Test Project

Task B2 – Water quality analysis

Water Technology

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Introduction

Water quality testing is essential for identifying the presence and concentration of various contaminants in water. This task is to construct a calibration curve from standard solutions and to determine ammonia nitrogen (NH_3-N) concentrations of the water samples using the calibration curve. Phenate method will be used for NH_3-N determination.

Description of project and tasks

Your task:

1. Prepare at least 4 standard solutions by dilution from ammonia nitrogen (NH_3-N) stock solution.
2. Measure absorbance at wavelength (λ) of 640 nm for each standard solution using spectrophotometer after the chemical reaction as described below for indophenol formation.
3. Note: The NH_3-N measurement range is 0.01-2.0 mg/L NH_3 as N. Higher concentrations can be determined by sample dilution.
4. Prepare standard curves and obtain linear relationship between absorbance and concentration using Microsoft Excel.
5. Note: no need to force the trend-line to pass through the zero point.
6. Show the linear formula and R^2 value in the graph.
7. Save the file with file name as B2-xxxxx in desktop, where xxxxx is your name.
8. Measure the absorbance of the water samples after the chemical reaction as described below for indophenol formation to determine NH_3-N concentrations of water samples collected from a wastewater treatment plant.
9. Calculate the NH_3-N concentrations of the water samples with the linear formula prepared from standard solutions.
10. Document your results.

Lab coat, gloves and safety glasses are required for this task.

Instructions to the Competitor

General Discussion

Phenate method is used for NH_3-N determination. An intensely blue compound, indophenol, is formed by the reaction of ammonia, hypochlorite, and phenol catalysed by sodium nitroprusside. The blue colour is measured by spectrophotometer.

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Reagents

1. Phenol solution: Mix 1.1 mL liquified phenol (≥89%) with 95% v/v ethyl alcohol to a final volume of 100 mL. Prepare weekly. Caution: Wear gloves and eye protection when handling phenol; use good ventilation to minimize all personnel exposure to this toxic volatile substance.
2. Sodium nitroprusside, 0.5% w/v: Dissolve 0.5 g sodium nitroprusside in 100 mL deionized water. Store in amber bottle for up to 1 month.
3. Alkaline citrate: Dissolve 200 g trisodium citrate and 10 g sodium hydroxide in deionized water. Dilute to 1000 mL.
4. Sodium hypochlorite, commercial solutions, about 5%. This solution slowly decomposes once the seal on the bottle cap is broken. Replace about every 2 months.
5. Note: Above 4 solutions (No. 1 – 4) have been prepared. You can take the required volume for your testing. Don't take more than what you need.
6. Oxidizing solution: Mix 100 mL alkaline citrate solution with 25 mL sodium hypochlorite. Prepare fresh daily.
7. Stock ammonium solution: Dissolve 3.819 g anhydrous NH_4Cl (dried at 100°C) in water, and dilute to 1000 mL; 1.00 mL = 1.00 mg N = 1.22 mg NH_3. This stock solution has been prepared for your use.
8. Standard ammonium solution: Use stock ammonia solution and water to prepare a calibration curve in a range appropriate to the concentrations of the samples.

Procedure for NH_3-N Determination

1. Use stock ammonium solution and water to prepare a series of standard NH_3-N solutions at a volume of at least 25 mL with a concentration range, e.g., 0.1 – 2.0 mg/L.
2. To 25 mL standard solutions and a blank in 100 or 125 mL Erlenmeyer flask, add, with thorough mixing after each addition, 1 mL phenol solution, 1 mL sodium nitroprusside solution, and 2.5 mL oxidizing solution.
3. Cover samples with plastic wrap or paraffin wrapper film. Let color develop at room temperature (22 to 27°C) in subdued light for at least 20 mins. Color is stable for 24h.
4. Measure absorbance at 640 nm.
5. Follow same procedure for NH_3-N determination for samples.

Procedure for Spectrophotometer

1. Follow manufacture instructions for wavelength setup and measurement.
2. Set wavelength (λ) of 640 nm for NH_3-N measurement.
3. Insert the zero solution vial into the cell compartment, and Press Zero.
4. Insert the test vial into the cell compartment, read and record the absorbance value of samples.
5. Please note you are NOT allowed to change the spectrophotometer default language setting of English to any other language.

To continue.

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Tables, Graphs and Pictures

B2 – Water Quality Analysis

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Data and Report

Country Name: _____ **Competitor Name:** _____

Table 1: Measurement of NH_3-N standard solution and absorbance.

SN	NH_3-N CONCENTRATION OF STANDARD SOLUTION (MG/L)	ABSORBANCE
1		
2		
3		
4		
5		
6		
7		

Table 2: Standard curve formula for NH_3-N.

Formula of standard curve	
R-square (R^2)	

Table 3: Ammonia nitrogen (NH_3-N) measurement of water samples.

SAMPLE	ABSORBANCE	CALCULATED NH_3-N CONCENTRATION (MG/L)
A		
B		
C		
D		
E		

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Table 4: Resource sustainability and waste generation.

ITEM	QUANTITY
Quantity of pipette tips used (Pieces) (Inclusive of all tips, e.g., 1mL and 5 mL tips)	

Table 5: Time Used for the Task.

TIME	TIME CHECK
End time (hh / mm)	
Duration (min)	
Checked by	Expert Signature / Name

Marking Scheme

The task evaluation will be made according to the Competition Information System (CIS) of Water Technology 2026.

End.

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