

**DEPARTAMENT OF CHEMISTRY**

**(CHEM1002)**

**ANALYSIS AND INTERPRTATION OF DIFFERENT PHYSIOCHEMICAL PARAMETERS OF WATER SAMPLE FROM DIFFERENT DEPARTMENT OF ITER CAMPUS**

**DECLARATION**

We hereby declare that the project work entitled **“ANALYSIS**

**AND INTERPRETATION OF DIFFERENT PHYSIOCHEMICAL**

**PARAMETERS OF WATERSAMPLE FROM DIFFERENT**

**DEPATMENT OF ITER CAMPUS”** submitted by us to the

**“Institute of Technical Education and Research (S’O’A**

**Deemed to be University)”** is the practical fulfilment for the

requirement for the award of degree of B.Tech in “Electronics

and Communication Engineering Department” is a record of

bonfire project work carried out by us under guidance of

Associate Professor Mrs MALABIKA TALUKADR.

**CERTIFICATE**

This is to certify that report entitled

**“ANALYSIS AND INTERPRETATIION OF DIFFERENT**

**PYSICOCHEMICAL PARAMETERS OF WATER SAMPLE**

**COLLECTED FROM DIFFERENT BLOCK OF ITER CAMPUS”**

submitted by **“GROUP-11 OF ECE-B”** TO SIKSHA ‘O’

ANUSANDHAN DEEMED TO BE UNIVERSITY.In the subject

**“ENVIRONMENT STUDIES”** is a bonafide record of the work

done under supervision andguidance of Associate Professor

**\_“Mrs Malabika Talkudar”\_**

**ACKNOWLEDEMENT**

We take the opportunity to express our profound gratitude and deep regard

To Asso. Professor **MALAVILKA TALKUDAR (Department of Chemistry)**

For her exemplary guidance monitoring and constant encouragement

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**SIKSHA ‘O’ ANUSANDHAN**

DEEMED TO BE UNIVERSITY

INSTITUTE OF TECNICAAL EDUCATION AND RESEARCH

**ANALYSIS AND INTERPRETATION OF DIFFERENT PHYSIOCHEMICAL**

**PARAMETER OF WATER SAMPLE COLLECTED FROM DIFFERENT BLOCK**

OF ITER CAMPUS

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**INTRODUCTION**

Water is one of the most important and abundant compounds of the

eco - system . All living organisms on the earth need water for their survival

and growth . As of now only earth is the planet having about 70% of water. But

due to increased human pollution, industrialization, use of fertilizer in the

agriculture and man-made activity it is highly polluted with different harmful

contaminants. Therefore it is necessary that the quality of drinking water

should be checked at regular time interval, because due to use of

contaminated drinking water, human pollution suffers from varied of water

bone diseases. It is difficult to understand the biological phenomenon fully

because the chemistry of water revels much about the metabolism of the

eco-system and explain the general hydro-biological relationship.

The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. Natural water contains different type of impurities are introduce in to aquatic system by different ways such as weathering of rocks and leaching of soils, dissolutions of aerosol particles from the atmosphere and from several human activities, including mining, processing and the use of metal based materials.

The increased use of metal-based fertilizer in agriculture revolution of the

government could result in continued rise in concentration of metal pollution

in fresh water reservoir due to the water run-off. Also faucal pollution of

drinking water causes water born disease which has led to the death of

millions of people.

People on globe are under tremendous threat due to undesired

changes in the physical, chemical and biological characteristics of air, water

and soil. These are related to animal and plants and finally affecting on it.

Industrial development (either new or existing industry expansion) results in

the generation of industrial effluents and if untreated results in water,

sediment and soil pollution. Having mainly excessive amounts of heavy metals

such as Pb, Cr and Fe as well as heavy metals from industrial processes are of

special concern because they produce water or chronic poisoning in aquatic

animals. High levels of pollutants mainly organic matter in river cause an

increase in biological oxygen demand, chemical oxygen demand, total

dissolved solids, total suspended solids and fecal coli form. They make water

unsuitable for drinking, irrigation or any other use.

These are trends in developing countries to use sewage effluents as fertilizer

has gained much importance as it is considered as a source of organic

matter and plant nutrients and serves as good fertilizer. Farmers are mainly

interested in general benefits, like increased agriculture production, low cost

water source, effective way of effluent disposal, source of nutrients, organic

matter etc., but are not well aware of its harmful effects like heavy metal

contamination of soils, crops, and quality problems related to health.

Research has proven that long term use of this sewage effluent for irrigation

contaminates soil and crops to such an extent that it becomes toxic to plants

and causes deterioration of soil.

**LITERATURE AND REVIWES:-**

**PH:**

More acidic solutions have lower pH . More alkaline solutions have higher pH . Substances that aren't acidic or alkaline (that is, neutral solutions) usually have a pH of 7 pH is a measure of the concentration of protons (H+) in a solution.

Role of pH:-

Managing pH is a critical component of maintaining healthy water chemistry. It is so important because pH is a driving factor in the Langelier Saturation Index (LSI), and also because pH determines how effective chlorine will be. The lower the pH, the stronger chlorine will be. That being said, it is also important to understand that the type of chlorine you use affects both pH and total alkalinity. That’s because different types of chlorine have very different pH levels. For example, Tricolours (mentioned above) has a low ph. But Calcium Hypochlorite (Cal Hypo) has a high pH of almost 12.

Low pH can cause damage to pool liners and etching of plaster; corrosion of metal components in and around the pool; skin and eye damage, as well as general patron discomfort; and a reduction of total alkalinity.

**CONDUCTIVITY:-**

Conductivity (or specific conductance) of an electrolyte solution is a measure of its ability to conduct electricity. The SI unit of conductivity is Siemens per meter (S/m).

Conductivity measurements are used routinely in many industrial and environmental applications as a fast, inexpensive and reliable way of measuring the ionic content in a solution. For example, the measurement of product conductivity is a typical way to monitor and continuously trend the performance of water purification systems.

Conductivity is traditionally determined by connecting the electrolyte in a Wheatstone bridge. Dilute solutions follow Kohlrausch's Laws of concentration dependence and additivity of ionic contributions. Lars Onsager gave a theoretical explanation of Kohlrausch's law by extending Debye–Hückel theory.

Resistance, R, is proportional to the distance, l, between the electrodes and is inversely proportional to the cross-sectional area of the sample, A (noted S on the Figure above). Writing ρ (rho) for the specific resistance (or resistivity),

In practice the conductivity cell is calibrated by using solutions of known specific resistance, ρ\*, so the quantities l and A need not be known precisely.

**TOTAL HARDNESS:-**

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. You may have felt the effects of hard water, literally, the last time you washed your hands. Depending on the hardness of your water, after using soap to wash you may have felt like there was a film of residue left on your hands. In hard water, soap reacts with the calcium (which is relatively high in hard water) to form "soap scum". When using hard water, more soap or detergent is needed to get things clean, be it your hands, hair, or your laundry.

**Disadvantage Advantage**

|  |  |
| --- | --- |
| It is more difficult to form lather with soap. | Some people prefer the taste. |
| Scum may form in a reaction with soap, wasting the soap. | Calcium ions in the water are good for children's teeth and bones. |
| Lime scale (a hard crust) forms inside kettles. This wastes energy whenever you boil a kettle. | It helps to reduce heart disease. |

**TOTAL ALKANITY:-**

Total alkalinity is the measure of the alkalinity of substances present in water. When the TA level is within appropriate levels, fast pH changes are prevented, which in turn balances the pH levels.

If the total alkalinity is too high, it can be hard to regulate the ph. With this, the water turns cloudy and the water may continuously need acid, depending on the results of testing. When this happens, the chlorine in the water becomes less efficient in disinfecting.

It is highly suggested to test for total alkalinity levels on a regular basis to maintain the safety and quality of water, pipelines and distribution systems.

The levels of TA can be raised when necessary with the use of compounds like sodium carbonate. When lowering the TA, acid in dry or liquid form can be added, such as dry acid and hydrochloric acid. Both can be time-consuming processes, but are guaranteed to provide appropriate solutions.

**Importance of alkanity :-**

Alkalinity is a measure of the capacity of water to neutralize acids (see pH description). Alkaline compounds in the water such as bicarbonates (baking soda is one type), carbonates, and hydroxides remove H+ ions and lower the acidity of the water (which means increased pH). They usually do this by combining with the H+ ions to make new compounds.

**Role of alkanity:-**

If you’re a pool operator, you probably already know that pH can fluctuate up and down. And when it does, the pool is constantly fighting against you. Having the right level of total alkalinity is a good thing, because it helps to keep the pH stabilized. A simple way to think about this is alkalinity neutralizes acids.

Technically, alkalinity buffers pH by either providing or absorbing a Hydrogen ion (H+) as needed. So when acid is added, carbonate ions can absorb Hydrogen to create bicarbonate ions. This is an equilibrium, just like pH, so it can go the other way too. The equilibrium looks like this:

HCO3- + H+ ↔ H2CO3

You could have a ton of 8.3pH Sodium Bicarb floating around in the water, and have the same pH as if you added a much smaller amount of 13.0pH soda ash. But the total alkalinity would be higher for the Sodium Bicarb, because there’s simply more of it in the water.

**DISSOLVED OXYGEN:-**

Dissolved oxygen (DO) refers to microscopic bubbles of gaseous oxygen (O2) that are mixed in water and available to aquatic organisms for respiration—a critical process for almost all organisms. Aquatic plants release oxygen into the water as a by product of photosynthesis.

Non-compound oxygen, or free oxygen (O2), is oxygen that is not bonded to any other element. Dissolved oxygen is the presence of these free O2 molecules within water. The bonded oxygen molecule in water (H2O) is in a compound and does not count toward dissolved oxygen levels. One can imagine that free oxygen molecules dissolve in water much the way salt or sugar does when it is stirred .

IMPORTANCE OF DISSOLVED OXYGEN:-

The temperature effect:-

If water is too warm, there may not be enough oxygen in it. When there are too many bacteria or aquatic animal in the area, they may overpopulate, using DO in great amounts.

Oxygen levels also can be reduced through over fertilization of water plants by run-off from farm fields containing phosphates and nitrates (the ingredients in fertilizers). Under these conditions, the numbers and size of water plants increase. Then, if the weather becomes cloudy for several days, respiring plants will use much of the available DO. When these plants die, they become food for bacteria, which in turn multiply and use large amounts of oxygen. And this depleting all the oxygen.

How much DO an aquatic organism needs depends upon its species, its physical state, water temperature, pollutants present, and more. Consequently, it’s impossible to accurately predict minimum DO levels for specific fish and aquatic animals. For example, at 5 oC (41 of), trout use about 50-60 milligrams (mg) of oxygen per hour; at 25 oC (77 of), they may need five or six times that amount. Fish are cold-blooded animals. They use more oxygen at higher temperatures because their metabolic rates increase.

Environmental Impact:-

Total dissolved gas concentrations in water should not exceed 110 percent. Concentrations above this level can be harmful to aquatic life. Fish in waters containing excessive dissolved gases may suffer from "gas bubble disease"; however, this is a very rare occurrence. The bubbles or emboli block the flow of blood through blood vessels causing death. External bubbles (emphysema) can also occur and be seen on fins, on skin and on other tissue. Aquatic invertebrates are also affected by gas bubble disease but at levels higher than those lethal to fish.

**Material and Methods**

The present study was carried out for four different department of ITER campus located in Bhubaneswar city. In the present study the sampling was done during morning hours and all water samples were collected in the polyethylene bottles. For tap water sample collection the closed bottle was dipped in the lake at the depth of 9.00 AM to 11.00 AM, and then a bottle was opened inside and was closed again to bring it out at the surface. The samples were collected from four different points and were mixed together to prepare different sample. From the time of sample collection and to the time of actual analysis, many physical and chemical reactions would change the quality of water sample therefore to minimize this change the sample were preserved soon after the collection. The water samples were preserved by adding chemical preservatives and by lowering the temperature. The water temperature, Odour, Taste, TDS were analysed immediately on the spot after the collection, Whereas the analyses of remaining parameters were done in the laboratory. The study was carried for a period of three week. The collected water samples were brought to the laboratory and relevant analysis was performed. pH was determined using pH meter, and similarly turbidity is “Physicochemical Analysis Of Water From Various department of ITER campus and Their Comparative Studies” measured by Turbidity meter.

**RESULT AND CALCULATION:-**

Observation Table (PH):-

|  |  |  |  |
| --- | --- | --- | --- |
| NO. OF SAMPLES | DEPARTMENTS | PH | MEASURE OF THE SAMPLE |
| 1 | E-BLOCK | 7.39 | SIMPLY ALKALIC |
| 2 | B-BLOCK | 6.92 | WEAK ACIDIC |
| 3 | D-BLOCK | 6.71 | WEAK ACIDIC |
| 4 | CANTEEN | 6.86 | WEAK ACIDIC |

**CONDUCTIVITY**

**Observation Table (Conductivity)**

|  |  |  |  |
| --- | --- | --- | --- |
| NO. OF SAMPLES | DEPARTMENTS | CONDUCTIVITY | MEASURE OF THE SAMPLE |
| 1 | E-BLOCK | 74.88 | SIMPLY ALKALIC |
| 2 | B-BLOCK | 120.2 | WEAK ACIDIC |
| 3 | D-BLOCK | 78.17 | WEAK ACIDIC |

**TOTAL HARDNESS**

**]**Observation Table (E-Block)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No of Obs | Vol of water(100ml) | IBR | FBR | DIFF  (FBR-IBR) | CONC READING |
| 1 | 100ML | 1.2 | 10.8 | 9.6 |  |
| 2 | 100ML | 10.8 | 20.2 | 9.4 | 9.4 |
| 3 | 100ML | 20.2 | 29.6 | 9.4 |  |

TOTAL HARDNESS =94 mg/L

Observation Table (B-Block)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No of Obs | Vol of water(100ml) | IBR | FBR | DIFF  (FBR-IBR) | CONC READING |
| 1 | 100ML | 1.2 | 15.6 | 14.4 |  |
| 2 | 100ML | 15.6 | 26.8 | 11.2 | 11.2 |
| 3 | 100ML | 26.8 | 38.0 | 11.2 |  |

TOTAL HARDNESS=112 mg/L

**TOTAL ALKALINITY**

**Observation Table (E-Block)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No Of Obs | Volume of Sample | IBR | FBR1 | FBR2 | DIFF  (F1-1) | CONC  (V1) | DIFF2  (F2-F1) | CONC2  (V2) |
| 1 | 50ML | 1 | 6 | 11.5 | 5 | NIL | 5.5 | NIL |
| 2 | 50ML | 11.5 | 17.5 | 23.5 | 6 | 5 | 6 | 6 |
| 3 | 50ML | 23.5 | 28.5 | 34.5 | 5 | NIL | 6 | NIL |

TOTAL ALKALINITY=220 ppm

**Observation Table (B-Block)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No Of Obs | Volume of Sample | IBR | FBR1 | FBR2 | DIFF  (F1-1) | CONC  (V1) | DIFF2  (F2-F1) | CONC2  (V2) |
| 1 | 50ML | 1.2 | 1.2 | 6 | 0 | NIL | 4.8 | NIL |
| 2 | 50ML | 6 | 6 | 13 | 0 | 0 | 7 | 7 |
| 3 | 50ML | 13 | 13 | 29 | 0 | NIL | 7 | NIL |

TOTAL ALKALINITY=140 ppm

**Observation Table (D-Block)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No Of Obs | Volume of Sample | IBR | FBR1 | FBR2 | DIFF  (F1-1) | CONC  (V1) | DIFF2  (F2-F1) | CONC2  (V2) |
| 1 | 50ML | 10 | 12.2 | 19.2 | 2.2 | NIL | 7 | NIL |
| 2 | 50ML | 19.2 | 21.2 | 28 | 2 | 2 | 6.8 | 7 |
| 3 | 50ML | 20 | 30 | 37 | 2 | NIL | 7 | NIL |

TOTAL ALKALINITY=180 ppm

**Observation Table (CANTEEN WATER)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No Of Obs | Volume of Sample | IBR | FBR1 | FBR2 | DIFF  (F1-1) | CONC  (V1) | DIFF2  (F2-F1) | CONC2  (V2) |
| 1 | 50ML | 0 | 0 | 5 | 0 | NIL | 0 | NIL |
| 2 | 50ML | 5 | 5 | 10.6 | 0 | 0 | 5.6 | 5.6 |
| 3 | 50ML | 10.6 | 10.6 | 16.2 | 0 | NIL | 5.6 | NIL |

TOTAL ALKALINITY=112 ppm

**DISSOLVED OXYGEN**

**Observation Table (E-BLOCK)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No of Obs | Vol of water(100ml) | IBR | FBR | DIFF  (FBR-IBR) | CONC READING |
| 1 | 100ML | 24 | 28 | 4 |  |
| 2 | 100ML | 28 | 31 | 3 | 3 |
| 3 | 100ML | 31 | 34 | 3 |  |

DISSOLVED OXYGEN=6 ppm

**Observation Table (B-BLOCK)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No of Obs | Vol of water(100ml) | IBR | FBR | DIFF  (FBR-IBR) | CONC READING |
| 1 | 100ML | 14 | 18 | 4 |  |
| 2 | 100ML | 18 | 22.2 | 4.2 | 4 |
| 3 | 100ML | 22.2 | 26.2 | 4 |  |

DISSOLVED OXYGEN=8 ppm

Observation Table (D-BLOCK)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No of Obs | Vol of water(100ml) | IBR | FBR | DIFF  (FBR-IBR) | CONC READING |
| 1 | 100ML | 37 | 42 | 5 |  |
| 2 | 100ML | 42 | 47.2 | 5.2 | 5 |
| 3 | 100ML | 5 | 10 | 5 |  |

DISSOLVED OXYGEN=10 ppm

Observation Table (CANTEEN)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No of Obs | Vol of water(100ml) | IBR | FBR | DIFF  (FBR-IBR) | CONC READING |
| 1 | 100ML | 0 | 3.8 | 3.8 |  |
| 2 | 100ML | 3.8 | 7.8 | 4 | 4 |
| 3 | 100ML | 7.8 | 11.8 | 4 |  |

DISSOLVED OXYGEN=8 ppm

**Results and Discussion**

The results of the physicochemical analysis of different department of ITER campus water samples.

**pH**

pH is considered as an important ecological factor and provides an important piece factor and piece of information in many types of geochemical equilibrium or solubility calculation. pH is an important parameter in water body since most of the aquatic organisms are adapted to an average pH and do not withstand abrupt changes. The pH values fluctuated between 6.86 to 7.39 . The limit of pH value for drinking water is specified as 6.5 to 8.5. The pH shows simply alkalic and weak acidic in nature. Generally pH of water is influenced by geology of catchments area and buffering capacity of water.

**Conductivity**

Conductivity (or specific conductance) of an electrolyte solution is a measure of its ability to conduct electricity . Measuring of conductivity is important parameter of water samples. The conductivity fluctuated between 74-120 which shows simply alkalic and weak acidic in nature.

**Total alkalinity**

The standard desirable limit of alkalinity in potable water is 120 mg/L. The value of alkalinity in water provides an idea of natural salts present in water. The cause of alkalinity is the minerals which dissolve in water from soil. The various ionic species that contribute to alkalinity include bicarbonate, hydroxide, phosphate, borate and organic acids. These factors are characteristics of the source of water and natural processes taking place at any given time .

**Total hardness (TH)**

ISI has specified the total hardness to be within 300 mg/L of CaCO3. Regarding total hardness fluctuating trends in its value were observed in different department in ITER campus. The observed total hardness values were well within the limits. It has comparatively high TH value (220 mg/L) than (94 mg/L).

**Dissolved Oxygen**

Dissolved oxygen (DO) refers to microscopic bubbles of gaseous oxygen (O2) that are mixed in water and available to aquatic organisms for respiration—a critical process for almost all organisms. We have taken some observation and found different dissolved oxygen found in water samples .we have mainly found 6 ppm to 10 ppm in different observations.

CONCLUSION

The result obtained during study was compared with ISI standards. Potable water is water safe enough to be consumed by humans or used with low risk of immediate or long term harm. Habited water is generally used by animals & birds & aquatic life. The disturbance in this biological system & ecological system may affect health of animals & birds & aquatic life. After physicochemical analysis we found that the sample of Potable water and Habited water are free from pollution & ecologically balanced.

**Future Work**

For a detailed analysis of water quality in ITER department, the monitoring and analysis should be carried out for a longer period of time. The minimum time for such monitoring in order to have a series of data or trends to confirm the study reliability. Standardization of the sampling locations would also help in making the obtained data more comparable with scientific findings. Study can be carried out in assessing concentration of Sn in the human body through analysis of urine or blood paired with health impact assessment to a population in certain locations, which may have been affected by high concentration of Sn in drinking water. The analysis of water parameters should be analysed in advanced analytical techniques such as Inductively Coupled Plasma-Mass Spectrometer (ICP-MS) in comparison to FAAS (used in current study) due to high detection limits . Besides the chemical and heavy metal analysis, the microorganisms (protozoa parasite, algae, bacteria, and virus), radionuclides (radioactive material’s such as uranium), and disinfectants should be analysed using advanced techniques such as ICP-MS.

**REFERENCE**

>Environmental studies lab record and manual.

>Internet(Goggle) – (Wikipedia)