270 |
| | | 2,4-dinitrophenol | (NO2)2C6H3OH | 300 |
| | | phenol | C6H5OH | 310 |
| **Demands** | H2O | glucose | C6H11O5CHO | 6800 |
| | | glutamic acid | HO2C2HNH2(CH2)2CO2H | 6800 |
| **Cyanide** | H2O | potassium ferricyanide | K3Fe(CN)6 | 230 |
| | | potassium hydroxide | KOH | 29 |
| | | sodium hydroxide | NaOH | 29 |
| **Residual Chlorine** | H2O | sodium hypochlorite....."Clorox" | NaClO | 440 |
| | **earth+salt** | | | **Maximum percent of mix** |
| **Residue (TSS-nonfilt)** | solid mix | infusorial earth (calcined powder) | (a natural clay) | 50 |
| | solid mix | sodium chloride | NaCl | 99 |

## COMPLETING THE NPDES CHEMISTRY LABORATORY DATA REPORT FORM

1. **USEPA Lab Code:** Enter your USEPA Lab Code in the spaces provided at the top of page 1. The USEPA Laboratory Code begins with your state abbreviation and is followed by five numbers. Do not submit a permit number, state laboratory code or certification ID in lieu of the USEPA Laboratory Code. If you are unsure of your USEPA Lab Code, it can be found on the label in the middle of page 1.

2. **Enter the appropriate data into each field**. The headings listed below relate to information on pages 3 & 4 of the Report Form.

   a. **Analyte Name and No.:** Identifies each analyte available and their corresponding analyte numbers (do not alter).

   b. **Sample No.:** Identifies the sample number which was analyzed to produce each result (do not alter).

   c. **USEPA Laboratory Code:** Enter your USEPA Code next to each analytical result produced by your laboratory and on any additional documentation that you may submit.

   d. **Voluntary Analyte:** Chemistry laboratories should not enter anything in this column.

   e. **Method Codes:** Using the enclosed list of USEPA approved methods, identify which method was used to produce each result being reported. A method code of "99" will require additional documentation describing the method used.

   f. **Usage of "<" or ">":** All analytes are present at quantifiable concentrations, so use of this field should not be necessary. However, if you are not capable of quantifying the sample concentration, you must enter the "<" or ">" portion of your analytical result in this space.

   g. **Quantity:**

      - Report only one value for each analyte, the result of a single analysis; do not report the mean of multiple analytical results.
      - Each box utilized must contain **only a number or a decimal** (no dashes, letters or symbols for any reason). **A decimal point requires its own box.**
      - Report your data to three significant digits, i.e., 0.XXX, X.XX, XX.X or XXX, if method allows.
      - "Right justify" each result in the spaces provided.
      - Report all data in the units specified on the data report form.

3. **Complete the Checklist and Certification Statement** on page 1 of the Chemistry Laboratory Data Report Form. The Certification Statement must be signed by the Director or an authorized representative of the laboratory. Most importantly, the laboratory is responsible for certifying the truth, accuracy, and completeness of the data and that **all work has been performed by the personnel that routinely conduct the self-monitoring required for each permittee they report to**. Reference to this section may be found in 40 CFR Part 122.22.

**DMR-QA STUDY 18**

**CHEMISTRY LABORATORY REPORTING PROCEDURE**

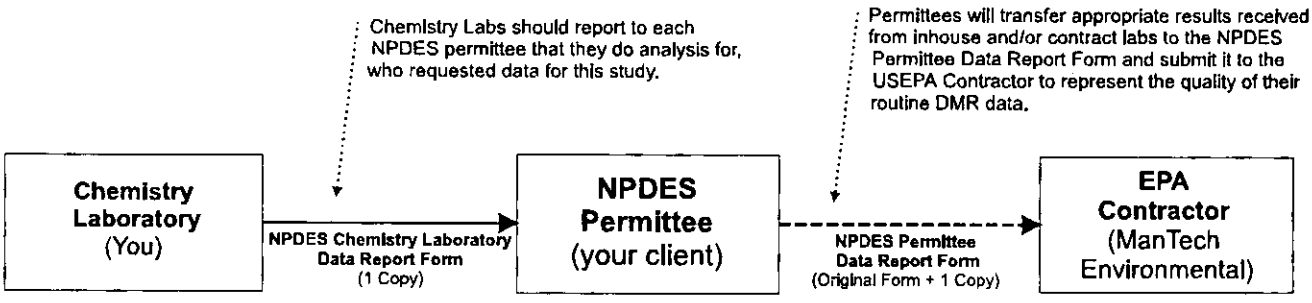
1) **Make photo copies** of the completed NPDES Chemistry Laboratory Data Report Form (pink colored form).

2) **Retain the original form for your files.**

3) **Contract labs should send 1 copy to each NPDES Permittee (your clients) who requested your participation, by September 4, 1998.** *This date should allow each permittee enough time to meet their reporting deadline of September 30, 1998*).

4) **In-house labs may disregard the NPDES Chemistry Laboratory Data Report Form and report directly on the NPDES Permittee Data Report Form (orange colored form).** This form will be sent in a separate mailing to each NPDES Permittee during the summer of 1998).

5) **Do not submit NPDES Chemistry Laboratory Report Forms (pink colored forms) to the USEPA Contractor, USEPA or to a State Agency; NPDES Permittees must report using NPDES Permittee Data Report Forms (orange colored forms).**



**DMR-QA STUDY 18**

**GENERAL INSTRUCTIONS**

- Immediately upon receipt of samples, check for breakage and correctness of sets shipped; see list of requested sets on the bottom of the report form label. To request replacements for broken and/or missing ampuls, FAX your request to **Terry Bundy at ManTech (919) 406-2246 (your EPA assigned lab code must be included on all sample requests)** using the form attached to the cover letter for this mailing; to obtain answers to questions, call your State or regional coordinator (see list included in these instructions). Sample replacement takes at least 2 to 3 weeks.
- Read instructions carefully before opening ampuls.
- Treat each PE study sample the same way you would treat a routine sample, i.e., usual analyst, usual analytical system, usual procedures, etc.
- For each analyte you report, provide results of a single analysis, as would be done with a routine sample.
- For best results, ampul solutions and reagent water should be at room temperature (near 20° Centigrade) when used.
- Amber-colored total residual chlorine ampuls as well as the clear cyanide ampuls should be stored away from light until the analyst is ready to use them.
- Open ampuls cautiously to avoid cuts or flying glass. A suggested procedure is to wrap the ampul in cloth or a thick paper towel and snap off the ampul top at the narrow part of the neck.
- Unless otherwise stated, samples need not be filtered.
- Use only Class A volumetrics.
- "Reagent water" is equivalent to Type II Reagent Water as specified in ANSI/ASTM Standard D 1193-91.
- Please Note: There is only one concentration per analyte.

## TRACE METAL SAMPLE

An ampul containing 5% nitric acid (v\v) is provided for preparation of the study sample.

### SAMPLE PREPARATION

To prepare sample 1, fill a 1-L volumetric flask approximately 3/4 full with reagent water, pipette 10.0 mL (which contains 0.5 mL of concentrated nitric acid) of ampul 1 and 1.0 mL of trace-metal-grade concentrated nitric acid into the flask, dilute to volume with reagent water, and mix well. The resulting samples should be analyzed for the following analytes at levels within the stated concentration ranges.

| Analyte | Concentration, micrograms per liter (µg/L) after dilution |
|---|---|
| Aluminum | <5000 |
| Arsenic | <2000 |
| Cadmium | <2000 |
| Chromium | <2000 |
| Cobalt | <2000 |
| Copper | <2000 |
| Iron | <4000 |
| Lead | <4000 |
| Manganese | <4000 |
| Mercury | <60 |
| Nickel | <4000 |
| Selenium | <4000 |
| Vanadium | <11000 |
| Zinc | <4000 |

Notes:

- Samples, standards and reagent water blanks should all have the same acid matrix. The solution resulting from the above dilution will contain 0.15% v/v nitric acid; additional or different acids may be used as appropriate for analytical procedures or to match standards.
- **Mercury is present as a mixture of organic and inorganic forms. If a cold vapor method is used, an aliquot of the sample must be digested before analysis for mercury. However, digestion of this sample for any other metal analysis in unnecessary.**
- Chromium should be determined only as total chromium. When chromium is analyzed by direct air-acetylene AA, use of matrix modifiers or the less sensitive oxidizing flame may be necessary to control interfering ions. Preferably, use a fuel-rich nitrous oxide-acetylene flame for best results.
- Some analytes may occur at concentrations that are too low for determination with simple direct AA and must be determined with ICP, furnace AA, or AA after chelation extraction (where approved) to produce reportable results.

- With some methods (such as colorimetric chromium method 3500D from Reference 74), preparatory extraction may be required to remove relatively high concentrations of interferences before analysis.
- Because many analysts will use atomic absorption or inductively coupled plasma spectrometry, multiple aspirations or measurements may be obtained to determine an analyte concentration, as with routine samples.
- Report results as micrograms per liter with three figures.
- If AA is used, specify which method (i.e., air-acetylene, nitrous oxide-acetylene, platform or non-platform) was used.

**Ampuls contain 5% nitric acid.**
**CORROSIVE/OXIDIZER - TOXIC - SEVERE IRRITANT**
**Material Safety Data Sheets are attached**
**immediately following the sample preparation instructions.**

**END OF INSTRUCTIONS FOR TRACE METALS**

## DMR-QA STUDY 18

### pH SAMPLE

SAMPLE PREPARATION

To prepare the pH sample, pour the contents of the pH ampul directly into a ≤50-mL beaker; do not dilute before determining pH.

NOTES:

- We acknowledge that, ideally: 1) the strong memory effects of the calibrating buffers are removed by allowing the electrode(s) to soak in some of the sample prior to analysis, and 2) laboratories should be able to use their entire routine analytical procedures in performance evaluation studies. However, there are practical limits to the amount of pH sample we can provide to you in our studies.

  Therefore, we propose that you soak your electrode(s) in distilled water to remove the memory effect of the calibration buffers before you analyze our pH sample as directed in the study instructions. We believe this adjustment to your normal procedure is reasonable, effective and should not adversely affect your chances of successful performance.

- If you cannot produce a valid pH measurement from your analytical system using a sample of 20 mL (or 40 mL using the contents of an additional ampul which is available upon request), your analytical system is beyond the scope of this study. For example, systems for continuous pH measurement may require a minimum sample size which is incompatible with the current study design. If your pH system is incompatible with the study design, you should discuss this with your State DMR-QA Coordinator (see list at back of this set of instructions).

**END OF INSTRUCTIONS FOR pH**

## NUTRIENT SAMPLES

Two ampuls containing reagent-water solutions are provided to prepare two separate samples. Sample 1 will contain inorganic nitrogen and phosphorus and may be analyzed for ammonia nitrogen, nitrate nitrogen, and orthophosphate phosphorus. Sample 2 will contain organically-bound forms and may be analyzed for total Kjeldahl nitrogen and total phosphorus. When prepared according to instructions, samples will contain <50 mg/L of each nutrient.

### SAMPLE PREPARATION

To prepare sample 1, fill a 1-L volumetric flask approximately 3/4 full with ammonia-free, reagent water, pipette 10.0 mL of ampul 1 solution into the flask, dilute to volume with reagent water, and mix well. To prepare sample 2, repeat the procedure with ampul 2.

NOTES:

- Solutions in ampuls were preserved by autoclaving the sealed ampuls. Because this preservative treatment is not effective after ampuls are opened, open ampuls just before analysis.
- If a solution is not to be analyzed within two days after preparation, preserve a sample aliquot with 0.2 mL of concentrated sulfuric acid per 100 mL of sample (pH <2) and store at 4°C until just before analysis. Analyze the preserved sample as soon as possible within the maximum 28-day holding time.
- Report results as milligrams per liter with three figures.

**END OF INSTRUCTIONS FOR NUTRIENTS**

## DMR-QA STUDY 18

### DEMAND SAMPLE

One ampul containing reagent-water solution is provided to prepare one sample. The sample may be analyzed to determine 5-day biochemical oxygen demand (BOD), 5-day carbonaceous BOD (CBOD), chemical oxygen demand (COD), and total organic carbon (TOC).

#### SAMPLE PREPARATION

To prepare the sample, fill a 1-L volumetric flask approximately 3/4 full with reagent water, pipette 20.0 mL from the ampul into the flask, dilute to volume with reagent water, and mix well. The sample is ready for analysis to determine 5-day BOD, 5-day CBOD, COD and TOC. Each measured value should be <300 mg/L.

NOTES:

- The ampul contains about 21 mL of solution; if clean dry pipettes are used, this is sufficient to prepare the sample. More ampuls may be requested if both 5-day BOD and 5-day CBOD are to be determined. If an additional sample is needed, complete the "Request for Sample Replacement" sheet attached to the cover memorandum and submit as directed.

- The solution in this ampul was preserved by autoclaving the sealed ampul. Because this preservative treatment is not effective after the ampul is opened, open the ampul just before analysis.

- Begin the BOD and/or CBOD as soon as possible after sample preparation. If cooled to 4°C, the maximum holding time for these analyses is 48 hours. If COD and/or TOC cannot be analyzed within your usual holding time after sample preparation, an aliquot should be preserved (pH <2) using 0.2 mL of concentrated sulfuric acid per 100 mL (or an equivalent amount of another acid which is compatible with your chosen methods). This acid preserved portion should be stored at 4°C and analyzed as soon as possible within the 28-day maximum holding time.

- 5-day BOD and 5-day CBOD: For proper oxygen depletion, the sample should be tested in a dilution series such as 4%, 8%, and 16%. Use a natural surface water, diluted domestic sewage, or commercially available seeds for seeded dilution water and avoid entrainment of air. For a 5-day CBOD, the use of a nitrifying inhibitor is recommended.

- Be sure to determine the "blank" BOD of your seeded dilution water so that the proper seed correction can be made (See STANDARD METHODS, 17th edition, Page 5-6).

- Report results as milligrams per liter with three figures.

**END OF INSTRUCTIONS FOR DEMAND**

## DMR-QA STUDY 18

### CYANIDE SAMPLE

One ampul containing a reagent-water solution is provided to prepare one sample.

SAMPLE PREPARATION

To prepare the sample, fill a 1-L volumetric flask approximately 3/4 full with reagent water and add 1 mL of 1N NaOH. Pipette 10.0 mL of the solution from the ampul into the flask, dilute to volume with reagent water, and mix well.

NOTES:

- CAUTION: The sample should be analyzed as soon as possible after opening and diluting.
- The cyanide concentration will be <2 mg/L.
- To prevent a concentration change, the ampul and, even more importantly, the prepared sample should not be exposed to sunlight or other ultraviolet light any longer than necessary. Therefore, perform the analysis immediately after sample preparation.
- The specified addition of 1 mL of 1 normal sodium hydroxide is only a recommended minimum to prevent the loss of cyanide. If another amount, or even another base (such as KOH) is part of the analyst's "normal routine", it is his/her option to change the recommendation.
- Since all the cyanide is present in soluble forms, filtration of the sample is **not** necessary, however, the sample will require distillation.
- The presence of a precipitate in the ampul is **not** a problem, unless it is blue in color.
- Report results as milligrams per liter with three figures.

**END OF INSTRUCTIONS FOR CYANIDE**

## DMR-QA STUDY 18

### NON-FILTERABLE RESIDUE (TOTAL SUSPENDED SOLIDS) SAMPLE

One vial containing homogeneously mixed solids is provided to prepare one sample.

SAMPLE PREPARATION

To prepare the sample, fill a 1-L volumetric flask about 3/4 full with reagent water. Soon after opening and without drying, weigh 500 mg of solids from the vial and quantitatively transfer to the volumetric flask using a glass funnel and wash bottle filled with reagent water. After rinsing the glass funnel thoroughly and removing it, dilute flask contents to volume with additional reagent water (see notes) and mix by inverting the flask 10 times. Let the sample flask stand for 10 min and invert again 10 times. Immediately after the second set of inversions, rapidly measure a 500-mL aliquot into a graduated cylinder by repetitively mixing and pouring so as not to allow solids to settle in the flask before the transfer is complete. Filter this 500-mL aliquot and determine the non-filterable residue (total suspended solids) according to your chosen routine method.

NOTES:

- Do not dry the vial contents prior to weighing the 500 mg of mixed solids. Weigh the solids as received without any preparatory action.
- If a significant portion of the weighed (500 mg) solids fails to disperse evenly and stubbornly floats on the surface, add a few drops of diluted detergent to the partially filled sample preparation flask. For example, dissolve approximately 10 mL of detergent in 100 mL of reagent water and mix. Then add 2 drops of this diluted detergent to the sample preparation flask, mix, observe, and repeat (if necessary) the 2 drop additions until the suspended sample appears to be dispersed evenly. Choose a detergent which will rinse clean from the Gooch crucible and filter pad without leaving a measurable residue requiring a blank subtraction. Possible conveniently accessible choices might be Triton-X-100, or any house-hold liquid dish-washing detergent void of insoluble ingredients. If your detergent fails to disperse the solids evenly and it was not Triton-X-100, try Triton-X-100. If all else fails, request a new ampul.
- CAUTION: The analysis should be performed soon after the 500 mL aliquot is obtained.
- Report results as milligrams per liter with three figures.

**Ampuls contain NaCl.**
**IRRITANT**
**Material Safety Data Sheets are attached**
**immediately following the sample preparation instructions.**

**END OF INSTRUCTIONS FOR NON-FILTERABLE RESIDUE**

## DMR-QA STUDY 18

### OIL AND GREASE SAMPLE

One ampul containing a solution of oil and grease in n-propanol and glycerol is provided to prepare one sample.

SAMPLE PREPARATION

To prepare the sample, add 994 mL of reagent water and 5 mL of 1:1 hydrochloric acid into a 2-L separatory funnel and mix. Pipette 1.0 mL of the ampul solution into the separatory funnel and mix well. Analyze the sample using whatever analytical method you most often use on routine samples. Note that data produced using hexane for extraction must be reported in a different place on the report form than data produced using Freon for extraction.

NOTES:

- To avoid a concentration change, the sample must be analyzed soon after the ampul has been opened.
- The sample should be analyzed with an approved gravimetric method, because it is not suitable for an infrared method.
- For calculations, assume that initial sample volume was 1000 mL.
- Report results as milligrams per liter with three figures.

**Ampuls contain n-propanol (flammable liquid)**
**and glycerol (irritant)**
**Material Safety Data Sheets are attached**
**immediately following the sample preparation instructions.**

**END OF INSTRUCTIONS FOR OIL AND GREASE**

## TOTAL PHENOLICS SAMPLE

One ampul containing a reagent-water solution is provided to prepare one sample.

### SAMPLE PREPARATION

To prepare the sample, fill a 1-L volumetric flask approximately 3/4 full with reagent water. Pipette 10.0 mL from the ampul into the flask, dilute to volume with reagent water, and mix well. Analyze the sample using a 4AAP method ONLY.

Notes:

- In each sample, the resulting total phenolic concentration will be <6 mg/L.
- The solution in the ampul was preserved by autoclaving the sealed ampul. Because this preservative treatment is not effective after the ampul is opened, open the ampul just before analysis.
- Do not report phenolic results determined with GC/MS, because GC/MS data are not equivalent to data obtained with the 4AAP methods.
- Report results as milligrams per liter with three figures.

**END OF INSTRUCTIONS FOR TOTAL PHENOLICS**

## DMR-QA STUDY 18

### TOTAL RESIDUAL CHLORINE SAMPLE

One ampul containing a reagent-water solution is provided to prepare one sample.

SAMPLE PREPARATION

To prepare the sample, fill a 1-L volumetric flask approximately 3/4 full with chlorine-free, reagent water. Pipette 10.0 mL from the ampul into the volumetric flask, dilute to volume with reagent water, and mix well.

NOTES:

- In this sample, the resulting concentration of total residual chlorine will be <6 mg/L.
- To prevent a concentration change, the ampul and prepared sample should not be exposed to sunlight or other strong light or agitation any longer than necessary. Therefore, perform the analysis immediately after sample preparation.
- Report results as milligrams per liter with three figures.

**END OF INSTRUCTIONS FOR TOTAL RESIDUAL CHLORINE**

Method Code Reference Guide

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Trace Metals: | | | |
| Aluminum (ICP) | 13 | R19 - 200.7 | Inductively Coupled Plasma |
| | 14 | R24 - 202.1 | Atomic Absorption (AA): Direct aspiration unless otherwise noted |
| | 15 | R24 - 202.2 | AA; Furnace |
| | 26 | R89 - 3111D | AA |
| | 27 | R89 - 3113B | AA; Furnace |
| | 28 | R89 - 3500D | Eriochrome Cyanine R |
| | 29 | R89 - 3120B | ICP |
| | 31 | R25 - D4190-82(88) | Direct Current Plasma (DCP) |
| | 43 | R79 - I-3051-85 | AA |
| | 56 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Antimony | 13 | R24 - 204.1 | AA |
| | 14 | R24 - 204.2 | AA; Furnace |
| | 15 | R19 - 200.7 | ICP |
| | 23 | R89 - 3111B | AA |
| | 24 | R89 - 3113B | AA; Furnace |
| | 25 | R89 - 3120B | ICP |
| | 99 | Other | |
| Arsenic | 14 | R19 - 200.7 | ICP |
| | 15 | R24 - 206.2 | AA; Furnace |
| | 16 | R24 - 206.3 | AA; Gaseous hydride |
| | 17 | R24 - 206.4 | Silver Diethyl-dithiocarbamate |
| | 20 | R89 - 3114B4d | AA; Gaseous hydride |
| | 21 | R89 - 3113B | AA; Furnace |
| | 22 | R89 - 3120B | ICP |
| | 29 | R89 - 3500C | Silver Diethyl-dithiocarbamate |
| | 31 | R25 - D2972-88A | Silver Diethyl-dithiocarbamate |
| | 32 | R25 - D2972-88B | AA; Gaseous hydride |
| | 33 | R25 - D2972-88C | AA; Furnace |
| | 45 | R79 - I-3062-85 | AA; Gaseous hydride |
| | 46 | R79 - I-3060-85 | Silver Diethyl-dithiocarbamate |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Cadmium | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 213.1 | AA |
| | 15 | R24 - 213.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 23 | R89 - 3120B | ICP |
| | 24 | R89 - 3500D | Dithizone |
| | 35 | R25 - D3557-90A | AA |
| | 36 | R25 - D3557-90B | AA; Chelation-extraction |
| | 37 | R25 - D4190-82(88) | DCP |
| | 38 | R25 - D3557-90C | Voltametry |
| | 39 | R25 - D3557-90D | AA; Furnace |
| | 44 | R79 - I-3135-85 | AA |
| | 45 | R79 - I-3136-85 | AA |
| | 46 | R79 - I-1472-85 | ICP |
| | 52 | R8 - p. 37 | AA |
| | 55 | R81 - 974.27 | AA |
| | 56 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Chromium | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 218.1 | AA |
| | 15 | R24 - 218.2 | AA; Furnace |
| | 16 | R24 - 218.3 | AA; Chelation-extraction |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 23 | R89 - 3120B | ICP |
| | 24 | R89 - 3500D | Diphenylcarbazide |
| | 35 | R25 - D1687-92B | AA |
| | 36 | R25 - D4190-82(88) | DCP |
| | 38 | R25 - D1687-92C | AA; Furnace |
| | 44 | R79 - I-3236-85 | AA |
| | 55 | R81 - 974.27 | AA |
| | 56 | R80 - AES0029 | DCP |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Cobalt | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 219.1 | AA |
| | 15 | R24 - 219.2 | AA; Furnace |
| | 25 | R89 - 3111B | AA |
| | 26 | R89 - 3111C | AA; Chelation-extraction |
| | 27 | R89 - 3113B | AA; Furnace |
| | 28 | R89 - 3120B | ICP |
| | 34 | R25 - D3558-90A | AA |
| | 35 | R25 - D3558-90B | AA; Chelation-extraction |
| | 36 | R25 - D4190-82(88) | DCP |
| | 37 | R25 - D3558-90C | AA; Furnace |
| | 44 | R79 - I-3239-85 | AA |
| | 51 | R8 - p. 37 | AA |
| | 56 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Copper | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 220.1 | AA |
| | 15 | R24 - 220.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 27 | R89 - 3120B | ICP |
| | 28 | R89 - 3500D | Neocuproine |
| | 29 | R89 - 3500E | Bicinchoninate |
| | 30 | R25 - D1688-90C | AA; Furnace |
| | 35 | R25 - D1688-84A(88) | Neocuproine |
| | 36 | R25 - D1688-90A | AA |
| | 37 | R25 - D1688-90B | AA; Chelation-extraction |
| | 39 | R25 - D4190-82(88) | DCP |
| | 44 | R79 - I-3271-85 | AA |
| | 45 | R79 - I-3270-85 | AA |
| | 52 | R8 - p. 37 | AA |
| | 54 | R41 - 8506 | Bicinchoninate |
| | 56 | R81 - 974.27 | AA |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Iron | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 236.1 | AA |
| | 15 | R24 - 236.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 27 | R89 - 3120B | ICP |
| | 28 | R89 - 3500D | Phenanthroline |
| | 30 | R25 - D1068-90C | AA; Furnace |
| | 36 | R25 - D1068-90A | AA |
| | 37 | R25 - D1068-90B | AA; Chelation-extraction |
| | 38 | R25 - D1068-90D | Phenanthroline |
| | 39 | R25 - D4190-82(88) | DCP |
| | 43 | R79 - I-3381-85 | AA |
| | 53 | R44 - 8008 | Phenanthroline |
| | 56 | R81 - 974.27 | AA |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Lead | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 239.1 | AA |
| | 15 | R24 - 239.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 23 | R89 - 3120B | ICP |
| | 24 | R89 - 3500D | Dithizone |
| | 35 | R25 - D3559-90A | AA |
| | 36 | R25 - D3559-90B | AA; Chelation-extraction |
| | 37 | R25 - D4190-82(88) | DCP |
| | 38 | R25 - D3559-90C | Voltametery |
| | 39 | R25 - D3559-90D | AA; Furnace |
| | 43 | R79 - I-3399-85 | AA |
| | 56 | R81 - 974.27 | AA |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Manganese | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 243.1 | AA |
| | 15 | R24 - 243.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 28 | R89 - 3120B | ICP |
| | 29 | R89 - 3500D | Persulfate |
| | 35 | R25 - D858-90A | AA |
| | 36 | R25 - D858-90B | AA; Chelation-extraction |
| | 37 | R25 - D4190-82(88) | DCP |
| | 38 | R25 - D858-90C | AA; Furnace |
| | 43 | R79 - I-3454-85 | AA |
| | 54 | R41 - 8034 | Periodate (pp. 2-113 and 2-117) |
| | 56 | R81 - 974.27 | AA |
| | 57 | R81 - 920.203 | Persulfate |
| | 58 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Mercury | 13 | R24 - 245.1 | Manual Cold Vapor |
| | 14 | R24 - 245.2 | Automated Cold Vapor |
| | 23 | R89 - 3112B | Manual Cold Vapor |
| | 33 | R25 - D3223-91 | Manual Cold Vapor |
| | 43 | R79 - I-3462-85 | Manual Cold Vapor |
| | 51 | R81 - 977.22 | Manual Cold Vapor |
| | 99 | Other | |
| Molybdenum | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 246.1 | AA |
| | 15 | R24 - 246.2 | AA; Furnace |
| | 23 | R89 - 3111D | AA |
| | 24 | R89 - 3113B | AA; Furnace |
| | 25 | R89 - 3120B | ICP |
| | 42 | R79 - I-3490-85 | AA |
| | 52 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Nickel | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 249.1 | AA |
| | 15 | R24 - 249.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 27 | R89 - 3120B | ICP |
| | 28 | R89 - 3500D | Heptoxime |
| | 34 | R25 - D1886-90A | AA |
| | 35 | R25 - D1886-90B | AA; Chelation-extraction |
| | 36 | R25 - D4190-82(88) | DCP |
| | 37 | R25 - D1886-90C | AA; Furnace |
| | 43 | R79 - I-3499-85 | AA |
| | 52 | R80 - AES0029 | DCP |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Selenium | 12 | R19 - 200.7 | ICP |
| | 13 | R24 - 270.2 | AA; Furnace |
| | 25 | R89 - 3113B | AA; Furnace |
| | 26 | R89 - 3114B | AA; Gaseous hydride |
| | 27 | R89 - 3120B | ICP |
| | 32 | R25 - D3859-88A | AA; Gaseous hydride |
| | 43 | R79 - I-3667-85 | AA; Gaseous hydride |
| | 99 | Other | |
| Silver | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 272.1 | AA |
| | 15 | R24 - 272.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3113B | AA; Furnace |
| | 23 | R89 - 3120B | ICP |
| | 43 | R79 - I-3720-85 | AA |
| | 52 | R8 - p. 37 | AA |
| | 56 | R81 - 974.27 | AA |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Strontium | 99 | Other | |
| Thallium | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 279.1 | AA |
| | 15 | R24 - 279.2 | AA; Furnace |
| | 23 | R89 - 3111B | AA |
| | 24 | R89 - 3120B | ICP |
| | 99 | Other | |
| Titanium | 13 | R24 - 283.1 | AA |
| | 14 | R24 - 283.2 | AA; Furnace |
| | 23 | R89 - 3111D | AA |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Vanadium | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 286.1 | AA |
| | 15 | R24 - 286.2 | AA; Furnace |
| | 26 | R89 - 3111D | AA |
| | 27 | R89 - 3120B | ICP |
| | 28 | R89 - 3500D | Gallic Acid |
| | 33 | R25 - D4190-82(88) | DCP |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Zinc | 13 | R19 - 200.7 | ICP |
| | 14 | R24 - 289.1 | AA |
| | 15 | R24 - 289.2 | AA; Furnace |
| | 20 | R89 - 3111B | AA |
| | 21 | R89 - 3111C | AA; Chelation-extraction |
| | 22 | R89 - 3500F | Zincon |
| | 27 | R89 - 3120B | ICP |
| | 28 | R89 - 3500E | Dithizone |
| | 34 | R25 - D1691-90B | AA; Chelation-extraction |
| | 35 | R25 - D1691-90A | AA |
| | 36 | R25 - D4190-82(88) | DCP |
| | 43 | R79 - I-3900-85 | AA |
| | 52 | R8 - p. 37 | AA |
| | 54 | R41 - 8009 | Zincon (pp. 2-231 and 2-333) |
| | 55 | R81 - 974.27 | AA |
| | 57 | R80 - AES0029 | DCP |
| | 99 | Other | |
| Nutrients: | | | |
| Ammonia, as Nitrogen | 14 | R24 - 350.2 | Titration |
| | 15 | R24 - 350.3 | Electrode |
| | 16 | R24 - 350.1 | Automated Phenate |
| | 17 | R24 - 350.2 | Nesslerization |
| | 20 | R89 - 4500C | Nesslerization |
| | 21 | R89 - 4500E | Titration |
| | 22 | R89 - 4500H | Automated Phenate |
| | 23 | R89 - 4500G | Electrode |
| | 24 | R89 - 4500F | Electrode |
| | 32 | R25 - D1426-89A | Nesslerization |
| | 33 | R25 - D1426-89B | Electrode |
| | 44 | R79 - I-3520-85 | Nesslerization |
| | 45 | R79 - I-4523-85 | Automated Phenate |
| | 53 | R40 - 379-75WE | Automated Electrode |
| | 54 | R81 - 973.49 | Nesslerization |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Nitrate, as Nitrogen | 15 | R24 - 352.1 | Brucine Sulfate |
| | 16 | R24 - 353.1* | Automated Hydrazine Reduction |
| | 17 | R24 - 353.2* | Automated Cadmium Reduction |
| | 18 | R24 - 353.3* | Cadmium Reduction |
| | 20 | R89 - 4500E* | Cadmium Reduction |
| | 21 | R89 - 4500F* | Automated Cadmium Reduction |
| | 22 | R89 - 4500H* | Automated Hydrazine Reduction |
| | 27 | R3 - 419D | Brucine Sulfate |
| | 35 | R25 - D3867-90A* | Automated Cadmium Reduction |
| | 36 | R25 - D3867-90B* | Cadmium Reduction |
| | 43 | R79 - I-4545-85* | Automated Camium Reduction |
| | 52 | R8 - p. 28 | Brucine Sulfate |
| | 54 | R81 - 973.50 | Brucine Sulfate |
| | 99 | Other | |
| Orthophosphate, as P | 13 | R24 - 365.1 | Automated Ascorbic Acid Reduction |
| | 14 | R24 - 365.2 | Manual Ascorbic Acid Reduction |
| | 15 | R24 - 365.3 | Manual Two Reagent |
| | 25 | R89 - 4500F | Automated Ascorbic Acid Reduction |
| | 26 | R89 - 4500E | Manual Ascorbic Acid Reduction |
| | 33 | R25 - D515-88A | Manual Ascorbic Acid Reduction |
| | 43 | R79 - I-4601-85 | Automated Ascorbic Acid Reduction |
| | 54 | R81 - 973.56 | Automated Ascorbic Acid Reduction |
| | 55 | R81 - 973.55 | Manual Ascorbic Acid Reduction |
| | 99 | Other | |

* Normally, use of these methods for nitrate would require a prior analysis of nitrite and subtraction of the nitrite results to get an estimate for nitrate, however, WP study samples do not contain any nitrite.

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Kjeldahl Nitrogen | 14 | R24 - 351.3 | Nesslerization |
| | 15 | R24 - 351.4 | Potentiometric |
| | 16 | R24 - 351.2 | Semi-automated Block Digestion |
| | 17 | R24 - 351.3 | Titration |
| | 18 | R24 - 351.3 | Electrode |
| | 19 | R24 - 351.1 | Automated Phenate |
| | 34 | R25 - D3590-89A | Titration |
| | 35 | R25 - D3590-89A | Nesslerization |
| | 36 | R25 - D3590-89A | Potentiometric |
| | 37 | R25 - D3590-89B | Semi-automated Block Digestion |
| | 42 | R26 - I-4551-78 | Automated Phenate |
| | 53 | R81 - 973.48 | Titration |
| | 70 | R89 - 4500H | Automated Phenate |
| | 71 | R89 - 4500B+E | Macro Digestion + Titration |
| | 72 | R89 - 4500B+C | Macro Digestion + Nesslerization |
| | 73 | R89 - 4500B+F | Macro Digestion + Electrode |
| | 74 | R89 - 4500B+G | Macro Digestion + Electrode |
| | 75 | R89 - 4500C+E | Semi-micro Digestion + Titration |
| | 76 | R89 - 4500C | Semi-micro Digestion + Nesslerization |
| | 77 | R89 - 4500C+F | Semi-micro Digestion + Electrode |
| | 78 | R89 - 4500C+G | Semi-micro Digestion + Electrode |
| | 99 | Other | |
| Total Phosphorus, as P | 13 | R24 - 365.2 | Manual Ascorbic Acid Reduction |
| | 14 | R24 - 365.3 | Man. Ascorbic Acid Reduction (2 reagents) |
| | 15 | R24 - 365.1 | Automated Ascorbic Acid Reduction |
| | 16 | R24 - 365.4 | Semi-automated Block Digestion |
| | 26 | R89 - 4500E | Manual Ascorbic Acid Reduction |
| | 27 | R89 - 4500F | Automated Ascorbic Acid Reduction |
| | 33 | R25 - D515-88A | Manual Ascorbic Acid Reduction |
| | 34 | R25 - D515-88B | Semi-automated Block Digestion |
| | 43 | R79 - I-4600-85 | Automated Ascorbic Acid Reduction |
| | 54 | R81 - 973.56 | Automated Ascorbic Acid Reduction |
| | 55 | R81 - 973.55 | Manual Ascorbic Acid Reduction |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Demands: | | | |
| Chemical Oxygen Demand (COD) | 12 | R24 - 410.1 | Dichromate Reflux |
| | 13 | R24 - 410.2 | Dichromate Reflux |
| | 14 | R24 - 410.3 | Dichromate Reflux |
| | 15 | R24 - 410.4 | Spectrophotometric |
| | 23 | R89 - 5220C | Dichromate Reflux |
| | 24 | R89 - 5220D | Spectrophotometric |
| | 33 | R25 - D1252-88A | Dichromate Reflux |
| | 34 | R25 - D1252-88B | Spectrophotometric |
| | 45 | R79 - I-3560-85 | Dichromate Reflux |
| | 46 | R79 - I-3562-85 | Dichromate Reflux |
| | 47 | R79 - I-3561-85 | Spectrophotometric |
| | 52 | R8 - p. 17 | Dichromate Reflux |
| | 54 | R41 - 8000 | Spectrophotometric |
| | 55 | R42 - p. 1 | Spectrophotometric |
| | 56 | R81 - 973.46 | Dichromate Reflux |
| | 99 | Other | |
| Total Organic Carbon (TOC) | 12 | R24 - 415.1 | Combustion or oxidation |
| | 23 | R89 - 5310B | Combustion or oxidation |
| | 24 | R89 - 5310C | Combustion or oxidation |
| | 25 | R89 - 5310D | Combustion or oxidation |
| | 32 | R25 - D2579-85A | Combustion or oxidation |
| | 33 | R25 - D2579-85B | Combustion or oxidation |
| | 42 | R82 - p. 14 | Combustion/Infrared |
| | 52 | R81 - 973.47 | Combustion or oxidation |
| | 99 | Other | |
| Biochemical Oxygen Demand (5 day BOD) | 11 | R24 - 405.1 | Winkler (Azide Modification) |
| | 12 | R24 - 405.1 | Electrode |
| | 24 | R89 - 5210B | Winkler (Azide Modification) |
| | 25 | R89 - 5210B | Electrode |
| | 42 | R26 - I-1578-78 | Winkler (Azide Modification) |
| | 51 | R8 - p. 17 | Winkler (Azide Modification) |
| | 53 | R81 - 973.44 | Winkler (Azide Modification) |
| | 99 | Other | |
| Carbonaceous BOD | 22 | R89 - 5210B | Carbonaceous BOD |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| Total Cyanide | 13 | R24 - 335.2 | Manual Spectrophotometric |
| | 14 | R24 - 335.3 | Automated Spectro-photometric |
| | 25 | R89 - 4500D | Titrimetric |
| | 26 | R89 - 4500E | Manual Spectrophotometric |
| | 34 | R25 - D2036-91A | Manual Spectrophotometric |
| | 43 | R79 - I-3300-85 | Manual Spectrophotometric |
| | 51 | R8 - p. 22 | Titration or Colorimetric |
| | 99 | Other | |
| Non-filterable Residue (Total Suspended Solids) | 12 | R24 - 160.2 | Glass fiber 103° to 105°C |
| | 24 | R89 - 2540D | Glass fiber 103° to 105°C |
| | 42 | R79 - I-3765-85 | Glass fiber 103° to 105°C |
| | 99 | Other | |
| Oil and Grease | 12 | R24 - 413.1 | Freon Extraction/Gravimetric |
| | 13 | R102 - 1664 | Hexane Extraction/ Gravimetric |
| | 23 | R89 - 5520B | Freon Extraction/Gravimetric |
| | 99 | Other | |

| Analyte | Method Code | Ref.-Method | Description |
|---|---|---|---|
| pH | 12 | R24 - 150.1 | Electrode |
| | 23 | R89 - 4500B | Electrode |
| | 32 | R25 - D1293-84A(90) | Electrode |
| | 33 | R25 - D1293-84B(90) | Electrode |
| | 43 | R79 - I-1586-85 | Electrode |
| | 52 | R43 - p. 1 | Automated Electrode |
| | 54 | R81 - 973.41 | Electrode |
| | 99 | Other | |
| Total Phenolics | 11 | R24 - 420.1 | Manual 4-AAP with distillation |
| | 12 | R24 - 420.2 | Automated 4-AAP with distillation (with the manual distillation in 420.1) |
| | 21 | R3 - 510A + 510B | Manual 4-AAP with distillation and chloroform extraction |
| | 22 | R3 - 510A + 510C | Manual 4-AAP with distillation |
| | 99 | Other | |
| Total Residual Chlorine | 11 | R24 - 330.1 | Titrimetric - amperometric |
| | 12 | R24 - 330.2 | Back-starch end point |
| | 13 | R24 - 330.3 | Iodometric |
| | 14 | R24 - 330.4 | DPD-FAS |
| | 15 | R24 - 330.5 | Spectrophotometric, DPD |
| | 16 | R24 - 330.2 | Back-amperometric end point |
| | 20 | R89 - 4500B | Iodometric |
| | 26 | R89 - 4500C | Back-starch end point |
| | 27 | R89 - 4500D | Titrimetric - amperometric |
| | 28 | R89 - 4500F | DPD - FAS |
| | 29 | R89 - 4500G | Spectrophotometric, DPD |
| | 31 | R25 - D1253-86(92) | Titrimetric - amperometric |
| | 51 | R49 - p. 1 | Electrode |
| | 99 | Other | |

## DMR-QA STUDY 18

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R81. "Official Methods of Analysis of the Association of Official Analytical Chemists," Methods manual, 15th ed. (1990). Available from the AOAC, 2200 Wilson Blvd., Suite 400, Arlington, VA 22201-3301. (703) 522-3032.

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J. T. BAKER CHEMICAL CO. 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865
M A T E R I A L S A F E T Y D A T A S H E E T
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CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802



## SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: NITRIC ACID
FORMULA: HNO3
FORMULA WT: 63.01
CAS NO.: 07697-37-2
NIOSH/RTECS NO.: QU5775000
COMMON SYNONYMS: HYDROGEN NITRATE
PRODUCT CODES: 4801,9602,9598,9606,5371,9597,9600,5113,9616,9605,9601

## PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 (POISON)
FLAMMABILITY - 0
REACTIVITY - 3 (OXIDIZER)
CONTACT - 4 (CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
STRONG OXIDIZER - CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE
LIQUID AND VAPOR CAUSE SEVERE BURNS - MAY BE FATAL IF SWALLOWED
HARMFUL IF INHALED AND MAY CAUSE DELAYED LUNG INJURY
SPILLAGE MAY CAUSE FIRE OR LIBERATE DANGEROUS GAS
KEEP FROM CONTACT WITH CLOTHING AND OTHER COMBUSTIBLE MATERIALS. DO NOT STORE NEAR COMBUSTIBLE MATERIALS. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, FLOOD WITH WATER. FLUSH SPILL AREA WITH WATER SPRAY.

## SECTION II - HAZARDOUS COMPONENTS

| COMPONENT | % | CAS NO. |
|---|---|---|
| NITRIC ACID | 65-75 | 7697-37-2 |

## SECTION III - PHYSICAL DATA

BOILING POINT: 120 C ( 248 F)
VAPOR PRESSURE(MM HG): 2.9
MELTING POINT: -42 C ( -44 F)
VAPOR DENSITY(AIR=1): 2.5
SPECIFIC GRAVITY: 1.50 (H2O=1)
EVAPORATION RATE: N/A (BUTYL ACETATE=1)

CONTINUED ON PAGE: 2

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## SECTION III - PHYSICAL DATA (CONTINUED)

SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: COLORLESS LIQUID, WITH CHOKING ODOR.

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: N/A NFPA 704M RATING: 3-0-0 OXY

FIRE EXTINGUISHING MEDIA
USE WATER SPRAY.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.

TOXIC GASES PRODUCED
NITROGEN OXIDES

## SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 5 MG/M3 ( 2 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 10 MG/M3 ( 4 PPM)

EFFECTS OF OVEREXPOSURE
LIQUID MAY CAUSE SEVERE BURNS TO SKIN AND EYES.
INHALATION OF VAPORS MAY CAUSE SEVERE IRRITATION OF THE RESPIRATORY SYSTEM
INHALATION OF VAPORS MAY CAUSE COUGHING, CHEST PAINS, DIFFICULTY BREATHING OR UNCONSCIOUSNESS.
INGESTION MAY BE FATAL.

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

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## SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, LIGHT

INCOMPATIBLES: STRONG BASES, COMBUSTIBLE MATERIALS, *STRONG REDUCING AGENTS*

DECOMPOSITION PRODUCTS: OXIDES OF NITROGEN

## SECTION VII - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STO
LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WIT
SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN,
DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.
KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL.

J. T. BAKER NEUTRASORB(R) OR NEUTRASOL(R) "LOW NA+" ACID NEUTRALIZERS
ARE RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002, D003 (CORROSIVE, REACTIVE WASTE)

## SECTION VIII - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, *A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.*

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, ACID-RESISTANT GLOVES ARE RECOMMENDED.

## SECTION IX - STORAGE AND HANDLING PRECAUTIONS

^AF-T-DATA(TM) STORAGE COLOR CODE: YELLOW

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE SEPARATELY AND AWAY FROM FLAMMABLE

CONTINUED ON PAGE: 4

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## SECTION IX - STORAGE AND HANDLING PRECAUTIONS (CONTINUED)

AND COMBUSTIBLE MATERIALS.

## SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

| | |
|---|---|
| PROPER SHIPPING NAME | NITRIC ACID (OVER 40%) |
| HAZARD CLASS | OXIDIZER |
| UN/NA | UN2031 |
| LABELS | OXIDIZER, CORROSIVE |
| REPORTABLE QUANTITY | 1000 LBS. |

INTERNATIONAL (I.M.O.)

| | |
|---|---|
| PROPER SHIPPING NAME | NITRIC ACID |
| HAZARD CLASS | 8 |
| UN/NA | UN2031 |
| LABELS | CORROSIVE |

(TM) AND (R) DESIGNATE TRADEMARKS.
N/A = NOT APPLICABLE OR NOT AVAILABLE
---
THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND DATA PRESENTED IN VARIOUS TECHNICAL PUBLICATIONS. IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR *THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE* MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.

-- LAST PAGE --

Mallinckrodt

SODIUM CHLORIDE

Material Safety Data Sheet

Mallinckrodt Inc.
Science Products Division
P.O. Box N
Paris, Kentucky 40361

Emergency Telephone Number
314-982-5000

Effective Date: 08-07-85

PRODUCT IDENTIFICATION:

*Synonyms: Salt*

Formula CAS No.: 7647-14-5

Molecular Weight: 58.44

Hazardous Ingredients:
None.

Chemical Formula: NaCl

## *PRECAUTIONARY MEASURES*

As part of good industrial and personal hygiene and safety procedure, avoid all unnecessary exposure to the chemical substance and insure prompt removal from skin, eyes and clothing.

SEE SECTION 5.

DOT Hazard Class: Not Regulated

Physical Data — SECTION 1

Appearance: White crystalline.

Odor: Odo.less.

Solubility: 36g/100cc water @ 20°C (68°F)

Boiling Point: 1413°C (2575°F)

Vapor Density (Air=1): No information found.

Melting Point: 801°C (1474°F)

Vapor Pressure (mm Hg): 1.0 @ 865°C (1589°F)

Specific Gravity: 2.16

Evaporation Rate: No information fou



Fire and Explosion Information — SECTION 2

Fire: Not considered to be a fire hazard.

Explosion: Not considered to be an explosion hazard.

Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Reactivity Data — SECTION 3

Stability: Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products: When heated to above 801°C (1474°F) it emits toxic fumes of chloride and sodium oxide

Hazardous Polymerization: Will not occur.

Incompatibilities: Lithium, bromide trifluoride.

Leak/Spill Disposal Information — SECTION 4

Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

Disposal: Whatever cannot be saved for reclamation may be delivered to an approved waste disposal facility, or if local ordinances allow, can be dissolved in sufficient amounts of water to meet water quality standards, and flushed down a sewer drain.

Ensure compliance with local, state and federal regulations.

## Health Hazard Information — SECTION 5

### A. Exposure/Health Effects

| | |
|---|---|
| Inhalation: | Inhalation of dust may cause mild irritation to mucous membranes, nose and throat. Symptoms may include coughing, dryness, and sore throat. |
| Ingestion: | Very large doses can cause vomiting, diarrhea, and prostration. Dehydration and congestion occur in most internal organs. Hyperteric salt solutions can produce violent inflammatory reactions in the gastrointestinal tract. |
| Skin Contact: | Not expected to be a health hazard. |
| Eye Contact: | May cause irritation. |
| Chronic Exposure: | No information found. |
| Aggravation of Pre-existing Conditions: | No information found. |

### B. FIRST AID

| | |
|---|---|
| Inhalation: | Remove to fresh air. Get medical attention for any breathing difficulty. |
| Ingestion: | If large amounts were swallowed, get medical advice. |
| Skin Exposure: | Wash exposed area with soap and water. Get medical advice if irritation develops. |
| Eye Exposure: | Wash thoroughly with running water. Get medical advice if irritation develops. |

### C. TOXICITY DATA (RTECS, 1982)

Oral rat LD50: 3000 mg/kg.
Reproductive effects cited.



## Occupational Control Measures — SECTION 6

| | |
|---|---|
| Airborne Exposure Limits: | None established |
| Ventilation System: | In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered. |
| Personal Respirators: (NIOSH Approved) | For conditions of use where exposure to the dust is apparent, a dust/mist respirator may be worn. For emergencies, a self-contained breathing apparatus may be necessary. |
| Skin Protection: | Wear protective gloves and clean body-covering clothing. |
| Eye Protection: | Use chemical safety goggles. Contact lenses should not be worn when working with this material.<br><br>Maintain eye wash fountain and quick-drench facilities in work area. |

## Storage and Special Information — SECTION 7

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage.

# MATERIAL SAFETY DATA SHEET

EM SCIENCE
A Division of EM Industries
P.O. Box 70
480 Democrat Rd.
Gibbstown, N.J. 08027

Preparation Date .....: OCT 27, '87
Date Sent to Customer....: NOV 5, '88
Information Phone Number.:
(609) 354-9200
Chemtrec Emergency Number:
1-800-424-9300

BIONETICS CORP.
16 TRIANGLE PARK DRIVE
CINCINNATI, OH
45246

NFPA HAZARD RATINGS

| | | | |
|---|---|---|---|
| Health ....: | 1 | Flammability ...: | 3 |
| Reactivity : | 0 | Special Hazards.: | N/A |

## SECTION I - GENERAL INFORMATION

Catalog Number(s): PX1815 PX1824

Chemical Name....: Propyl Alcohol
Trade Name.....: n-Propyl Alcohol; Propanol
C.A.S. Number....: 71-23-8
Chemical Family..: Alcohol
Formula.....: CH3CH2CH2OH
Molecular Weight.: 60.10
DOT Shipping Name: N/A
DOT Number.....: N/A

## SECTION II - HAZARDOUS INGREDIENTS

-N/A

## SECTION III - PHYSICAL DATA

Boiling Point (C° 760 mm Hg).: 97C
Melting Point (C°).....: -127C
Specific Gravity(H2O = 1).....: 0.804
Vapor Pressure (mm Hg).....: 15 @ 20C
Percent Volatile by Vol (%)..: >99
Vapor Density (Air=1).....: 2.1
Evaporation Rate (BuAc=1).....: 1.3
Solubility in Water (%).....: Miscible
Appearance and Odor.....: clear, colorless liquid; alcoholic odor

## SECTION IV - FIRE & EXPLOSION HAZARD DATA

Flash Point (T°).....: 74F (tcc)
Flammable Limits LEL %.: 2.1
Flammable Limits UEL %.: 13.7
Extinguishing Media....:
CO2, Dry Chemical, "Alcohol" foam, Water spray
Fire Fighting Proc.....:
Wear self-contained breathing apparatus, protective clothing
Fire & Expl. Hazards...:
-Vapor can travel distances to ignition source and flash back

## SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....:
200 ppm (TWA)
Toxicity Data.....:
-orl-hmn LDLo: 5700 mg/kg orl-rat LD50: 1870 mg/kg
Symptoms of Exposure.....:
-Vapor irritating to eyes, nose, and throat
Narcotic at high concentrations
Effects from ingestion or inhalation: headache, nausea, dizziness, incoordination
Medical Cond. Aggravated by Exp: Data not available.
Routes of Entry.....: Inhalation, ingestion or skin contact.
Carcinogenicity.....: See Comments, Section X: If no information appears, the material is not listed as a cancer causing agent.
Emergency First Aid.....:
Skin: wash thoroughly with soap/water
Eyes: immediately flush thoroughly with water for at least 15 minutes
Inhalation: remove to fresh air; give artificial respiration if breathing has stopped
Ingestion: If conscious, induce vomiting
GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE

## SECTION VI - REACTIVITY DATA





Stability.....: YES
Conditions to Avoid...:
-Heat, sparks, open flame, hot surfaces
Materials to Avoid.....: ( ) Water (X) Acids
( ) Bases ( ) Corrosives (X) Oxidizers
(X) Other (specify)-Aldehydes, Halogens, Isocyanates, Strong oxidizers
Hazardous Polymerization..: Data not available.
Hazardous Decomposition..: -COx

## SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

Spill Response:
-Eliminate ignition sources; collect on absorbent
Flush area with water
Waste Disposal: To be performed in compliance with all current local, state and federal regulations.

## SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation, Respiratory Protection, Protective Clothing, Eye Protection:
-Material should be handled or transferred in an approved fume hood or with adequate ventilation
Protective gloves (Neoprene, Nitrile or equivalent) should be worn to prevent skin contact
Safety glasses with side shields must be worn at all times

## SECTION IX - SPECIAL PROTECTION INFORMATION

Handling & Storage ....:
-Keep container closed
Store in cool, well-ventilated area away from ignition sources and oxidizers
Do not breathe vapor
Do not get in eyes; avoid skin contact
Electrically ground all equipment when handling this product
Retained residue may make empty containers hazardous; use caution!
Work/Hygienic Practices: Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

## SECTION X - OTHER INFORMATION

Comments.....:
-Tests on laboratory animals indicate material may produce adverse mutagenic effects and cause tumors

Rev. 6/86

N/A
Revision History.....: 01/01/82, N/A
OCT 27, '87
N/A = Not available:

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Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

MATERIAL SAFETY DATA SHEET



## SECTION I - PRODUCT IDENTIFICATION

Product Name: Glycerol, Anhydrous
Formula: $HOCH_2CHOHCH_2OH$
Formula Wt: 92.10
CAS No.: 56-81-5
NIOSH/RTECS No.: MA8050000
Common Synonyms: 1,2,3-Propanetriol; Glycerin; Glycyl Alcohol
Product Codes: 2141,2135,M778,2136

## PRECAUTIONARY LABELLING

BAKER SAF-T-DATA* System


Laboratory Protective Equipment


Precautionary Label Statements

CAUTION!
MAY CAUSE IRRITATION
MAY BE HARMFUL IF SWALLOWED
During use avoid contact with eyes, skin, clothing. Wash thoroughly after handling. When not in use keep in tightly closed container.

SAF-T-DATA* Storage Color Code: Orange (general storage)

## SECTION II - HAZARDOUS COMPONENTS

| Component | % | CAS No. |
|---|---|---|
| Glycerol, Anhydrous | 90-100 | 56-81-5 |

## SECTION III - PHYSICAL DATA

Boiling Point: 290°C ( 554°F) Vapor Pressure(mmHg): <0.1

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## SECTION III - PHYSICAL DATA (Continued)

Melting Point: 18°C ( 64°F) Vapor Density(air=1): 3.1

Specific Gravity: 1.26 ($H_2O$=1) Evaporation Rate: N/A (Butyl Acetate=1)

Solubility($H_2O$): Complete (in all proportions) % Volatiles by Volume: 0

Appearance & Odor: Clear, colorless, odorless syrupy liquid.

## SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Closed Cup): 199°C ( 390°F) NFPA 704M Rating: 1-1-0

Flammable Limits: Upper - N/A % Lower - 0.9 %

Fire Extinguishing Media
Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode

Unusual Fire & Explosion Hazards
Contact with strong oxidizers may cause fire or explosion.

Toxic Gases Produced
carbon monoxide, carbon dioxide, acrolein

## SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 10 $mg/m^3$ ( ppm)

Toxicity: $LD_{50}$ (oral-rat) (g/kg) - 12.6
$LD_{50}$ (ipr-mouse) (mg/kg) - 63
$LD_{50}$ (scu-rat) (mg/kg) - 100
$LD_{50}$ (iv-rat) (mg/kg) - 5566

Carcinogenicity: NTP: No IARC: No Z List: No OSHA reg: No

Effects of Overexposure
Inhalation of vapors may cause coughing and difficult breathing.
Contact with skin or eyes may cause irritation.
Prolonged skin contact may cause dermatitis.

Continued on Page: 3

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ABD00060341

## SECTION V - HEALTH HAZARD DATA (Continued)

Ingestion may cause headache, nausea, vomiting, gastrointestinal irritation, convulsions, and unconsciousness.

Target Organs
*eyes, skin, mucous membranes*

Medical Conditions Generally Aggravated By Exposure
None Identified

Routes Of Entry
eye contact, skin contact, inhalation, ingestion

Emergency and First Aid Procedures

INGESTION: If swallowed and the person is conscious, immediately give large amounts of water. Get medical attention.

INHALATION: If a person breathes in large amounts, move the exposed person to fresh air. Get medical attention.

EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. Get medical attention.

SKIN CONTACT: Immediately wash with plenty of soap and water for at least 15 minutes.

## SECTION VI - REACTIVITY DATA

Stability: Stable Hazardous Polymerization: Will not occur

Incompatibles: strong oxidizing agents, strong acids, strong bases

Decomposition Products: *carbon monoxide, carbon dioxide,* acrolein

## SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge
Wear suitable protective clothing. Take up with sand or other noncombustible absorbent material and place into container for later disposal. Flush spill area with water.

Disposal Procedure
*Dispose in accordance with* all applicable federal, state, and local environmental regulations.

## SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation: Use general or local exhaust ventilation to meet TLV requirements.

Respiratory Protection: Respiratory protection required if airborne concentration exceeds TLV. At concentrations *above 10 mg/m$^3$*, a dust/mist respirator is

Continued on Page: 4



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## SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT (Continued)

recommended.

Eye/Skin Protection: Safety goggles, uniform, apron, proper gloves are recommended.

## SECTION IX - STORAGE AND HANDLING PRECAUTIONS

*SAF-T-DATA* Storage Color Code: Orange (general storage)*

Special Precautions
Keep container tightly closed. Suitable for any general chemical storage area.
Isolate from incompatible materials.

## SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

Proper Shipping Name Chemicals, n.o.s. (Non-regulated)

INTERNATIONAL (I.M.O.)

Proper Shipping Name Chemicals, n.o.s. (Non-regulated)

*N/A = Not Applicable or Not Available*

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The information published in this Material Safety Data Sheet has been compiled from our experience and data presented in various technical publications. It is the user's responsibility to determine the suitability of this information for the adoption of necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available. J. T. Baker Inc. makes no warranty or representation *about the accuracy or* completeness nor fitness for purpose of the information contained herein.

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-- LAST PAGE --

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American Samoa EPA
Environmental Quality Commission
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Env. Protection Div.
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Atlanta, GA 30354
(404) 362-2680

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