WATER SUPPLY AND SANITATION ENGINEERING
LAB MANUAL

DEPT OF CIVIL ENGINEERING
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LIST OF EXPERIMENTS

1. To determine the pH of given water sample
2. To determine the conductivity of given water sample
3. To determine the turbidity of given water sample
4. To determine the acidity present in water sample
5. To determine the alkalinity present in water sample
6. To determine the hardness of given water sample
7. To determine the chloride content of given water sample
8. To determine the Residual Chlorine present in water

PROCEDURE FOR COLLECTION, TRANSPORTATION AND PRESERVATION OF WATER & WASTEWATER SAMPLE

The samples of water and wastewater collected from different sources should be transported at the earliest to the laboratory for, the purpose of analysis. There is a well-defined procedure for collection, transportation and preservation of the sample so that the sample will be truly) representative sample i.e. representing the characteristics of the whole sample. It should be ensured that there should be no change in physical, chemical and bacteriological characteristics during the period of transportation and preservation. Adequate quantity of the sample should be collected depending on the specific purpose of analysis. Generally, five litres of water or wastewater is adequate for routine analysis.

The procedure for collection, transportation and preservation of water and wastewater sample are listed below.

- Utmost care and cleanliness are most important for collection of the sample. The bottle used for collection of sample should be well stoppered good quality of glass or polyethylene bottle. The bottle should be thoroughly cleaned, sterilized and rinsed with the sample to be collected. The stopper should be tight and properly sealed with wax after collection of the sample.
- The collection bottle should be properly labeled with the information such as name and location of the source, sample number, date and time of collection, volume of sample, any specific information regarding analysis date and time of testing
- In case of highly polluted water i.e. wastewater and industrial wastewater, the exact point of source should be mentioned.
- The sample collected from the source should ensure that it is a representative sample.
- In case of higher atmospheric/ambient temperature, the sample should be transported in ice bags and reach the laboratory preferably within six hours from the time of collection.
- The sample should be preserved in the laboratory at a temperature of 10℃.
- The time interval between collection of sample and actual testing in laboratory should be desirably within
  - (i) 72 hours for clear and unpolluted water sample.
  - (ii) 12 hours for polluted sample and wastewater.
  - (iii) 6 hours for septic sewage and industrial effluent.

PRECAUTIONS TO BE TAKEN IN THE LABORATORY

1. Apron should be used.
2. Safety goggles should be used.
3. A pair of gloves must be used while handling toxic chemicals.
4. A rubber bulb should be used for pipetting the solution.
S. Experiments involving toxic reagents or solvents must be conducted in an efficient fume cupboard.
6. Before leaving the laboratory, every apparatus should be properly cleaned and kept in its original position. The working table should be wiped. After using any chemical/reagent, the container should be tightly closed and returned to its original place.
7. Required quantity of reagents should be used. Unnecessary wastage of reagents should be avoided.
8. Strong acids used for conducting experiments should be diluted before being poured into the sink.
9. Only one reagent bottle should be taken at a time to avoid cross contamination.
10. Chemicals should not be handled with fingers. A clean spatula should be used for this purpose.
11. Glass bottle should never be lifted holding the neck only.
12. Eating and drinking in the laboratory should be avoided.
13. Solid waste or used filter paper should not be thrown in the sink.

Experiment 1

Aim: To determine the pH of the given sample

Theory:

Measurement of pH is most frequently used in water chemistry. Practically, every phase of water supply and wastewater treatment, e.g. water softening, precipitation, coagulation, disinfection, acid-base neutralization is pH dependent. At a given temperature, the intensity of acidic or basic character of a solution is indicated by pH

Alkalinity and acidity are the acid- and base-neutralizing capacities of a water and usually are expressed as milligrams $CaCO_3$ per litre. pH as defined by the Sorenson is – log[H+], negative logarithm of hydrogen ion concentration. It is the intensity factor of acidity. Pure water is slightly ionized and at equilibrium, the product is

$[H^+][OH^-] = 10^{-14}$ at 25°C …………….(1)

where $[H^+]$ = activity of hydrogen ions, moles/L

$[OH^-]$ = activity of hydroxyl ions, moles/L and a logarithmic scale is convenient for expressing a wide range of ionic activities.

Apparatus:

The apparatus consists of a pH meter with glass and reference electrode with temperature compensation.

Procedure:

The pH meter is switched on and allowed it to warm for some period. Then the meter is standardized by dipping the electrode in pH 4.00 & 9 buffer. The temperature of water is measured and the temperature knob is kept at on that temperature. Now the instrument is calibrated and ready for measuring the pH of unknown solutions.

Tabulation:

Sample	pH	Temp(℃)

Result: The pH of the given water sample is found to be

Discussion: Discuss the result obtained.

EXPERIMENT 2

Aim: To determine the Conductivity of the given sample

Theory:

Conductivity is the capacity of water to carry an electrical current that varies both with number and types of ions in the solution which is related to the concentration of ionized substances in the water. Most dissolved inorganic substances in water are in the ionized form that contributes to conductance. Conductivity measurement gives rapid and practical estimate of the variations in the dissolved contents of water.

Environmental Significance:

Electrical conductivity measurement is useful for quantitative measurement of ions dissolved in water, which are important for boiler feed water and cooling water etc. Conductivity data is useful in determining the suitability of water and wastewater for disposal on land. Irrigation waters up to 2 millisiemens/cm conductance have been found to be suitable for irrigation depending on soils and climatic characteristics.

Requirements:

Conductivity Meter, Flask, Beaker, Wash Bottle

Reagents:

0.01 N, KCL solution: Dissolve 0.746 grams of potassium chloride in 1 liter of distilled water.

Procedure:

1. The electrode is rinsed thoroughly and dried.

2. Then the electrode is immersed in 0.01 N KCL solution and the conductivity should be 1413 micro mhos at 25℃ temperature. Now the instrument is calibrated.

4. Then the cell is removed from KCL solution and washed it thoroughly with distilled water.

5. The electrode/cell is immersed in the unknown sample whose conductivity is to be determined.

6. The instrument reading is noted down. If the cell constant is given on the cell itself, the measured value of conductivity = Cell Constant X Screen reading.

Tabulation:

Sample	Conductivity(ms/cm)	Temp(℃)

Result: The electrical conductivity of the given water sample is found to be

Discussion: Discuss the result obtained.

EXPERIMENT -3

Aim: To determine the turbidity of the given sample

Theory:

Turbidity is a measure the extent to which light is either absorbed or scattered by suspended material present in the water. Surface waters results from the erosion of colloidal material such as clay, slit, rock fragments and metal oxides from soil, vegetable fibers and micro-organisms may also contribute to turbidity. Drinking water supplies requires special treatment by chemical coagulation and filtration before it may be used for public water supply.

This turbidity can be brought down to required level by adding coagulants. Coagulants when added to water it will form a geletaneous substance known as floc and this will arrest the fine suspended and colloidal particles. These arrested particles will settle down rapidly because of increase in their size.

Environmental Significance:

Turbidity water is displeasant and is accepted for domestic use. The colloidal matter associated with turbidity provides adsorption sites for chemicals and biological organisms that may be harmful or cause undesirable tastes and odour. Disinfection of the turbid waters is difficult and unsatisfactory, since the colloids partially shield organisms from the disinfectant. This IS values for drinking water is 10 to 25 NTU.

Apparatus:

Nephelo turbidity meter.

Reagents:

1. Turbidity free water: Pass distilled water through a lower turbidity than distilled water, discard the first 200ml, collected. If filtration does not reduce turbidity use distilled water.
2. Stock turbidity solutions:-

i) Solution 1: Dissolve 1.0 grams hydrazine suplate $(NH_2)_2.H_2So_4$ in distilled water and dilute it to 100 ml in a make up flask.

ii) Solution 2: Dissolve 10.0 grams hexamethylene tetramine $(CH_2)_6N_4$ in distilled water and dilute it to 100ml.

iii) Solution 3: In a 100ml flask, mix 5ml. each of solution 1 and 2. Allow it to stand 24 hours, then dilute it to 100ml and mix thoroughly. The turbidity of this solution is 400 NTU.

iv) Standard Turbidity Solution: Take 10.0ml of solution 3 in a 100ml make up flask and dilute it to 100ml. with turbid free water. The turbidity of this suspension is 40 NTU.

Procedure:

a) Calibration of Nephelometer:

i) Proper range of NTU on Nephelometer is selected.

ii) By placing distilled water in Nephelometer test tube, the Nephelometer reading to zero is set using the knobs.

iii) Using the standard turbid solution (i.e. 40 NTU), the Nephelemeter (i.e. adjust the Nephelemeter reading to 40 NTU using calibration knob) is calibrated.

b) Determination of turbidity of sample water:

Then the sample is thoroughly shaken so as to remove any air bubbles and poured it into meter cell. The turbidity of the sample is read out from the digital display.

Tabulation:

Sample	**Turbidity(NTU)**	**Temp(℃)**

Result: The turbidity of the given water sample is found to be

Discussion: Discuss the result obtained.

EXPERIMENT 4

Aim: To determine the acidity present in water.

Theory:

Acidity of water is its quantitative capacity to neutralize a strong base to a designated pH. Acidity of water is significant in many water supply systems, because acidity influences certain chemical and biological process in water. Acidity of water is due to Hydrogen ions (H+) present in a sample of water. As a result, dissociation of Hydrogen ions is neutralized by titration with standard solution of a strong base in presence of an indicator. Dissolved Carbon dioxide is usually the major acidic component of surface water.

Environmental Significance:

1. Acidic waters are of concern because of their corrosive characteristics and the expense involved in removing or controlling the corrosion-producing substances. The corrosive factor in most waters is carbon dioxide, but in many industrial wastewaters, it is mineral acidity.
2. In the development of new public water supplies, the carbon dioxide acidity is an important factor that must be considered in the treatment method and the facilities needed.
3. Many underground supplies require treatment to overcome corrosive characteristics resulting from carbon dioxide. The amount present is an important factor in determining whether removal by aeration or simple neutralization with lime or sodium hydroxide will be chosen as treatment method.
4. The quantities of chemicals, size of chemical feeders, storage space and cost of treatment are determined from the laboratory data based on acidity.
5. When biological processes of treatment are used, the pH must be maintained in between 6 to 8.5. This criterion often requires adjustment of pH to favorable levels and calculation of the amount of chemical needed is based upon acidity values in most cases.

Apparatus:
Titration Stand with Burette, Conical Flask, Beaker, Measuring Cylinder, Pipette, Funnel, Wash Bottle etc.

Reagents:
0.02 N NaOH Solution: Dissolve 0.8 grams of NaoH in 1 liter of distilled water.

Phenolphthalein Indicator: Dissolve 0.5 gm of Phenolphthalein Indicator in 500 ml distilled water.

Methyl orange Indicator: Dissolve 0.5 g of Methyl orange Indicator & dilute to 1000 ml with distilled water.

Procedure:

A. Methyl Orange Acidity

1. 50ml of sample is taken in a conical flask (V).

2. 2 drops of methyl orange is added to it and the colour change is being observed. If color is turned to yellow, methyl orange acidity is absent. If colour is turned to orange, sample is titrated with 0.02 N NaOH till colour changes to faint orange. The volume of NaOH consumed (A) is noted.

B. Phenolphthalein Acidity

1. Then suitable volume of sample (25, 50 or 100 mL) is taken in a Conical flask.(V)

2. 2-3 drops of phenolphthalein indicator is added and the colour change is being observed, If the sample is turned to pink color it means that, phenolphthalein acidity is absent and the experiment is stopped.

3. If there is no color change, then it is titrated with 0.02N Standard NaOH solution till faint pink color is appeared. The end point is colorless to faint pink color. Additional volume of NaOH consumed (B) is noted.

Observation:

1. Titrant :

2. Indicators : Phenolphthalein and Methyl Orange Indicator

3. End Point : a) Yellow to Faint Orange b) Colorless to Faint Pink Color

Tabulation:

Table: 1 Mineral Acidity: (Methyl Orange Indicator)

Sample	Volume of sample V(ml)	Burette initial reading	Burette final reading	Volume of NaOH(ml) A

Table: 2 Phenolphthalein Acidity: (Phenolphthalein Indicator)

Sample	Volume of sample V(ml)	Burette initial reading	Burette final reading	Volume of NaOH(ml) B

Calculations:

Methylorange acidity as $CaCO_3$ in mg/l = (Volume of NaOH (A) x N x 50 x1000)/V
Phenolphthalein acidity as $CaCO_3$ in mg/l = (Volume of NaOH (B) x N x 50 x1000)/V
Total acidity as $CaCO_3$ in mg/l = (Volume of NAOH (A)+(B) x N x 50 x1000)/V

Results:

Discussion: Discuss the result obtained.

EXPERIMENT 5

Aim: To determine the Alkalinity present in water sample

Theory:

Alkalinity of water is its quantitative capacity to neutralize a strong acid to a designated pH. Alkalinity is significant in treatment of wastewater. It is significant in determining suitability of water for drinking as well as irrigation purpose. Alkalinity is primarily due to salts of weak acids and bicarbonates. Major part of alkalinity is because of the action of Carbon dioxide on basic materials.

Environmental Significance:

1. Highly alkaline waters are usually unpalatable and consumers tend to seek other supplies.
2. Chemicals used for coagulation of water and wastewater react with water to form hydroxide precipitates. The hydrogen ions released react with the alkalinity of the water. Thus, the alkalinity acts to buffer the water in pH range where the coagulant can be effective. Alkalinity must be present in excess of that destroyed by the acid released by the coagulant for effective and complete coagulation to occur.
3. Alkalinity is a major item that must be considered in calculating the lime and soda ash requirements in softening of water by precipitation methods.
4. Alkalinity is an important parameter involved in corrosion control.
5. Alkalinity measurements are made as a means of evaluating the buffering capacity of wastewater and sludge. They can also be used to assess the ability of natural water to resist the effects of acid rain.

Apparatus:

Titration Stand with Burette, Conical Flask, Beaker, Measuring Cylinder,Pipette, Funnel, Wash Bottle etc.

Reagents:

0.02 N NaOH Solution: Dissolve 0.8 grams of NaoH in 1 liter of distilled water.

Phenolphthalein Indicator: Dissolve 0.5 gm of Phenolphthalein Indicator in 500 mL distilled water.

Methyl orange Indicator: Dissolve 0.5 g of Methyl orange Indicator & dilute to 1000ml with distilled water.

Procedure:

A. Phenolphthalein Alkalinity:

1. Suitable volume of sample is taken in a conical flask.
2. 2-3 drops of phenolphthalein indicator is added to sample and the colour change is observed.
3. If the sample is turned to pink in colour, then it is titrated with 0.02 N H_2SO_4, till the pink colour is disappeared. The volume of acid required as (A) is noted.
4. If the pink colour does not exist it indicates that, phenolphthalein Alkalinity is absent. Then continue the titration with Methyl Orange indicator.

B. Methyl Orange Alkalinity:

1. 2-3 drops of methyl orange is added to the same flask and titration is continued till colour becomes orange. The volume of H_2SO_4 consumed as (B) is noted.
2. If there is no pink colour after adding phenolphthalein, process is continued according to step 3.
3. The alkalinity in mg/l is calculated as follows;

Observation:

1. Titrant :

2. Indicators : Phenolphthalein and Methyl Orange Indicator

3. End Point : a) Pink to Colourless

b) Yellow to Faint Orange Color

Tabulation:

Table: 1 Phenolphthalein Alkalinity: (Phenolphthalein Indicator)

Sample	Volume of sample V(ml)	Burette initial reading	Burette final reading	Volume of H_2SO_4 (ml) A

Table: 2 Methyl orange Alkalinity: (Methyl Orange Indicator)

Sample	Volume of sample V(ml)	Burette initial reading	Burette final reading	Volume H_2SO_4 of (ml) B

Calculations

Phenolphthalein alkalinity as $CaCO_3$ in mg/l = (Volume of H_2SO_4 (A) x N x 50 x1000)/V

Methyl orange alkalinity as $CaCO_3$ in mg/l = (Volume of H_2SO_4 (B) x N x 50 x1000)/V

Total alkalinity as $CaCO_3$ in mg/l = (Volume of H_2SO_4 (A)+(B) x N x 50 x1000)/V

Alkalinity Relationship (P and T)

The values obtained from Phenolphthalein and Total alkalinity determination for a given sample of water are used to estimate three forms of alkalinity shown below.

Results of Titration	**Hydroxide Alkalinity/Caustic Alkalinity as** $CaCO_3$	**Carbonate Alkalinity as** $CaCO_3$	**Bicarbonate Alkalinity as** $CaCO_3$
P=0	0	0	0
P<1/2 T	0	2P	T-2P
P=1/2T	0	2P	0
P>1/2 T	2P-T	2(T-P)	0
P=T	T	0	0

Where: P: Phenolphthalein Alkalinity, T: Total Alkalinity

Results:

Sample Used :

Phenolphthalein Alkalinity (mg/L):

Methyl Orange Alkalinity (mg/L):

Total Alkalinity (mg/L) :

Hydroxide Alkalinity :

Carbonate Alkalinity :

Bicarbonate Alkalinity :

Discussion: Discuss the result obtained.

EXPERIMENT 6

Aim: To determine the hardness of given sample

Theory:

Hardness of water is a measure of soap consuming capacity to produce foam or lather. Also produce scale in hot water pipes, heaters, boilers and other units, precipitated by Calcium and Magnesium ions commonly and by ions of other polyvalent metals such as Aluminium, Iron, Strontium, Zinc etc. present in water. Calcium and Magnesium ions are usually present in significant concentrations in natural water.

Temporary hardness is mainly due to presence Carbonate and Bicarbonate of Calcium and Magnesium. Permanent hardness is mainly due to presence of Sulphate and Chlorides of Calcium and Magnesium. The degree of hardness of drinking water has been classified in terms of the equivalent $CaCO_3$ concentration as follows:

Soft: 0 - 60 mg/L; Medium: 60 - 120 mg/L; Hard: 120 -180 mg/L; Very hard: 180 mg/L.

Environmental Significance:

Scales are formed as inner coating of the pipelines which prevents corrosion. Absolutely soft waters are corrosive and dissolve the metals. Hard water is useful to growth of children due to the presence of calcium. Hard waters cause excessive consumption of soap used for cleaning purpose. Sodium soaps react with multivalent metallic cations to form a precipitate, thereby lose their surfactant properties. Lathering doesn't take place until all hardness ions precipitate out. This precipitate adheres to surfaces of tubes, sinks, dish washer and may stain clothing. Scales formed mainly due to carbonate hardness act as insulations and cause enormous loss of fuel in boiler. Scales deposited due to increase in pH to 9 at which bicarbonates are converted as carbonates are formed in distribution mains reducing their carrying capacity.

Apparatus:

Titration Stand with Burette, Conical Flask, Beaker, Measuring Cylinder, Pipette, Funnel, Wash Bottle etc.

Reagents:

Standard EDTA solution 0.01 M (0.02N): Dissolve 3.723 gm EDTA disodium salt and dilute to 1000 ml distilled water.

Erichrome black T indicator: Mix 0.5gm dye with 100 gm NaCI to prepare dry powder. or 0.5 gm of indicator in 100 ml of Ethyl Alcohol.

Ammonia Buffer solution: Dissolve 16.9gm Ammonium Chloride (NH_4Cl) in 143 ml of Ammonium Hydroxide (NH_4OH). Add 1.25 gm magnesium salt of EDTA and dilute to 250 ml with distilled water.

Procedure:

50mL of sample is taken in a conical flask (V) and 1-2 ml of Ammonia buffer solution is added to it. A pinch of Eriochrome black T is added and titrated with standard EDTA (0.01 M) till wine red color changes to blue color. The Volume of EDTA is noted down.

Then another 50 mL of sample is taken in a clean beaker and boiled for 20minutes to remove precipitate form due to decomposition of temporary hardness. A reagent blank is run with distilled water and above steps is followed. The volume of EDTA consumed is noted down.

Observation:

1. Titrant :
2. Indicators : Eriochrome Black T Indicator
3. End Point : Wine Red to Blue

Tabulation:

Total Hardness:

Sample	Initial Burette reading of sample	Final Burette reading of sample	Total Burette reading of sample	Volume of EDTA(ml)	Total hardness in mg/l

Permanent Hardness:

Calculations:

Volume of hard water taken=

Sample	Initial Burette reading of sample	Final Burette reading of sample	Total Burette reading of sample	Volume of EDTA(ml)	Permanent hardness in mg/l

Volume of EDTA Solution consumed=

Volume of boiled water taken=

Total hardness as mg/l = (Volume of EDTA solution consumed/Volume of hard water taken) X 1000

Permanent hardness as mg/l = (Volume of EDTA solution consumed /Volume of boiled water taken) X 1000

Result:

Hardness of the supplied water sample is found to be

Discussions:

Discuss the results obtained

EXPERIMENT 7

Aim: To determine the chloride content of the given sample.

Theory:

Chloride in the form of chlorine ion is one of the major inorganic anions. The salty taste produced by Chloride concentration is variable and dependent on the chemical composition of water. The Chloride is higher in wastewater than in raw water. Along the sea costal, Chloride may be present in high concentrations because of intrusion of salt water into the water and sewage system. In this method, slightly alkaline solution is used. Potassium chromate can indicate the end point of Silver nitrate titration of Chloride as quantitatively precipitated before red Silver chromate is formed.

In Mohr's method, the acidity of the water sample is removed by adding calcium carbonate. Potassium chromate acts as an indicator for titration. Preferential precipitation of white silver chloride over red silver chromate is the principle of this method. The change of colour from white to red indicates the end point. The reactions are:

$$\mathrm{NaCl + AgN03 \sim AgCl + NaNO_3}$$

(white)

$$\mathrm{Ag_2Cr0_4 + 2KNO_3}$$ (red)

Environmental Significance:

Chlorides associated with sodium (Sodium Chloride) exert salty taste when its concentration is more than 250 mg/L. These impact a salty taste to water. Chlorides are generally limited to 250 mg/L in water supplies intended for public water supply. In many areas of the world where water supplies are scarce, sources containing as much as 2000 mg/L are used for domestic purposes without the development of adverse effect, once the human system becomes adapted to the water.

It can also corrode concrete. Magnesium chloride in water generates hydrochloric acid after heating which is also highly corrosive and creates problem in boilers. Chloride determinations in natural waters are useful in the selection of water supplies for human use. Chloride determination is used to determine the type of desalting apparatus to be used and to control pumping of ground water from locations where intrusion of seawater is a problem.

Apparatus:

Titration Stand with Burette, Conical Flask, Beaker, Measuring Cylinder, Pipette, Funnel, Wash Bottle etc.

Reagents:

1. Standard silver nitrate solution, AgN03 (0.02 N)
2. 5 % Potassium chromate solution

Procedure:

50 mL of the given water sample is pipetted in a conical flask. Two drops of potassium chromate is added to the sample. The whole solution is titrated against standard silver nitrate solution with constant stirring. The red colour appearing at this stage does not persist and disappears on shaking. The titration is carried out till faint red colour persists. The procedure is repeated till three concordant readings are obtained.

Observation:

1. Titrant :
2. Indicator : Potassium Chromate Solution
3. End Point : Yellow to Brick Red

Tabulation:

sample	Volume of sample ml	Initial Burette reading of sample	Final Burette reading of sample	Volume of silver nitrate(mL)	Chloride(mg/l)

Calculations:

Initial Burette reading = X mL , Final Burette reading = Y mL

Total volume of $AgN0_3$= X - Y = V mL, Strength of $AgN0_3$ solution = y (N/50)

1000 mL of 1 N $AgN0_3$ solution = 35.5 g of chloride

V mL ofy (N/50) $AgN0_3$ solution = (35.5 x V x y x 1000)/(50 x 1000) = 0.71 Vy mg of chloride

50 mL of supplied water sample contains 0.71 Vy mg of chloride

1000 mL of supplied water sample contains (0.71 Vy x 1000) / 50 mg of chloride = 14.2Vy mg of chloride

Concentration of chloride in given water sample = 14.2Vy mg/L

Result:

The chloride concentration of the given water sample is found to be

Discussion:

Discuss on the result obtained.

EXPERIMENT 8

Aim: To determine the Residual Chlorine present in water.

Theory:

Chlorine will liberate free iodine from potassium iodide (KI) solutions at pH 8 or less. The liberated iodine is titrated with a standard solution of sodium thiosulphate with starch as the indicator. The liberated iodine is directly proportional to the concentration of chlorine present in sample. Titrate at pH 3 to 4 because the reaction is not stoichiometric at neutral pH due to partial oxidation of phosphate to sulfate.

Select a sample volume that will require not more than 20mL of 0.01N sodium thiosulphate. For residual chlorine concentration of 1 mg/L or less, 100mL sample for chlorine range 1-10 mg/L, 500ml for chlorine above 10mg/L and proportionally less as per chlorine concentration.

Apparatus:

Titration Stand with Burette, Conical Flask, Beaker, Measuring Cylinder**,** Pipette, Funnel, Wash Bottle etc.

Reagents:

1. Acetic acid, conc. (glacial)
2. Potassium iodide, KI, crystals
3. Standard sodium thiosulphate, 0.01N: Dissolve 2.482gm in 1L freshly boiled distilled water.
4. Starch indicator solution

Procedure:

1. 200 ml of chlorinated water sample is taken in a conical flask (V).
2. 5 ml Acetic Acid is added in sample to reduce the pH between 2 and 4.
3. Then 1 gm potassium Iodide (KI) is dissolved it by thoroughly mixing it with stirring rod. The titration is performed quickly with standard solution $Na_2S_2O_3$ until the yellow colour of librated iodine is almost faded out. (Pale yellow colour appears)
5. 1 ml of starch solution is added, the yellow colour changes to dark blue colour. The titration is continued until the blue colour disappears. The volume of titrant used is noted down.

Observation:

1. Titrant:

2. Indicator: Starch Solution

3. End Point: Blue to Colorless

Tabulation:

Sample	Initial burette reading (ml)	Final burette reading (mL)	Volume $Na_2S_2O_3$ (mL)	Residual Chlorine (mg/l)

Calculation:

Residual chlorine in mg/l = (volume of sodium thiosulphate A X N X 35.46 X 1000) / V

Result:

The residual chlorine of the given water sample is found to be

Discussion:

Discuss about the potability of water based on the result obtained.