Project Report

On

WATER SAMPLE TESTING

in partial fulfillment of the requirements for the award of

DIPLOMA IN CIVIL ENGINEERING

SUBMITTED TO

REGIONAL COLLEGE OF POLYTECHNIC
Lucknow (U.P.)

Partner Institute of AUS-CIDC

ASSAM UNIVERSITY, SILCHAR

&

CONSTRUCTION INDUSTRY DEVELOPMENT COUNCIL

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Annexure-IV

ASSAM UNIVERSITY, SILCHAR
And

CONSTRUCTION INDUSTRY DEVELOPMENT COUNCIL

Diploma Engineering

BONAFIDE CERTIFICATE

This is to certify that Mr./Ms…………………………………………………………………...bearing Enrol. No.-……………………………………has satisfactorily completed the field training project work in CIVIL ENGINEERING under AUS-CIDC Diploma Program for the year ………………….. which is a compulsory requirement for the award of Diploma.

Project Guide **Date:** **Academic Head**

Record of Submission

Name of the Candidate :………………………………………………………………………

Registration No. :……………………………………………………………………………

Examination Centre :…………………………………………………………………………..

Signature of Supervisor :……………………………………………………………………

Signature of CIDC Training Coordinator :…………………………………………………

Annexure-III

DECLARATION

I hereby declare that the project entitled **"WATER SAMPLE TESTING"** submitted for the Diploma Engineering is my original work and the dissertation has not formed the basis for the award of any diploma, degree, associate ship, fellowship or any other similar titles.

Place: **(Name)**

Date: Signature of the Student

ABSTRACT

The purpose of this **Water Sample Testing Civil Project** is to find out, how the water sample can test. The report starts with introduction and ends with conclusion with experiment report. The report defines the detailed information about water testing with various examples. The report also explains about the quantity of the samples and types of the samples. The Sampling Methods consists of Manual sampling, Automatic sampling and Sorbent sampling, which explain the details of water testing.

The physical and chemical properties of drinking water vary from top to bottom of the depth of the earth, and the time from morning to night. It is therefore difficult to obtain a truly representative sample. We need water for different purposes; we need water for drinking, industry, irrigation, swimming, fishing, etc. Water for various purposes requirements for the composition and purity, and each body of water must be tested regularly to confirm the suitability.

The types of analysis could change from simple field testing for a single analytic to laboratory based multi component instrumental analysis. The analytical process demands sampling and sample storage since changes in composition of water do not stop once the sampling has been taken. Screening is done to ensure that water reaches the laboratory, the same composition as it has occurred during sampling.

Conclusion:

The purpose of this project is to better understand environmental impacts of our actions on the local streams and rivers, the scientific studies of water quality and the understanding is to make the significance of the results. Water analysis and monitoring is a very important aspect of water conservation and protection. Water is a vital resource that runs more quickly over time. To ensure continued supply of safe, clean drinking water, we must work together as a community to protect and to this vital resource.

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INTRODUCTION

Sampling:

The physical and chemical characteristics of drinking water vary from top to bottom of depth of land, as well as with time as from morning to evening. It therefore becomes difficult to obtain a truly representative sample.

Types of samples:

a) Grab sample: Grab samples are single samples collected at a specific spot at a site over a short period of time (typically seconds or minutes).

b) Composite samples: Composite samples should provide a more representative sampling of heterogeneous matrices in which the concentration of the analysis of interest may vary over short periods of time and/ or space. Composite samples can be obtained by combining portions of multiple grab samples or by using specially designed automatic sampling devices.

Sampling Methods:

a) Manual sampling: Manual sampling involves minimal equipment but may be costly and time-consuming for routine or large-scale sampling programs.

b) Automatic sampling: Automatic samplers can eliminate can reduce labor costs, may provide the means for frequent sampling and are used increasingly.

c) Sorbent sampling: Use of solids sorbent s, particularly membrane type disks, is becoming more frequent. These methods offer advantages of rabid, inexpensive sampling if the analytes of interest can be adsorbed and desorbed efficiently and the water matrix is free of particulates that plug the sorbent.

Source of sample:

Sample collected from bore water in**VALLAM** 27.11.10 and testing conducted on 02.11.10.

Sample containers:

Containers typically are made of plastic or glass, but one material may be preferred over the others. For example, silica, sodium, and boran may be leached from soft glass but not plastic, and trace levels of some pesticides and metals may absorb onto the walls of glass containers. Thus hard glass container is preferred. For samples, containing organic compounds, do not use plastic containers expect those made of fluorinated polymers such as polytetrafluoroethylene (PTFE).

Sample Volumes:

Collect a 1 litre sample for most physical and chemical analyses. Do not use sample from the same container for multiple testing requirements (e.g., organic, inorganic, radiological, bacteriological, and microscopic examinations) because methods of collecting and handling are different for each type of test.

Always collect enough sample volume in the appropriate container in order to compile with the sample handling, storage and preservation requirements.

Time interval between collection and analysis:

In general, the shorter the time that elapses between collection of a sample and its analysis, the more reliable will be analytical results. For certain constituents and physical values, immediate analysis in the field is required. For composited sample it is common practice to use the time at the end of composite collection as the sample collection time.

Preservation Techniques:

To minimize the potential for volatilization or biodegradation between sampling and analysis, keep samples as cool as possible without freezing. Preferably pack samples in crushed or cubed ice or commercial ice substituent before shipment. Avoid using dry to break. Dry ice also may effect a pH change in samples. Keep composite samples cool with ice or a refrigeration system set at 4˚C during compositing. Analyze samples as quickly as possible on arrival at the laboratory. If immediate analysis is not possible, preferably store at 4˚C.

1)DETERMINATION OF pH

AIM:

To determine the pH of a given sample of water.

APPARATUS REQUIRED:

1) Ph meter with electrode
2) Beakers
3) 100 ml standard flasks
4) Funnels
5) Tissue papers
6) Wash bottle

CHEMICALS REQUIRED:

1) Distilled water
2) Buffer tablets pH values of 4.0
3) Buffer tablets pH values of 7.0
4) Buffer tablets pH values of 9.2

REAGENT PREPARATIONS:

Standard Buffer Solutions:

They can be prepared easily by dissolving the pH powder or tablets completely in 100ml of distilled water.

PRINCIPLE:

pH unit of measure which describes the degree of acidity or alkalinity of a solution. It is measured on a scale of 0to 14. The term pH is derived from P the mathematical symbol of the negative logarithm, and H the chemical symbol of the Hydrogen. The formal definition of pH is the negative logarithm of the hydrogen ion activity.

$$pH = -\log 10[H^+]$$

pH provides the needed quantitative information by expressing the degree of the activity of an acid or base in terms of hydrogen ion activity.

THEORY:

Fresh distilled water has a pH of 7. Acidic waters have a pH of 0to 7, whereas alkaline waters have a pH of 7 to 14. Ammonia and Lime solution have pH of about 12 where as many cool drinks, lime juice, battery, etc. have pH of less than 4. As pH is measured on a logarithmic scale, a water having a pH of 6to 10 times more acidic than the natural water, a water having a pH of 4 is 1000 times more acidic than water with pH 7 and a pH of 2 is 100000 times more acidic than a pH of 7.

pH of a solution can be found easily by using pH strips (paper) or a pH meter gives very accurate values whereas pH strips gives approximate values. pH is determined by the measurement of electromotive force of a cell comprising an indicator electrode responsive to hydrogen ions (such as glass electrode) immersed in the test solution and a reference electrode is usually achieved by means of a liquid junction, which forms a part of the reference electrode. The ‘emf’ of this cell is immersed with pH meter. This is high impedance electrometer calibrated in terms of pH.

SPECIFICATION:

Range : 0-14pH

Accuracy : 0.01 pH (1digit)

Resolution : 0.01 pH

Temp.Compensation :0to100 Degree C. (Manual).

PROCEDURE:

Connect the pH electrode to the input socket at the front. Clean the electrode with distilled water and dry it. Dip the electrode in the 4.00 pH buffer solution which is provided. Measure the temperature of the buffer solution. Keep the TEMP. Knob at temperature of the solution. Push the pH switch. Adjust the display to 4.00 pH with the CAL knob. Now the instrument is calibrated. Wash the electrode, dry it and put it in the solution whose pH is to be measured.

RESULT:

pH of the given samples=**7.27**

SIGNIFICANCE:

1) Knowing pH value is very important parameter for analysis of water/waste water and its suitability for domestic use and for irrigation. Certain chemical and biological processes work only at a particular pH. of 6.5 to 8.5 has no direct adverse effect on health. However a lower value below will produce

sour taste and higher value above 8.5 a bitter taste. Higher value of pH encourages the potential of chlorine. High pH induces the formation of trihalomethanes which are causing cancer in human beings. According to BIS water for domestic consumption should have a pH between 6.5 to 8.5.

2) Corrosion of water mains is the main problem associated with acidic waters.
3) Acidic/alkaline waters cannot be used for contraction purpose also. If pH is less algae die, fish cannot reproduce and it causes acidity, corrosion, and irritation of mucous membranes, tuberculosis and further health problems in humans.

REFERENCE:

IS 3025 (part 11)-1983 methods of sampling and test (Physical and chemical) for water and waste water- pH value.

2)DETERMINATION OF TURBIDITY

AIM:

To determine the amount of turbidity present in the sample of water by using Nephelo Turbidity meter.

APPARATUS REQUIRED:

1) Nephelometric turbidity meter,
2) Nessler’s tubes with stand,
3) Standard flasks,
4) Wash bottle.

CHEMICALS REQUIRED:

1) Distilled Water
2) Hydrazine sulphate,
3) Hexamethylenetetramine

PREPARATION OF STOCK STANDARDS:

The particles of formation are uniform in size and shape. The stock standards prepared from the formations are accurate within 1% and stable for 6-8 weeks. The stock standard of 4000NTU is prepared as per the following procedure.

1) Take 5g of reagent grade Hydrazine Sulphate and dissolve in 400 of distilled water. This is solution A.

2) Next dissolve 50g of pure HexamethyleneTetramine in 400 ml of distilled water. This is solution B.
3) Mix solution A and B and make it upto one litre by adding distilled water and allow this mixture to settle for 48 hours at normal room temperature.

This is a stock standard of 4000 NTU and can be used for 6-8 months to prepare working standards as per following table. Shake this solution well before making dilution.

NTU Standard	Amount of stock std.Required to make 1 lit sol.
500	125.0 ml
100	25.0 ml
50	12.5 ml
10	2.5 ml
5	1.25 ml
1	0.25 ml

PRINCIPLE:

The tungsten filament produces a converging light beam. It is then scattered by the suspended particles present in the given sample of water. The scattered light is sensed by a photo cell kept at 90 in light path and the amount of scattered light is a direct measure of tubidity of the solution.

As table and regulated DC supply is used to excite the lamp. Similarly a high gain amplifier is used to convert the photocell output into measurable signal.

THEORY:

Turbidity is a measure of the transparency of the water. Turbidity is the property of water because of which it offers resistance to passage of light. It is caused by suspended solids (such as silt and clay), living or dead algae and other microorganisms. It depends on the type of soil over which water has run and the velocity of run-off. As sand is a good filtering methods, ground waters are less turbid. River/ canal waters are highly turbid (upto 300 NTU) during monsoon. River water have negligible turbidity during summer, as river flow is mostly contributed by ground water during summer. Turbidity is measured by “Turbidity Rod” or “Jackson Turbidity Meter” (in JT Units) or by “Nephelometer” (in NT Units). Insoluble particles of soil, organics, micro-organisms and other inorganic material, impede the passage of light by scattering and absorbing rays. The scattering of light is generally proportional to the turbidity. The turbidity is thus measured from the amount of light scattered by the sample taking a reference with standard turbidity suspension. Turbidity is expressed as the amount of suspended matter in liquid in parts per million or milligrams per liter, determine by the optical observations. The standard unit of turbidity is “that produced by one part of finely dissolved silica in one million parts of distilled water” for potable water allowable turbidity is between 5 to 10 mg/l.

SPECIFICATION:

Range: From 0to 500 NTU in four

decade range of , 10, 1CO and 500 NTU

Accuracy :+ 1% of full scale in 10 & 100 NTU range

+ 2% of full scale in 1 & 500 NTU ranges.

Drift/ Oscillation :0.02 NTU due to particle movement

Supply:230V AC + 10% at 50 Hz

Power Consumption :25VA approx.

PROCEDURE:

Three pin plug of the instrument was introduced into the appropriate main socket. The instrument was switched on and it was allowed to warm up for 10 to 15 minutes. The appropriate range is selected and standardize control was kept maximum. The test tube with distilled water was inserted into the cell holder and it is covered with light shield. Now set zero control was adjusted to indicate zero in the meter. The test tube containing distilled water is removed and was replaced with the test tube containing standard solution. The standard axliseel controller was adjusted, such that the meter indicate 100 in accordance with the appropriate range in standard solution. The test tube containing the sample solution was inserted into the cell holder and the corresponding reading was noted in NTU units.

RESULT:

The turbidity in sample water=**5.3NTU**

PRECAUTIONS:

1) The instrument should be kept and operated in environment free from corrosive acid fumes and excessive moisture for prolonged life.

2) Ensure that instrument GROUND pin is connected to real ground through supply socket.
3) Test tubes are cleared with detergent and rinsed with distilled water prior to wiping off with tissue paper. The cleaning of the test tubes is very essential while standardizing instrument for 0-1 NTU range.
4) Align the marking of test tube and cell holder for accurate readings.
5) Use high grade distilled water to get accurate results. The performance of instrument in 0-1 NTU range is greatly independent on the quality of distilled water. It is preferable to use triple distilled water.
6) Keep the tube holder covered with light shield when not in use.

REFERENCE:

IS 3025 (part 10)-1984 Methods of sampling and test (physically and chemical) for water and water- Turbidity.

3) DETERMINATION HARDNESS

AIM:

To determine the total hardness of the given sample of water.

APPARATUS REQUIRED:

1. Burette,
2. Pipette,
3. Conical flask,
4. Beakers,
5. Standardflask,
6. PVC bottle.

CHEMICALS REQUIRED:

1.EDTA,

2. Ammonium chloride,

3. Ammonium hydroxide ,

4. EBT,

5. Sodium chloride,

6. Ethanol.

REAGENT PREPARATIONS:

1. EDTA solution 0.01N:

Dissolve 3.723g of disodium salt of EDTA in distilled water to prepare 1liter of solution. Store in polyethylene or Pyrex bottle.

2. Buffer solution:

Dissolve 16.9g of ammonium chloride in 143ml of concentrated ammonium hydroxide. Add 1.25g of magnesium salt of EDTA to obtain sharp change in color of indicator and dilute to 1 liter with distilled water.

3. Erichrome Black T:

Dissolve 0.25g of EBT in 500ml alcohol or 0.5g of EBT with 100g sodium chloride (A.R) to prepare dry powder.

PRINCIPLE:

Hardness is generally caused by the calcium and magnesium ions present in water. Polyvalent ions of some other metals like strontium, iron, aluminum, zinc and manganese etc. Are also capable of precipitating the soap and thus contributing to the hardness. However, the concentration of these ions is very low in natural waters, therefore,hardness is generally measured as concentration of only calcium and magnesium which are far higher in qualities over other hardness producing ions.

Calcium, and magnesium form a complex of wine red color with Erichrome black t at ph of 10.0+0.1 the EDTA has g0t a stronger affinity towards ca++ and mg++ and, therefore by addition of EDTA, the former complex ion broken down and a new complex of blue color is formed.

PROCEDURE:

TITRATION:

EDTA VsSAMPLE WATER

To pipette out 20ml of sample water into a clean conical flask. To this 5ml of buffer solution and 2drops of Erichrome Black T indicator was added. The solutionwas titrated against EDTAtaken in the burette. The end point was change of color from wine red to steel blue.Thetitration was repeated upto concordant values.

S.No	Volume of std. Water sample (ml)	Burette Reading (ml)		Volume of EDTA (ml)	End point
		Initial	Final		
1	20	0	11	11	Change from wine red to steel blue
2	20	0	11		

$V_1 N_1 = V_2 N_2$

Where,

$V_1 = Volume\ of\ EDTA$

$N_1 = Normality\ of\ EDTA$

$V_2 = Volume\ of\ sample\ water$

$N_2 = Normality\ of\ sample\ water$

$$N_2 = \frac{V_1 N_1}{V_2}$$

$N_2 = 5.57710^{-3}\ N$

Amount of hardness present in the given sample water=Normality of sample water

X

Equivalent wt. of $CaCO_3$

X

1000

$=5.577X\ 10^{-3}X100X1000$

=577.5 mg/l

RESULT:

The hardness of given sample of water 577**.5 mg/l**

SIGNIFICANCE:

1. Absolutely soft water are tasteless (e.g. Distilled water). On the other hand, hardness up to 600 mg/l can be relished if got acclimatized to.

2. Moderately hard water is prepared to soft water for drinking and irrigation purposes.
3. Hard water from scales in hot water pipes and boilers. They are difficult to be removed and lot of heat energy is wasted if these scales are not removed.
4. Soft water affects the human cardiovascular system and causes heart-attacks.
5. Soft water has a flat taste. Soft water tends to become acidic and has corrosive action. It dissolves toxic elements such as lead easily.
6. The precipitate formed by soap and hard water adheres to surface of tubes, sinks and utensils and stain clothes and dishes.

REFERENCE:

IS 3025 (part 21)-1983 Methods of sampling and test (physical and chemical) for water and waste water –Total hardness.

4)DETERMINATION OF RESIDUAL CHLORINE

AIM:

To determine the residual chlorine present in the given sample of water.

APPARATUS:

1. Conical flasks,
2. burette, pipette,
3. Standard flask.

CHEMICALS REQUIRED:

a. Acetic acid,
b. Potassium Iodide,
c. Sodium thiosulphate,
d. Starch.

REAGENT PREPARATIONS:

1. Sodium thiosulpahte solution 0.025N:

Dissolve 1.575 g of sodium thiosulphate in distilled water and make upto 1 liter.

2. Starch Indicator:

Dissolve 2 g of L.r grade soluble starch in distilled water and pour this emulsion into 100 ml of boiling water. Allow to boil for few minutes, add 0.2 g of salicylic acid as preservative. Cool this solution and then use.

PRINCIPLE:

Chlorine is primarily added to the water for destroying the harmful micro organisms, presence of excess chlorine intensities the taste and odours of many other compound such as phenol, etc., It may also be harmful to many aquatic microorganisms in combination with ammonia.

Chlorine is a strong oxidizing agent and liberates iodine from potassium iodide. The liberated iodine is equivalent t the amount of chlorine and can be titrated against sodium thiosulphate using starch as an indicator.

PROCEDURE:

Take 100 ml sample of water in a conical flask and add 5ml acetic acid. The pH after addition of acetic acid should be between 3 and 4.

Add approximately 1 g of KI crystals and mix thoroughly with a stirring rod for about 15 minutes keeping it away from the direct sunlight. Add a few drops of starch indicator and titrates against 0.025N sodium thiosulphate until the contents turns colorless from blue.

S.No	Volume of sample (ml)	Burette readings (ml)		Volume of sodium thiosulphate (ml)	End point
		Initial	Final		
1	100	0	2	2	Blue to colorless
2	100	0	2		

CALCULATIONS:

$$\text{Residual chlorine mg/l} = \frac{(ml X) of titration X\ 1000\ X\ 35.5}{ml of sample}$$

$$= \frac{2 X 0.025 X 1000 X 35.5}{100}$$

=17.75 mg/l

RESULT:

Amount of residual chlorine present in the given sample is =**17.75mg/l**

REFERENCE:

IS 3025 (part 26) – 1986 methods of sampling and test (physical and chemical) for water and waste water- Residual Chlorine.

5)DETERMINATION OF CHLORIDES

AIM:

To determine the concentration of chlorides present in the given sample of water.

APPARATUS REQUIRED:

- Conical flasks,
- Burette
- Pipette,
- Standard flask,
- Funnel
- Wash bottle.

CHEMICALS REQUIRED:

a. Silver nitrate
b. Potassium chromate
c. Sodium chloride

REAGENT PREPARARTIONS:

1) Silver Nitrate 0.02N:

Dissolve 3.4 g of dried silver nitrate in distilled water to make 1liter of the solution and keep in a dark bottle.

2) Potassium chromate 5%:

Dissolve 5 g of potassium chromate in 100 ml distilled water.

3) Sodium chloride 0.0141N:

Dissolve 4.121 g of anhydrous Sodium chloride in 250 ml distilled water.

PRINCIPLE:

Silver nitrate reacts with chloride to form very slightly soluble white precipitate of $AgCl_2$. At the and point when all the chloride get precipitated, free silver ions react with chromate to form silver chromate of reddish brown color.

PROCEDURE:

TITRARTON:

SAMPLE WATER Vs SILVER NITRATE

20 ml of sample water pipette out into a clean conical flask. One drop of potassium dichromate was added as a indicator. The solution turns yellow in color. The solution was titrated against silver nitrate taken in the burette. The end point was the change of yellow color into reddish brown color. Titration was repeated upto its concordant values.

S.NO	Volume of sample water (ml)	Burette reading (ml)		Volume of silver Nitrate (ml)	End point
		Initial	Final		
1	20	0	2.5	2.5	Yellow color to reddish brown
2	20	0	2.5		

$$V_1N_1 = V_2N_2$$

Where,

$V_1 = Volume\ of\ Silver\ Nitrate$

$N_1 = Normality\ of\ Silver\ Nitrate$

$V_2 = Volume\ of\ Sample\ Water$

$N_2 = Normality\ of\ sample\ water$

$$N_2 = \frac{V_1N_1}{V_2}$$

=0.00537 N

Amount of chloride present in the given sample of water=0.033 N

Normality of sample water X Equivalent weight of silver nitrate X 1000

=0.00537X39.5X1000

=212.043 mg/l

RESULT:

The amount of chloride present in the given sample of water=**212.043 mg/l**

REFERENCE:

IS 3025 (part 32)-1988 Methods of sampling and test (physical and chemical) for water and waste water- Chloride.

6)DETERMINATION OF SULPHATE

AIM:

To estimate the concentration if sulphate in the given sample of water.

APPARATUS REQUIRED:

1) Silica crucible,
2) Desiccators,
3) Ash less filter paper,
4) Beaker.

CHEMICALS REQUIRED:

1) Methyl red,
2) Hydrochloric acid,
3) Silver Nitrate,
4) Nitric acid.

REAGENT PREPARATIONS:

1.Methyl red indicator:

Dissolve 100 mg of methyl red sodium salt in distilled water to prepare 100 ml of solution.

2.Hydrochloric acid:

HCl (1:1)

3. Barium chloride solution:

Dissolve 100 g $BaCl_2.H_2O$ in distilled water to prepare 1 liter of solution. Filter the solution through a filter paper before use.

4.Silver nitrate-nitric acid reagent:

Dissolve 8.5 g of $AgNO_3$ and 0.5 ml concentrated HNO_3 in distilled water to prepare 500 ml reagent.

PRINCIPLE:

Sulphate is precipitated as barium sulphate in the hydrochloric acid medium by addition of barium chloride solution. The reaction is carried out near the boiling temperature. The precipitation is filtered, washed to remove the chlorides, cried or ignited and weighed as $BaSO_4$.

Many substances interfere in performing this test. Suspended matter, Silica, nitrate and sulphate lead to the positive errors where the results are on the higher side. Alkali metal sulphate causes the low results. Presence of other metals such as iron and chromium also yield low results due to the formation of metals sulphates.

PROCEDURE:

1) If the sample consist more than 25 ml/l of silica, it is to be removed prior to the analysis for sulphate.

2) For removal of silica, evaporator the suitable volume of sample to dryness in platinum dish on a water bath. Rotating the dish. Dry to contents again by evaporation and for final drying deep the dish at 180 degree Celsius in an oven. If some organic matter is also present, it can be burden over a flame at this stage. Now add 2 ml of dryness on a water bath. Add 2 ml of HCl and transfer it in hot water and filter. Wash the filter paper having silica. Several times with hot distilled water and collect the combined filtrate.

3) Adjust the volume of the filtrate so that 50 mg sulphate should be in 250 ml volume. If silica is present is less than 25 mg/l, there is no need of removal of it and suitable volume of sample (100-150 ml0 can directly be taken for estimation of sulphates.
4) Add a few drop of methyl red to the sample and adjust the pH to 4.5-5.0 by addition of HCl until the color changes to the orange. Add additional 1-2 ml of HCl.
5) Boil the solution and add warm $BaCl_2$ solution in excess until the precipitation is completes.
6) Heat the precipitation at 80-90 degree Celsius for at least 2 hours or more.
7) Filter the precipitation through the ash less filter paper by adding some pulp of the same filter paper as a aid for filtration.
8) Wash the precipitate repeatedly with warm distilled water until the filtrate is free from chloride which can be tested by $AgNO_3$ solution. In the presence of chloride $AgNO_3$ gives a white turbidity.
9) Dry the filter paper containing precipitate and ignite it in a crucible at 800 degree centigrade for about 1 hour. Cool it in a desiccators and weight the precipitate of $BaSO_4$.

CALCULATION:

$$SO_4 \text{ mg/l} = \frac{mg BaSO_4 X 411.5}{ml\ of\ Sample}$$

$$= \frac{0.1X411.5}{100}$$

$$=0.41 \text{ mg/l}$$

RESULT:

Sulphate content of the given sample is = **0.41 mg/l**

REFERENCE:

IS 3025 (part 24)- 1986 methods of sampling and test (physical and chemical for water and waste water- sulphate.

7)DETERMINATION OF DISSOLVED OXYGEN

AIM:

To determine the dissolved oxygen concentration in the given sample.

APPARATUS REQUIRED:

a. Dissolved Oxygen bottle with stopper
b. Burette
c. Pipette

REAGENT PREPARATIONS:

1.Sodium thiosulpahte solution 0.025N:

Dissolve 24.82 g of $Na_2S_2O_3$ in boiled distilled water and make up the volume to 1 lit. Add 0.4 g of borax or a pallet of NaOH as stabilizer. This is 0.1 N stock solution. Dilute I to 4 times with boiled distilled water to prepare 0.025 N solution (250≥ 1000 ml). Keep in a brown glass stopper bottle.

2. Alkaline potassium iodide solution:

   Dissolve 100 g of KOH and 50 g of KI 200 ml of boiled distilled water.

3. Manganesesulphate solution:

   Dissolve 100 g of $MnSO_4.4H_2O$ in 200 ml of boiled distilled water and filter.

4. Starch solution:

    Dissolve 1 g of starch in 100 ml of warm (80 C- 90 C) distilled water And add a few drops of formaldehyde solution.

5. Sulphuric acid:

    H_2SO_4 conc. (sp.gr.1.84)

PRINCIPLE:

The manganese sulphate reacts with the alkali (KOH or NaOH) to form a white precipitate of manganese hydroxide which in the presence of oxygen, gets oxidized to a brown color compound. In the strong acid medium magnetic ions are reduced by iodide which ions which get converted into iodine equivalent to the original concentration of oxygen in the sample. The iodine can be titrated against thiosulphate using starch as an indicator.

PROCEDURE:

Water sample was filled in a dissolved oxygen bottle and 1 ml of manganese sulphate was added with a help of pipette. To it 1 ml of alkaline potassium iodide solution was added. If oxygen is present it will form brown. If oxygen was not present while precipitate of manganese oxide was formed. The bottle was shake for 50-100 times.

Then the precipitation was allowed to settle down. 2 ml of conc.H_2SO_4 was shake slowly. Till all the precipitate are dissolved leaving the solution transparent but yellow in color. The contents are transformed to titration flask and was titrated against N/40 sodium thiosulphate solution till light yellow color was obtained.

Then 2-3 drops of solution blue. Again sodium thiosulphate solution was added till the solution become colorless note the volume of sodium thiosulphate used.

SNO	Volume of sample water (ml)	Burette reading (ml)		Volume of sodium thiosulphate (ml)	End point
		Initial	Final		
1	20	0	0.3	0.3	Disappearance of blue color
2	20	0	0.3		

CALCULATION:

When only a part of the contents have been titrated:

$$\text{Dissolved Oxygen, mg/L} = \frac{(mlXN) of\ titrant X 8 X 1000}{V_2(V_1 - V/V_1)}$$

$$= \frac{0.3X0.025X8X1000}{20X\frac{(300-2)}{300}}$$

=3.02 mg/l

Where,

$$V_1 = Volume\ of\ sample\ bottle\ after\ placing\ the\ stopper$$

$$V_2 = Volume\ of\ the\ part\ of\ the\ contents\ titrated$$

V = Volume of $MnSO_4$ and KI added.

RESULT:

The dissolved oxygen concentration in the given sample of water is =**3.02 mg/l**

REFERENCE:

IS 3025 (part 38)-1989 Methods of sampling and test (physical and chemical) for water and waste water – Dissolved Oxygen.

CONCLUSION:

SNO	PARAMETER	DESIRABLE LIMIT	MAXIMUM PERMISSIBLE LIMIT	OBSERVED VALUE
1	Color	5	25	-
2	Odour	Unobjectable	Unobjectable	-
3	Taste	agreeable	agreeable	Agreeable
4	Turbidity (NTU)	5	10	5.3
95	pH value	6.5 – 8.5	No relaxation	6.77
6	Total Hardness	300	600	577.5
7	Chlorides	250	1000	212.45
8	Sulphate	200	400	0.41

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