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Project Report

On

*“Analysis of Water Samples”*

Submitted

to

School of Applied Sciences



by

(IP Group No- 16 CSE K103)

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Guide - Jyotsna Kaushal

1. Abstract

The basic idea behind our project is to give emphasize on the factor chemical contamination. To check the amount of contaminants in water samples initially different water samples were collected from different resources. As inputting the following parameters which are the key to check the chemical contaminants (calcium, magnesium, arsenide, chlorine content, dissolved oxygen, ph) in the respective water .Through our project, we want find out the reason for the contamination of water over different parameters and how to remove them.

Water is odorless, tasteless, transparent liquid that is colorless in small amounts but exhibits a bluish tinge in large quantities. It is the most familiar and abundant liquid on earth. In solid form (ice) and liquid form it covers about 70% of the earth's surface. Most of the living tissue of a human being is made up of water; it constitutes about 92% of blood plasma, about 80% of muscle tissue, about 60% of red blood cells, and over half of most other tissues.

2. INTRODUCTION

We choose this project because in the present world water contamination is very common. Day by day increase in number of pollutants in water leads to the water problem that must be cured as soon as possible. The most important factor to take into the account is the chemical contamination in water.

And so is our project based upon which involves the analysis of different water samples on different parameters. It is so made to specify the chemical contaminants such as calcium, magnesium, fluoride, dissolved oxygen, chlorine content, ph which are unlikely to change significantly with time. For our survey, we have been assigned a village THUHA which is situated nearby CHITKARA UNIVERSITY.

An attractive conversation has been done with the Sarpanch of the village who made us meet with some knowledgeable facts. We have gained some basic information about the village like village has 2100 votes and 500 houses each contains motors.

The point to look upon was that initially the bore wells were dig around 350 feet but now its around 650. For our further analysis different water samples were taken out from different resources to look upon the parameters like hardness, chlorine content, dissolved oxygen, ph, and etc. the result has been carried out very efficiently when we checked out these

3. Parameters to be investigated

* Hardness
* Residual chlorine
* pH
* Dissolved Oxygen
* C.O.D
* TDS(Total Dissolved Solids**)**

4. Hardness

Water hardness is the amount of dissolved calcium and magnesium in the water. The simple definition of water hardness is the amount of dissolved calcium and magnesium in the water. Hard water is high in dissolved minerals, both calcium and magnesium

* Types of hardness

Temporary hardness is a type of water hardness caused by the presence of [dissolved](https://en.wikipedia.org/wiki/Dissolution_(chemistry)) [bicarbonate](https://en.wikipedia.org/wiki/Bicarbonate) [minerals](https://en.wikipedia.org/wiki/Mineral) ([calcium bicarbonate](https://en.wikipedia.org/wiki/Calcium_bicarbonate) and [magnesium bicarbonate](https://en.wikipedia.org/wiki/Magnesium_bicarbonate)).

When dissolved, these minerals yield calcium and magnesium [cations](https://en.wikipedia.org/wiki/Cations) (ca2+, mg2+) and carbonate and [bicarbonate](https://en.wikipedia.org/wiki/Bicarbonate) [anions](https://en.wikipedia.org/wiki/Anion) (co32−, hco3−)

Permanent hardness is hardness (mineral content) that cannot be removed by [boiling](https://en.wikipedia.org/wiki/Boiling). When this is the case, it is usually caused by the presence of [calcium sulphate](https://en.wikipedia.org/wiki/Calcium_sulphate)/[calcium chloride](https://en.wikipedia.org/wiki/Calcium_chloride),

Increased intake of magnesium salts may cause a change in bowel habits (diarrhea).Drinking-water in which both magnesium and sulphate are present in high concentrations (~250 mg/l each) can have a laxative effect. Laxative effects have also been associated with excess intake of magnesium taken in the form of supplements, but not with magnesium in the diet.

4.2. Procedure *-*

* We rinsed and fill the burette with EDTA solution. Take 50 ml of standard hard water in to a conical flask. Add 5 ml of buffer solution and 2-3 drops of EBT indicator to it. The color of the solution turns wine red.
* Titrate it against standard 0.1 m EDTA solution till the color of the solution changes from wine red to blue at the end point. Take the two readings. Titrate similarly with all the collected samples .Take 100 ml of the hard water in 250 ml beaker & boil gently for about 20 minutes.
* Cool and filter it. Temporary hardness will precipitate out. Take 50 ml of filtrate and titrate with EDTA in the similar way as described above. This volume of EDTA used corresponds to permanent hardness of the water sample.

4.3. General Calculation

A) 1ml of known solution = 1mg CaCO3

V1 ML of EDTA =50 ml known solution=50 mg CaCO3

1 ml EDTA = 50/ V1 mg CaCO3

B) Total hardness

50 ml unknown solution = V2 ml EDTA

= V2 \* 50 /V1 mg CaCO3

1 ml unknown solution = V2/V1\* 50/50 mg CaCO3

1000 ml unknown solution = V2/V1 \* 1000mg CaCO3

Total Hardness = V2/V1 \* 1000 ppm

C) Permanent hardness

50 ml boiled water = V3 ml EDTA

Permanent hardness = V3/V1 \*1000 mg CaCO3

Permanent hardness= V3/V1 \*1000 ppm

D) Temporary hardness = Total hardness - Permanent hardness

4.4. Result-





5. Dissolved Oxygen

Dissolved oxygen refers to the level of free, non-compound oxygen present in water or other liquids. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water. In limnology (the study of lakes), dissolved oxygen is an essential factor second only to water itself .A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality.

* How DO varies with the temperature-

## Dissolved oxygen concentrations decrease as temperature increases Solubility of oxygen decreases as temperature increases . This means that warmer surface water requires less dissolved oxygen to reach 100% air saturation than does deeper, cooler water. Consequences of Unusual DO Levels-Fish kill / Winterkill, Gas Bubble Disease. A winterkill is a fish kill caused by prolonged reduction in dissolved oxygen due to ice or snow cover on a lake or pond ²⁰.Just as low dissolved oxygen can cause problems, so too can high concentrations. Supersaturated water can cause gas bubble disease in fish and invertebrates.

5.1. Procedure

* A 250ml amount of sample water is taken in a stopper bottle avoiding contact with air. Add 2ml of manganese sulphate and 2ml of alkaline KI solution to it. Stopper the bottle and shake it thoroughly. Allow the ppt. to settle down and add 2 ml conc. Sulphuric acid and shake
* The bottle until the ppt. is completely dissolved. Take 100ml of prepared solution in 250 ml titration flask. Titrate the liberated iodine with hypo solution until the solution becomes pale yellow.
* Add 2-3 drops of starch indicator and the solution turns blue. Continue the titration till blue color disappears. Take three concordant readings.

5.2. General Calculation

Normality = N1 \*V1=N2\*V2

=1/20\*V1=N2\*100

N2=V1/2000

Strength of dissolved oxygen =N2\*Eq. wt.

5.3. Results-





6. Residual Chlorine

Residual chlorine is the amount of chlorine that remains in the water after a certain period or contact time. Through the residual chlorine test, the remaining chlorine amount is determined in water that has finished testing and is ready to be released in the distribution system.

* Different forms of residual chlorine-

1. Free - Residual chlorine composed of dissolved hypochlorite ions, hypochlorous acid and chlorine gas
2. Combined - Composed of chloramines that can kill bacteria and oxidize organic matter
3. Total - The sum of free and combined residual chlo

Chlorine and chlorine-based disinfectants are used worldwide to destroy germs in drinking water and swimming pools. One of the reasons for the widespread use of chlorine disinfectants is that they provide a “residual” level of protection against waterborne pathogens

6.3. Procedure -

* Take 50 ml of the given water sample in a conical flask, add 5 ml of KI solution 2ml of glacial acetic acid to maintain PH up to 3-4.Cover the flask and shake it well to ix the solution properly. With the help of a wash bottle rinse the sides of the flask and titrate it against N/20 Hypo solution until a pale yellow color appears.
* Now add 1-2 drop of freshly prepared starch solution as indicator, a deep blue color appears. Again, titrate it against N/20 hypo solution until the blue colored solution becomes colorless.
* Note the final reading and repeat to get three concordant readings.

WHO Standard for residual chlorine - 0.2 ppm.

7. pH

pH a figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are more acid and higher values more alkaline. The pH is equal to −log10 c, where c is the hydrogen ion concentration in moles per litre.

Chemicals reactions in water are affected by the acidity or alkalinity of the solution. This is important not only in the chemistry lab, but in industry, cooking, and medicine. pH is carefully regulated in human cells and blood. The normal pH range for blood is between 7.35 and 7.45. Variation by even a tenth of a pH unit may be fatal. Soil pH is important for crop germination and growth.

Acid rain caused by natural and man-made pollutants changes the acidity of soil and water, greatly affecting living organisms and other processes. In cooking, pH changes are used in baking and brewing. Since many reactions in everyday life are affected by pH, it's useful to know how to calculate and measure it

7.1. Procedure

* Calibrate the pH-meter with the glass electrode in the buffer solution of know .Clean the electrode using distilled water and wipe them with tissue paper.
* Take 50ml amount and dip the glass electrode in it. Note the pH

**(pH-Meter)**

**7. Results**

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8. Total Dissolved solids

Total dissolved solids (TDS) are a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular (colloidal sol) suspended form. Generally the operational definition is that the solids must be small enough to survive filtration through a filter with two-micrometer (nominal size or smaller) pores. In general, the total dissolved solids concentration is the sum of the cations (positively charged) and anions (negatively charged) ions in the water.

* Water classification

1. Fresh water: less than 500 mg/L TDS=500 ppm

2. Brackish water: 500 to 30,000 mg/L TDS=500-30 000 ppm

3. Saline water: 30,000 to 40,000 mg/L TDS=30 000-40 000 ppm

4. Hypersaline: greater than 40,000 mg/L TDS>=40 000 ppm

8.2. Procedure -

* Take the water sample in beaker.
* Put TDS meter in each of the water sample.
* Note the observation.

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**(TDS-METER)**

8.3. Results

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9. Chemical oxygen demand

In environmental chemistry, the chemical oxygen demand (COD) is an indicative measure of the amount of oxygen that can be consumed by reactions in a measured solution. It is commonly expressed in mass of oxygen consumed over volume of solution which in SI units is milligrams per litre(mg/L). A COD test can be used to easily quantify the amount of organics in water. The most common application of COD is in quantifying the amount of oxidizable pollutants found in surface water (e.g. lakes and rivers) or wastewater. COD is a useful in terms of water quality by providing a metric to determine the effect an effluent will have on the receiving body much like biochemical oxygen demand (BOD).

9.1. Procedure

* Take 50 ml of the sample in the round bottomed flask and 1g of h2so4 and some broken procelein pieces. Now add 25 ml of K2Cr2O7 (0.25N) to this solution and mix the contents of the flask.
* Attach the reflex condenser and reflex for 2 hours. Wash the condenser with distilled water in the flask. Cool and dilute to about 300ml by distilled water. Add 2-3 drops of ferroin an indicator and titrate against 0.25N Mohr's salt solution till the end point i.e from blue to wind red.
* Record the volume of Mohr's salt solution and let it be X ml. Perform a blank titration by using distilled water in place of sample solution. For this, take 50 ml of distilled water in a round bottomed flask, add the same amounts of reagents and reflux for 2 hours. Titerate it at the same way as is done with the sample water. Record the volume of Mohr's salt solution used. Let it b Y ml.

9.2. Result-No C.O.D is found in the sample.

## 10. RESULTS

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| **Sources of**  **Water** | **Dissolved**  **Oxygen** | **PH** | **C.O.D** | **TDS** | **Residual Chlorine** | **Hardness** |
| Tap Water | **11.2** | **7.15** | No  C.O.D  Found | **421** | **No chlorine** | **68** |
| R.O Water | **21** | **6.75** | No  C.O.D  Found | **365** | **No chlorine** | **204.5** |
| Well Water | **11.8** | **7.2** | No  C.O.D  Found | **330** | **No chlorine** | **105** |
| Hand Pump Water | **9** | **6.75** | No  C.O.D  Found | **456** | **No chlorine** | **1200** |

11. Conclusion-

* Residual chlorine
  + No chlorine content is found in the given samples.
  + On comparison with WHO standards we find the chlorine content to be fine in every sample.
* Dissolved oxygen.
  + Dissolved oxygen for the tested sample are 11.8, 11.2, 9, 20.8 mg/l. Test result shows that water is healthy and is fit for aquatic life.
  + For healthy water body dissolved oxygen is about 18 parts per million.
  + On comparison with WHO standards we can see that the water has samples have nearly the desired levels of D.O.
* pH
  + pH for the tested sample are 6.75, 7.23, 7.15, 6.75 which is well within WHO standards.
  + The pH range for water bodies is 6.5-8.5.
* Hardness-
  + Hardness for the tested sample is 204.5, 103, 68, 1200 ppm. Hardness of hand pump water is too much while hardness of tap water is very less than WHO standards
  + The hardness range is around 200-300 ppm.
* TDS-
* According to WHO standards water with TDS less than 500 is fresh water.
* Every sample has TDS less than 500.