## Fwd: Internship at ICCR- reg.

banditarani behera <bandita614@gmail.com>

Mon 05-Jul-21 6:29 PM

To: Ms. Mayuri Mistry <mayuri.mistry@cug.ac.in>

3 attachments (46 KB)

Undertaking non-discloure RO AHD.docx; Interns Agreement RO Ahmadabad.docx; sig0.jpeg;

---------- Forwarded message ---------
From: **Director Admin ICCR** <spdadmn.iccr@gov.in>
Date: Wed, 23 Jun 2021, 11:11 am
Subject: Internship at ICCR- reg.
To: <bandita614@gmail.com>
Cc: Rajeev Kumar <ddgad.iccr@mea.gov.in>

Dear Ms. Behera,

Please refer to your application for Internship in ICCR and online interview held on June 11, 2021.

The Competent Authority of ICCR has decided to engage you as Intern in the Council at its Regional office at Ahmedabad for a period of four months.

You are requested to report at ICCR's, Regional Office Ahmedabad on July 01, 2021

Kindly convey your acceptance for working as full time Intern as per the terms and conditions specified above.

With kind regards,

वाई एल राव / Y L Rao
**निदेशक (प्रशासन)/ Director (Administration)**
**भारतीय सांस्कृतिक संबंध परिषद/ Indian Council for Cultural Relations**
**आजाद भवन, आईपी एस्टेट/ Azad Bhavan, IP Estate**
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# CHARACTERIZING INCINERATOR ASH FOR ITS TREATMENT: THE CASE OF BIOMEDICAL WASTE

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF

**MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES**

BY


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GANDHINAGAR, INDIA

**JULY - 2021**

# A Dissertation

On

# Studies on the role of silicon in alleviating potassium deficiency in peanut (*Arachis hypogaea L.*) through physiological and biochemical approaches

**Submitted for the partial fulfillment of award of**

**Master of Sciences**

**Degree**

**In**

**Environmental Sciences**

**By**


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**Enrolment no. 190502003**

**School of Environment and Sustainable Development**
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# POLLUTION LOAD REDUCTION IN COMMON EFFLUENT TREATMENT PLANT USING MULTI-EFFECT EVAPORATOR

Dissertation Submitted in partial fulfilment of the requirement for the Degree of

**Master of Science in Environmental Sciences**

By


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# STAGEWISE PERFORMANCE EVALUATION OF COMMON EFFLUENT TREATMENT PLANT OF EAST AHMEDABAD, GUJARAT, INDIA

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF

**MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES**

BY


## KASHIKA CHAUDHARY

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GANDHINAGAR-382030

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**JULY-2021**

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This is to certify that **Ms. KASHIKA CHAUDHARY** is a student of M.Sc. ENVIRONMENTAL SCIENCES from **CENTRAL UNIVERSITY OF GUJARAT, Gandhinagar** was associated with **Gujarat Pollution Control Board, Gandhinagar** for her dissertation work on **"STAGEWISE PERFORMANCE EVALUATION OF COMMON EFFLUENT TREATMENT PLANT OF EAST AHMEDABAD, GUJARAT, INDIA"**. She has taken dissertation training during 28th January, 2021 to 20th July, 2021. She was found to be sincere in her work.

(M. V. Patel)
Head- Research & Development Cell

(A. V. Shah)
Member Secretary

**Date:** 28/7/2021
**Place: Gandhinagar**

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This is to certify that work described in the thesis on "*STAGEWISE PERFORMANCE EVALUATION OF COMMON EFFLUENT TREATMENT PLANT OF EAST AHEMDABAD, GUJARAT, INDIA*" submitted by "KASHIKA CHAUDHARY" (Roll No.: 190502017) to Central University of Gujarat, Gandhinagar has been carried out under my supervision in accordance for the partial fulfilment of the degree of Master of Science (Environmental Sciences) of Central University of Gujarat, Gandhinagar. The work incorporated in this thesis has not been submitted elsewhere earlier, in part or in full, for the award of any other degree or diploma of this or any other Institution or University.

**Date:** 28/7/2021

**Place:** Gandhinagar

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# DECLARATION

I, hereby declare that the dissertation entitled "**STAGEWISE PERFORMANCE EVALUATION OF COMMON EFFLUENT TREATMENT PLANT OF EAST AHMEDABAD, GUJARAT, INDIA**" submitted for the partial fulfillment of the award of the degree of Master of Science in **Environmental Sciences** from Central University of Gujarat, Gandhinagar, India. It is the result of investigations done by me under the direct guidance and supervision of **Dr. Sunita Varjani,** Scientific Officer, Gujarat Pollution Control Board, Gujarat. I also humbly affirm that no part of this dissertation has been submitted previously for any other degree to this University or any other University/Institute.

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# CERTIFICATE

# ACKNOWLEDGMENT

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**Signature**

**Kashika Chaudhary**

**Date: 17 July, 2021**

**Place: Gandhinagar**

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# LIST OF ABBREVIATIONS

1. DDE – Dichloro-Diphenyl-Dichloroethylene
2. DDD – Dichloro-Diphenyl-Dichloroethane
3. DDT – Dichloro-Diphenyl-Trichloroethane
4. PCB – Polychlorinated Biphenyls
5. MLD – Millions of Liters per Day
6. EPA – Environmental Protection Agency
7. CETP – Common Effluent Treatment Plant
8. POP – Persistent Organic Pollutants
9. VSS – Volatile Suspended Solids
10. FSS – Fixed Suspended Solids
11. BOD – Biological Oxygen Demand
12. COD – Chemical Oxygen Demand
13. TOC – Total Organic Carbon
14. SSI – Small Scale Industries
15. TSS – Total Suspended Solids
16. STP – Sewage Treatment Plant
17. ETP – Effluent Treatment Plant
18. TDS – Total Dissolved Solids
19. BAC – Bacterial Artificial Chromosome
20. MF – Micro Filtration
21. AOP – Advanced Oxidation Process
22. NF – Nano Filtration
23. WWTP – Waste Water Treatment Plant
24. DO – Dissolve Oxygen
25. MLSS – Mixed Liquor Suspended Solids

26. F/M – Food to Microorganisms Ratio
27. CLF – Clariflocculator
28. EQ – Equalization Tank
29. DAF – Dissolved Air Flotation
30. FPS – Final Pumping Station
31. BIS – Bureau of Indian Standards
32. APHA – American Public Health Association
33. CPHEEO – Central Public Health and Environmental Engineering Organisation
34. MLVSS – Mixed Liquor Volatile Suspended Solids
35. TIC – Total Inorganic Carbon
36. GSECL – Green Environment Services Co-operative Society Ltd.
37. ASP- Activated Sludge Process
38. FCR – Fenton Catalytic Reactor
39. MEE – Multi Effect Evaporator
40. RAS – Return Activated Sludge
41. WAS – Waste Activated Sludge
42. SLF – Secured Landfill Facility
43. SVI – Sludge Volume Index
44. TSDF – Total Solids Disposal Facility
45. LAF – Laminar Air Flow
46. CPCB – Central Pollution Control Board
47. GPCB – Gujarat Pollution Control Board
48. USEPA - United States Environmental Protection Agency

# CHAPTER 1
# INTRODUCTION

Water is the basis of all life on Earth, and it essentially dominates the chemical makeup of all species. Water's prevalence in biota as the pivot of biochemical metabolism is due to its distinct chemical and physical qualities. As a result of this fact, a direct connection has developed between its richness, quality of life and population density.

Newer studies in several nations have demonstrated that a country's pace of growth can be evaluated with incredible precision by the utility of water per occupant. Scarcity of drinking water and poor sanitation are two environmental issues that have a negative impact on human health. More than 1 billion people are projected to lack access to appropriate clean water resources. It has been estimated that roughly 80% of all diseases in the world may be traced back to a lack of safe drinking water in some form.

On the other hand wastewater is any spent water polluted by human activity. It is the utilized water from any mishmash of commercial, pastoral, industrial, household activities, surface storm water runoff, or sewage seepage. Wastewater is also considered as a byproduct of agricultural sector, commercial sector, domestic sector and industrial sector activities. It comprises matters like oils, food leftovers, human waste, chemicals etc.

## 1.1 TYPES OF WASTEWATER:

**A) <u>On a broad scale wastewater is generally categorized into 2 types namely</u>:**

**Sewage -** The type of wastewater which is a by-product of domestic activities is called sewage. Places like restaurants, hotels, schools, hospitals, houses and public toilets are responsible for producing large amounts of wastewater on regular basis, and it usually contains faecal matter and urine.

**Non-sewage -** Non - sewage wastewater is contributed by water used in commercial activities like laundrettes or garages, storm water and rainwater from flooding and water from industrial plants.

**B) <u>Based on domestic uses, wastewater can be categorized into following types</u>:**

**Blackwater -** Black water generates from kitchen sink, washrooms and dishwashers. Urine, tissue paper, food leftovers, faecal matter and huge amounts of dishwashing liquids and synthetics are elements found in black water. Due to its high contamination it can possibly cause diseases.

**Greywater -** It is the type of wastewater that comes from bathroom sinks, baths and washing machines. It does not carry urine, faeces or food waste with it. Also, it is less harmful than blackwater.

**Yellow water -** Yellow water primarily includes urine from some particular sources that does not contain pollutants of blackwater and greywater.

## 1.2 NATURE AND CHARACTERISTICS OF WASTEWATER:

The nature of waste water are primarily determined by its flow rate and quality characteristics and wastewater discharges are categorized based on the fact that whether they come from industries or municipalities. Wastewater flow rates also play important role in designing a wastewater treatment plant, important information regarding flow rates include Average daily flow, Maximum daily flow, Peak hourly flow, Minimum daily flow and minimum hourly flow. Average daily flow describes about average flow rate in a day based on total yearly flow rate data. Maximum daily flow describes about maximum flow rate occurring in a day based on yearly functioning data. Peak hourly flow describes about the peak hourly flow rate taking place in a day based on yearly functioning data. Minimum daily flow describes about the minimum flow rate taking place in a day depending on yearly functioning data. Minimum hourly flow describes about the minimum flow rate occurring in a day depending upon yearly functioning data.

The quality of wastewater is described by chemical, physical and biological characteristics. Chemical factors includes inorganics (pH, basicity, chloride, N, P, Toxic elements, heavy metals) organic elements (carbohydrates, surfactants, lipids, phenol, proteins, and pesticides) and gases like hydrogen sulfide, methane, oxygen as chemical factors. Solids, color, temperature, odour, oil turbidity and grease are physical factors. Lastly animals, viruses and plants are considered as biological factors.

## 1.3 WASTEWATER ANALYSIS:

Diverse methods are used to evaluate water and wastewater. Electrochemical (using meters with electrodes), Gravimetric (weighing), and optical measurements are the most popular (including visual). Instrumental approaches are growing more common, and with the addition of microprocessors, instrumentation is becoming better and simpler to use. The following are some of the most dependable measurement techniques-

- Gravimetric
- Electrochemical
- Colorimetric or spectrophotometry
- Titration
- Chromatography
- Mass spectrometry

The following are the purpose of wastewater analysis:

- To plan a wastewater treatment plant that is suited for a certain area.
- To track and assess the efficacy of treatment procedures.
- To look into the reuse of treated wastewater (in agriculture or recharge).
- To help formulate for Environmental Impact Assessment projects.

## 1.4 WASTEWATER TREATMENT:

Wastewater treatment technologies are designed to resemble physical, chemical and biological processes found in nature. The types of technology utilized and their intensity, as well as the various combinations of technologies, determine the distinctions across facilities. Then, almost all processes can be classified according to their physico-chemistry, biochemistry (including microbiology), and process speed.

In 2014, the “classical” secondary and biological activated sludge treatment process celebrated its centennial. From 1930 on, this wastewater treatment technique became the

treatment of choice all over the globe. Activated sludge technology is nevertheless very successful today, however there are various new technologies built on the activated sludge principle, such as membrane bioreactors (MBR), as well as other “hard” techniques that have established a market niche.

Usually, the treatment of wastewater generated by household activity, industries, factories and garbage landfill is carried out in the following stages -

- **Primary treatment:**

Sedimentation, coagulation, and filtration are used to treat waste water before it is discharged into a river or running stream. This is referred to as "primary treatment." If the water is to be used for consumption, it must be treated further using secondary and tertiary procedures.

- **Secondary or biological treatment:**

After the very first treatment, the water is unsuitable for human consumption and must be treated further. Secondary or biological treatment is used to accomplish this. Allowing contaminated water to spread out over a vast bed of stones and gravel promotes the growth of diverse microbes that require nutrients and oxygen. A swiftly moving food chain is established over time. Bacteria, for example, devour organic materials from dirty water, while protozoa feed on bacteria. Algae and fungi, for example, contribute to the cleaning procedure. This is referred to as secondary water treatment.

Softening and aeration are two of the mechanisms involved. Softening aids in the smoothing of water by eliminating Mg and Ca cations that are unwanted. Soft water is subjected to air during the aeration process by blowing air through it to give oxygen to the water. This promotes the breakdown of organic materials by bacteria into innocuous byproducts like water and Carbon Dioxide. The introduction of oxygen minimizes carbon dioxide, sulphate, and other contaminants, but the water is still unsafe to drink. It is necessary to eliminate harmful microbes and other bacteria. This is done in the treatment's following stage.

- **Tertiary treatment:**

The goal of tertiary wastewater treatment is to improve the water's grade to meet domestic and industrial standards, as well as to meet strict criteria for water discharge safety. In the case of municipally treated water, tertiary treatment also includes the elimination of microbes, ensuring that the water is safe to consume.

The most prevalent and primary goal of wastewater treatment is to ensure the sanitation of as many places, sites, cities, and towns as possible, as well as to ensure the safe disposal of treated wastewater into the environment while adhering to disposal standards.

## OBJECTIVES:

- To explore and visit a common effluent treatment plant facility
- To collect samples of wastewater before treatment
- To collect samples of wastewater after treatment
- To study stagewise performance of the selected common effluent treatment plant
- To determine the total efficacy of secondary treatment in terms of pollutant elimination
- To determine the percentage reduction in different physicochemical parameters of final treated wastewater sample

# CHAPTER 2
# LITERATURE REVIEW

## 2.1 WATER AND ITS POLLUTION:

Pollution develops when toxins are introduced into the natural environment and cause harm. Chemicals or energy, such as illumination, unwanted sound, or heat, can pollute the environment. Toxins are either alien substances/energies or naturally produced pollutants that contribute to pollution.

The polluting of water bodies is known as water pollution (e.g. lakes, rivers, oceans, aquifers and groundwater). When contaminants are dumped into waterways, either actively or passively, without proper treatment to eliminate dangerous substances, water pollution develops. Water pollution has an impact on the plants and species that live in water bodies. The result is virtually always harmful to not only specific species and populations, but also natural ecological communities.

Water contamination is divided into 6 categories by the United States Environmental Protection Agency (EPA).

1. Animals and human beings waste make up the majority of biodegradable trash. When biodegradable trash enters a water system, it provides bacteria with a power source (organic carbon). Organic carbon is transformed to water and carbon dioxide, resulting in acid rain in the atmosphere. This type of pollution is significantly more ubiquitous and hazardous than other types of pollution, such as radioactive waste. When there is a lot of organic stuff in the water, oxygen-consuming (aerobic) bacteria will multiply swiftly and devour all of the oxygen, killing all aquatic life.

2. Phosphates and nitrates, which are plant nutrients, jump into the water from sewage, livestock, and fertilizer runoff. In addition, phosphorus and nitrates can be present in industrial waste material. Despite the fact that these chemicals are natural, 80% of nitrates and 75% of phosphates in water are contributed by man. Algae blooms when a water source has too much nitrogen or phosphorus (0.3 ppm for nitrogen and 0.01 ppm for phosphorus). When algae thrives, the water turns green and hazy, feels greasy, and stinks foul, which encourages germs to proliferate and spread. Decaying plants deplete the dissolved oxygen, causing aquatic life to suffer, biodiversity to decline, and even death. This process, known as eutrophication, is a natural one that takes thousands of years to complete. Without nutrient pollution, eutrophication enables a lake to become increasingly rich in nutrients over 10,000 years, but pollution can speed up the process by hundreds of thousands of times.

3. Water pollution can be caused by heat. The amount of dissolved oxygen reduces as the temperature of water rises. Thermal pollution can also be natural, as in the case of summertime Hot Springs and shallow ponds, or man-made, as in the discharge of water from coal power plants or other industrial equipment. Thermal pollution limits the aquatic species diversity in the water since fish and plants need certain temperatures and oxygen levels to exist.

4. One of the most typical water sources is sediment. Sediment is mineral or organic solid stuff that is washed or blown into water sources from the land. As it comes from nonpoint sources like construction, agricultural and animal operations, logging, flooding, and city runoff, sediment contamination is hard to trace. Over 1 billion tons of silt pollutes water systems in the USA yearly. Sediment can block municipal waterways, suffocate marine life, and cause water to grow progressively murky, all of which are major issues. Also, because murky water absorbs more radiation from the sun, turbid water can produce thermal pollution.

5. Chemicals that are hazardous or harmful are usually man-made products that are not properly handled or disposed of. Industrial discharges and oil spills are examples of point sources of chemical pollution. More thorough information regarding oil spills and other sources of oil pollution can be found in the oil pollution factsheet. Runoff from major streets and pesticide residues were two nonpoint causes of chemical pollution. Most individuals assume that industries are the source of the most chemical contamination. However, chemical use in the home and by individuals can considerably add to chemical pollution. Household cleansers, dyes, paints, and solvents are all poisonous, and if poured down drains or flushed down the toilet, they can build up. One drop of old motor oil can contaminate up to 25 litres of water. Pesticides are used ten times more per acre by consumers who use them on their gardening and lawns than they are by farmers.

6. Wastewater discharges from industry, hospitals, and uranium mines are examples of radioactive contaminants. Radioactive contaminants, such as radon, can also come from natural isotopes. Repeated radioactive contaminants can be toxic, and it can take a long time before radioactive compounds are no longer regarded worrisome.

**Table 1: Various analytical water quality criteria are used to analyze the quality of water, as well as their sources of occurrence and potential health impacts, according to USEPA recommendations**

| Sr. No. | PARAMETERS | SOURCE OF OCCURRENCE | POTENTIAL HEALTH IMPACTS |
|---|---|---|---|
| 1 | pH | Different dissolved gases and particles cause pH to fluctuate. | Mucous membrane irritation, harsh taste, and corrosion. |
| 2 | D.O | Because of the dissolved oxygen, there is a presence. | At lower concentrations, dissolving boxes and corroding water lines, boilers, and heat exchangers makes it impossible for aquatic animals to thrive. |
| 3 | Total hardness | Ca and Mg ions can be found in a water source. Every water supply contains hardness ions to some extent. | Poor soap lathering, loss of clothing quality, and scale formation. |
| 4 | Total alkanity | Due to dissolved gases ($CO_2$). | Boiler steel Embrittlement. |
| 5 | Ammonia | As a result of dissolved gases and organic decomposition. | Complex ion production causes corrosion of Cu and Zn alloys. |
| 6 | BOD | Contamination of water with organic materials. | Dissolved oxygen levels are reduced when BOD levels are high. |
| 7 | Chloride | Water additives used to treat and control microorganisms. | Irritation of the eyes and nose, as well as stomach pain. Increase the corrosiveness of water. |
| 8 | Sulphate | Due to dissolved Ca/Mg/Fe sulphate. | Irritation of the gastrointestinal tract. |

Source - USEPA guidelines report

## 2.2 POLLUTION SOURCES:

According to studies of (Talabi and Kayode, 2019) different categories of wastewater that come from residential, municipal, commercial, industrial and agricultural areas have different type of contaminants and sources of contamination. The residential wastewater contain household wastewater furniture stripping/ refinishing that include septic tanks, paints, sewer network as sources of contamination. The municipal wastewater contains municipal sludge spreading inland, salt for street de- icing, municipal incinerators and sewer lines that include street and parking lots, municipal landfills, road maintenance depot as source of contamination. The commercial wastewater include contamination from airports, construction areas, cemeteries, gas station, medical institutions and research laboratories. Industrial water gets its contamination from chemical industry, mining and mine drainage, petroleum production, pipelines and storage tanks. Water in agricultural land gets contaminated from animal feed, sludge reuse, livestock waste, fertilizer storage/use, chemical spills and pesticides well.

## 2.3 IMPACT OF WASTEWATER ON LIVING WORLD:

The word “environment” comes from the French word “Environia”, which means to surround. It covers both the biotic (living) and abiotic (non-living) environments. The term environment also refers to physical surroundings where organisms live. Organisms (species) and environment are considered as complex and proactive component of our natural world. The totality of conditions that surround us at any given point in time and space forms our natural environment. It is made up of interacting networks of cultural, physical, and biological elements that are both collectively and individually interconnected. The totality of circumstances under which any species must survive and sustain its life processes, represents the environment. It has an effect on how living things grow and develop.

But due to selfish purposes of humans they create disturbance in natural environment and thus, as a result imbalance in nature can be seen from few decades which is increased with the increase of time. One of such main cause of imbalance is water pollution, which is produced due to varying anthropogenic activities.

Water can be polluted in several ways, some of which are described below.

Pesticides such as DDT are found in run-off from fields, backyards, and golf courses, contaminating the water. Another big contaminant source is leachate from landfills. Endocrine and reproductive disruption in wildlife is two of their impacts on ecosystems and human health. The organophosphates and the carbonates existing in insecticides distress and harm the systema nervosum and can root tumor (Woldetsadik et al., 2017). Since pesticides are mobile in the soil, groundwater is vulnerable to contamination. These contaminants are persistent in the soil and water, which is a cause for concern. The organophosphates and the carbonates present in pesticides affect and damage the nervous system and can cause cancer (Woldetsadik et al., 2017).

In developing countries, unprocessed or ineffectively treated urban waste is a significant foundation of groundwater and surface water contamination. The biological deterioration of carbon-based material settled with urban waste into watercourses consumes a significant amount of oxygen, disrupting the ecological balance of rivers and lakes (Tasker et al., 2018). Sewage also includes microbial pathogens that are responsible for disease transmission.

Pathogens are illness-causing mediators found in the feces of ill people. They include viruses, bacteria, protozoa, and parasitic worms. These diseases are more common in areas where sanitation is low. These diseases propagate through water supplies and directly affect the people who treat food and water. Since these illnesses are contagious, people caring for the infected patient should exercise strict caution and hygiene. The more communal water-borne sicknesses that distress residents in tropical regions are hepatitis, cholera, dysentery, and typhoid.

Many of the current synthetic compounds are present in the marine environment and hoard in the food chain. Industrial chemicals and agricultural pesticides are examples of POPs, or persistent organic contaminants (Varjani et al., 2017), which are the most detrimental to the environment and human health. These chemicals can build up in fish and cause severe health problems for humans. When chemicals are used in large quantities, groundwater becomes polluted, resulting in the chemical pollution of drinking water (Sabeen et al., 2018). Since lead accrues in the body and disturbs the central nervous system, it is detrimental to one's health. The most vulnerable are children and pregnant women. Excess fluoride can cause tooth discoloration, spinal cord damage, and other debilitating diseases. Drinking nitrate-contaminated water can be fatal, particularly for infants who intake formula milk, since it reduces the quantity of oxygen that enters the brain, resulting in the "blue baby" syndrome.

It's also related to cancers of the digestive tract. It induces algae blooms in surface water, resulting in eutrophication. Benzene and other petrochemicals can origin malignance even at little introduction levels. Other heavy metals can damage the nervous system and kidneys, as well as cause metabolic problems (Barancheshme and Munir, 2018).

## 2.4 ANALYSIS OF WASTEWATER:

After home and industrial use, a large quantity of water is released back into the environment. Domestic garbage and industrial effluents poisoned the water. Pollution occurs when contamination exceeds specified permissible limits and the contaminants are referred to as pollutants. Water pollution is described as the presence of pollutants that are detrimental to living organisms in rivers, seas, lakes, subsurface water, or oceans. When the level of naturally occurring compounds in water rises, the water is said to be contaminated.

When the following parameters exceed a specific concentration in water, it is referred to as polluted water.

- **Physical parameters:** Physical factors like as turbidity, odour, colour, temperature, taste, and ionic conductivity are important markers of contamination. Colour turbidity, for example, is a visible sign of dirty water, while an irritating odour or a bitter, different-than-normal taste renders water unsafe for ingesting.
- **Chemical parameters:** Carbonates, chlorides, sulphates, nitrates, fluorides, and metal ions are among them. The TDS in water is made up of these substances.
- **Biological parameters:** Algae, viruses, fungus, bacteria and protozoa are among the biological parameters. The presence of contaminants has a significant impact on the organisms that live in water. Pollutants in water have the potential to reduce the abundance of both lower and higher plants and animals. As a result, biological characteristics provide an approximate indication of water pollution levels.

## 2.5 TREATMENT METHODS OF WASTEWATER:

The treatment of wastewater is generally carried out in three stages namely,

- Primary treatment

- Secondary treatment
- Tertiary treatment

- **Primary Treatment:**

It aims to extract fine suspended organic solids that were not detached during the preliminary treatment. Sedimentation or settling is the most basic form of primary treatment. Sedimentation is normally performed twice in the standard wastewater treatment phase, once before secondary treatment and again after secondary treatment is complete, a process known as secondary sedimentation. Chemical precipitation, also known as coagulation-aided sedimentation, is a mechanism in which chemical coagulants are used to promote or assist sedimentation (Taboada-Santos et al., 2020). It comprises a Physico-chemical process, wherein a Flash mixer and a Clariflocculator are used to ensure substantial removal of suspended solids by sedimentation method and COD and BOD to some extent.

- **Secondary or Biological Treatment:**

For the removal of dissolved and fine colloidal organic matter, secondary treatment is needed. Microorganisms (bacteria, algae, fungi, protozoa, rotifers, nematodes) are used in this process to decompose unstable organic matter into stable inorganic forms. The biological treatment of wastewater is categorized into three categories: aerobic, anaerobic, and pond processes. Suspended growth systems and attached growth systems are classified according to the characteristics of the microorganisms used (Acharya et al., 2020).

Consists of an aeration tank and a secondary clarifier wherein, finely suspended dissolved organic materials BOD, and COD are substantially removed by aerobic and anaerobic units. Thus, the aerobic units used to treat suspended matters are – activated sludge process, aerated lagoons, aerobic digestion, sequencing batch reactor. And for the treatment of attached growth – trickling filters, roughing filters, packed bed reactor, rotating biological contractors (Saleh et al., 2020). The anaerobic units used to treat suspended matters are-Anaerobic digestion through stages such as -hydrolysis, acidogenesis, and methanogenesis, anaerobic contact process. While for the treatment of attached growth matters - An expanded-bed process is

used which includes inert materials (sand or coal expanded aggregates), anaerobic filter process.

- **Tertiary or Advanced Treatment:**

After the standard primary and secondary treatments, tertiary or advanced treatments may be required to remove suspended and dissolved substances. In general, effluents collected after secondary treatment can be disposed of easily and without causing any inconvenience.
However, in the following situations, tertiary treatment is required

- When the consistency of the effluent to be discharged falls out of the necessary standard.
- When there is a requirement to reuse the treated wastewater.
- For the removal of nitrogen and phosphorous from the effluent.

Four processes are carried out in this treatment, they are –solids removal, biological phosphorus removal, biological nitrogen removal, disinfection by chemical agent (chlorine) physical agent (heat and light), gamma rays from radioisotopes which partially remove disease-causing organisms (Bui et al., 2019).

## 2.6 COMMON EFFLUENT TREATMENT PLANT:

CETPs (common effluent treatment plants) are treatment systems that are particularly engineered to treat wastewater discharged by small-scale industrial entities in a clusters (Vyas et al, 2011). The Ministry of Environment and Forests has introduced a Centrally Sponsored Scheme to assist Small Scale Industries (SSI) in establishing a CETP in the country to install pollution control equipment for effluent treatment. The SSIs pollute the atmosphere with their effluents, but many of them cannot afford to install pollution control equipment. A financial assistance scheme has been established to promote the use of emerging technology for CETPs in existing SSI clusters of units (CPCB, 2016).

CETP has a primary and secondary treatment system that meets the specified effluent requirements for discharge into land surface water. A Flash mixer and a Clariflocculator are used in the primary treatment process to ensure that COD, SS, and to a lesser degree BOD are significantly eliminated. BOD, COD, and SS are significantly eliminated during secondary treatment, which includes an aeration tank and a secondary clarifier (Padalkar and Kumar, 2018).

## 2.6.1 CETP AND STP SCENARIO IN INDIA:

Report of Ministry of Environment, Forest and Climate Change, Government of India has stated that in India total 193 CETPs are available in which highest CETPs are located in Tamil Nadu nearly 49 and total 920 STPs are available from which Punjab contain highest STPs around 86.

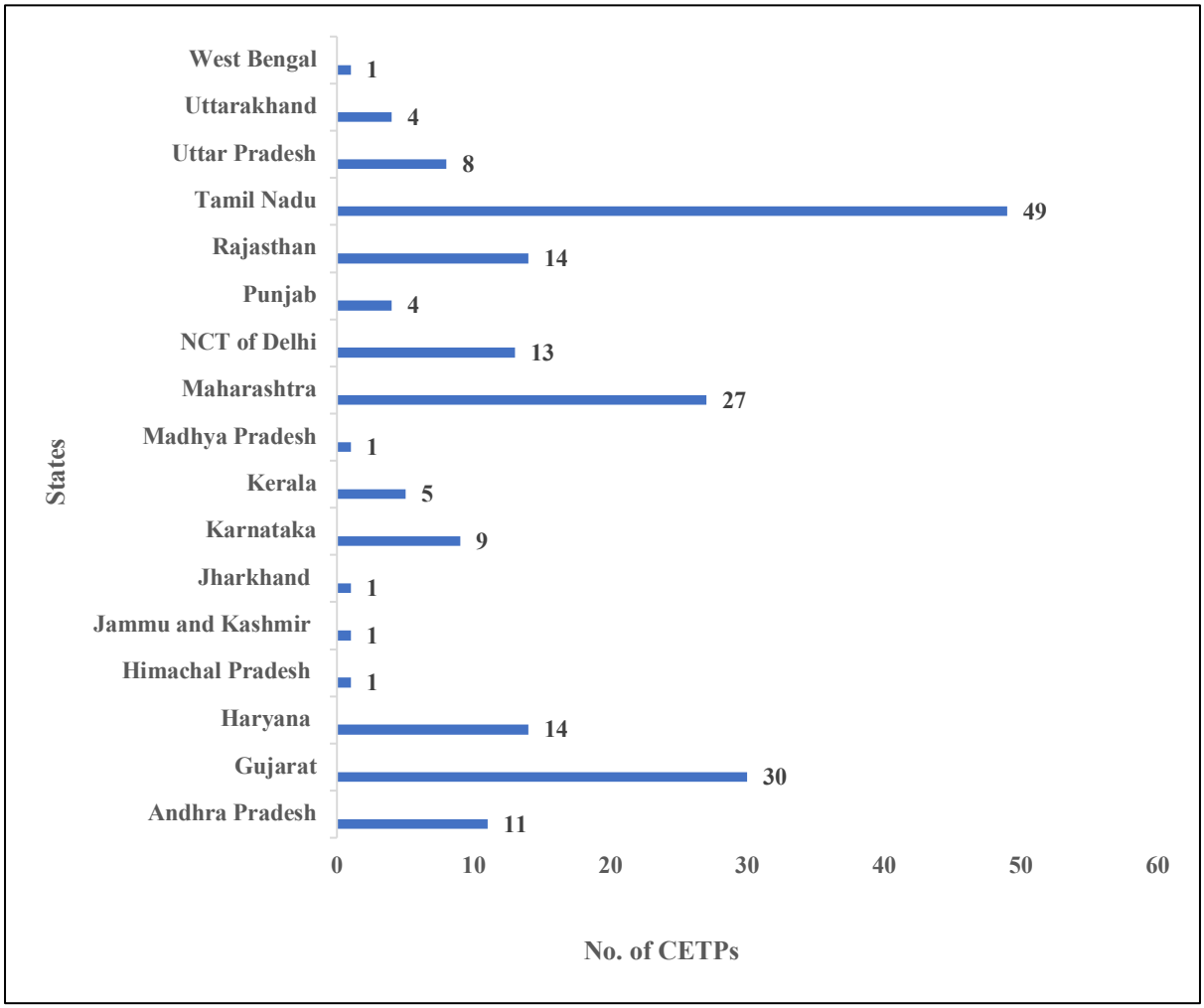


**Figure 1:** Number of CETPs in India (CPCB 2016)

**Source:** http://www.sulabhenvis.nic.in/database/stst_wastewater_2090.aspx

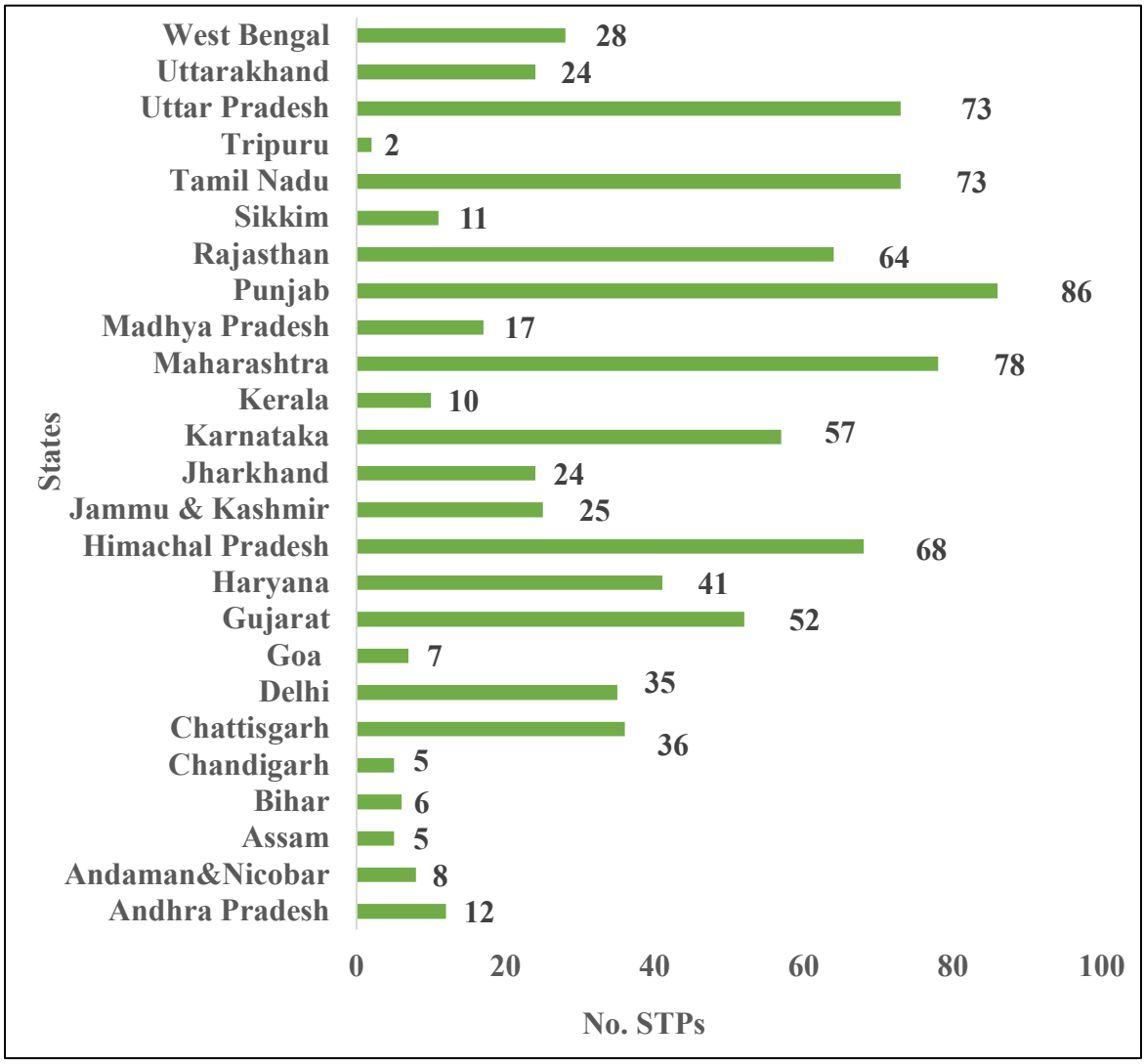


**Figure 2:** Number of STPs in India (CPCB 2016)

**Source:** http://www.sulabhenvis.nic.in/database/stst_wastewater_2090.aspx

## 2.6.2 Significant advantage of CETP as wastewater treatment approach:

- A treatment plant's investment and maintenance costs are reduced. Tiny, dispersed treatment units are often more expensive than collective treatment.
- Separate units would have a tough time ensuring land accessibility if they opt for individual treatment plants. This is especially significant in the case of standing ancient industries that are literally out of the room.
- Contribution of enzyme and diluting potential, facilitating the deterioration of complicated industrial waste.

- The dilution and stabilization of complex waste allow for its techno-economic management.
- For the management of CETP, skilled and qualified personnel may be made accessible, which is not likely for individual plants.
- Clearance of treated wastewater and sludge becomes more systematized.
- The reduced problem of several regulatory authorities in safeguarding pollution control obligations.

# CHAPTER 3

# MATERIALS AND METHODS

## 3.1 SECONDARY TREATMENT PLANT AT VATVA:

For biological treatment, the extended aeration model is used. the effluent obtained from the settling tank, where five root blowers (each of 175HP capacity) with medium bubble diffused aeration grid and 23 triton style Jet Aerators (each of 60 HP capacity) with 10HP air blowers provide the required amount of DO and MLSS (R. Patel et al., 2020).

For bio augmentation, treated sewage from the STP, Vinzol (Municipal Corporation), is applied to the aeration tank. The active microorganisms in the activated sludge aerobically destroy the organic matter and certain nutrients in the form of nitrogen and phosphorus present in wastewater.

The flow delivery chamber receives an effluent containing MLSS from two secondary clarifiers with a combined capacity of 3924 $m^3$ (each with a capacity of 1962 $m^3$). Before clarification in the secondary clarifier, anionic polyelectrolyte and spent aluminium chloride (75ppm) are added to the effluents from the aeration tank. CETP member units M/s. Meghmani Organics and M/s Ami Organics Industries produce spent aluminium chloride, which is used as a chemical aid for clarity. In the clarifiers, the activated sludge mixed liquor is clarified by gravity before being transported to the Sludge Sump (S. B. Patel et al., 2017).

To preserve the F/M ratio, a portion of this activated sludge (recycled activated sludge) is recycled into the aeration tank. Excess sludge (waste-activated sludge) is pumped to a sludge storage tank, where it is dewatered using a centrifuge/decanter. Non-anionic polyelectrolytes are added to the decanter once more. The supernatant/treated effluent from the secondary clarifiers is collected in a holding tank and pumped to the Sabarmati River, where it is discharged through a closed Mega pipeline. The treated effluent is pumped to the mega line, which transports effluent from reliance and other CETPs such as Naroda, Odhav, and Narol Dyestuff to the Sabarmati River, where it is mixed with 1000 MLD of treated sewage (R. Patel et al., 2019).

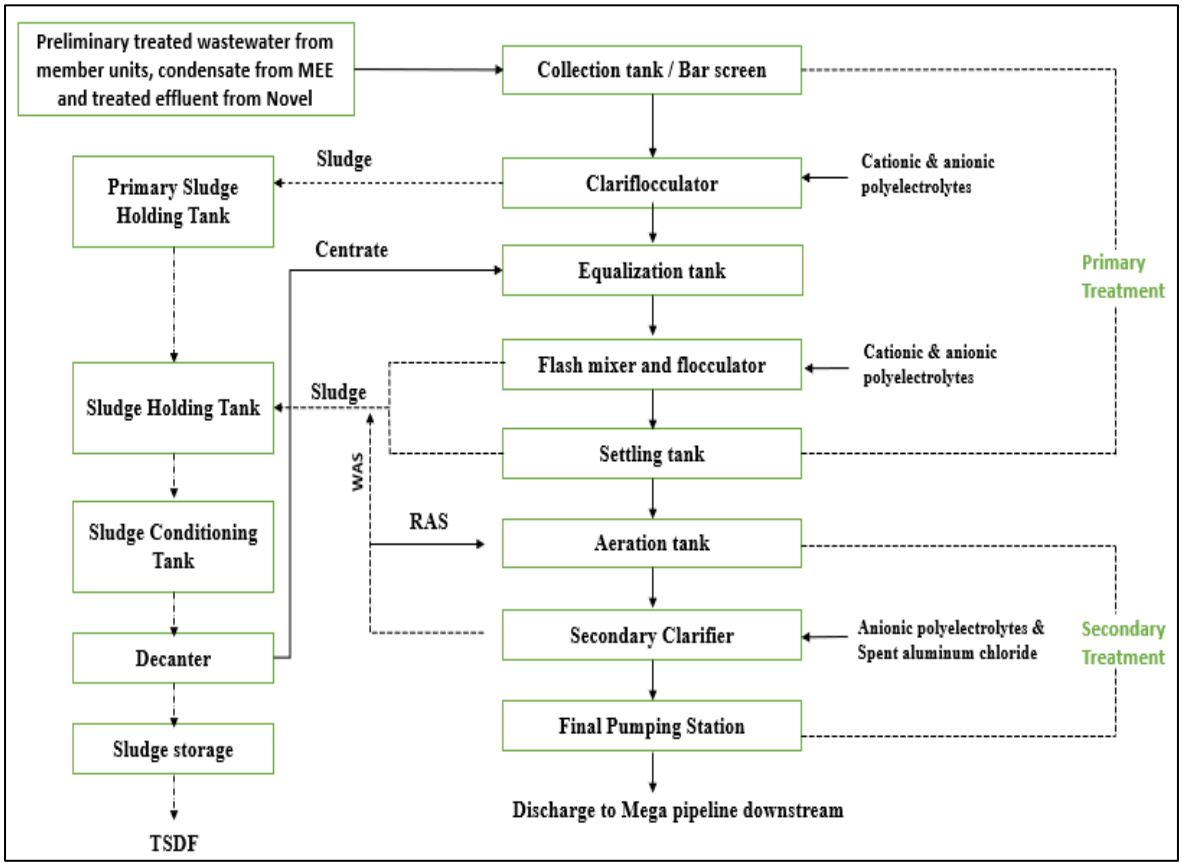


**Figure 3:** Treatment Scheme of CETP, Ahmedabad

## 3.2 COLLECTION OF WASTEWATER SAMPLE:

Wastewater samples were collected stage wise at the treatment plant, VATVA from the primary CLF inlet, primary CLF outlet, EQ, DAF, Aeration, and effluent from the final pumping station. Water samples were analysed at the Vatva laboratory for the physicochemical characteristics of the collected wastewater samples. The parameters analysed were pH, EC, TSS, TDS, TOC, $NH_3$-N, COD, and BOD for the wastewater and, were measured by the standard procedure outlined by the Bureau of Indian Standards (BIS) and American Public Health Association (APHA). The conductivity was measured according to Piper (1966) and pH was measured according to Jackson (1973) with a Potentiometric pH meter.

The samples were taken between the 2nd and 3rd of March. Personnel at the treatment plant took the water samples from each unit following the retention time of water for each unit. Each sample had a volume of 2 litre.

**Following precautions were taken while collecting the samples:**

- Different plastic containers of 2liter capacity and resistance to the solution actions were used for the collection and storage of different wastewater samples collected from different units of the treatment plant.
- Separate sterilized glass bottles were used BOD test.
- While taking wastewater samples from the plant to the laboratory for analysis, the collected samples were labelled properly to indicate the location and date of sampling.
- Special care was taken to prevent the formation of air bubbles, which causes interference with the true measurement of BOD values of the sample.
- The measurement of temperature, pH, EC was carried out immediately in the laboratory after sampling.
- For BOD evaluation of samples, the preparation and procedure were carried out on the same day of sampling.
- During transportation, all samples were protected from direct exposure to heat and sunlight until estimation.

## 3.3 PHYSICOCHEMICAL PARAMETERS:

### 3.3.1. $NH_3$- N (AMMONIACAL NITROGEN):

**Method selection**: Distillation

**Table 2: The table below assist to choose a sample volume for the distillation and titration methods.**

| $NH_3$-N in sample (mg/L) | Sample volume (mL) |
|---|---|
| 5-10 | 250 |
| 10-20 | 100 |
| 20-50 | 50.0 |
| 50-100 | 25.0 |

**Interferences:**

On resting, urea, glutamic acid, glycine, acetamide and cyanates all hydrolyze gradually in solution, but only cyanates and urea can hydrolyze on distillation at pH 9.5. At this pH, cyanates hydrolysis is around 5%, while urea hydrolysis is around 7%. Titrimetric effects can be affected by volatile alkaline compounds such as hydrazine and amines. Residual chlorine reacts with ammonia, so sample pretreatment is necessary to separate it. If a sample is likely to contain residual chlorine, treat it with a dechlorinating agent as soon as possible after collection.

**Principle:**

The reaction is carried out under alkaline conditions, ensuring that any ammonium ions ($NH_4$) are converted to ammonia ($NH_3$), which is then calculated in the next reaction. The sample is buffered with a borate buffer at pH 9.5 to reduce cyanate and organic nitrogen compound hydrolysis. By using the titration method, it is distilled into a boric acid solution, and by using the phenate method, it is distilled into $H_2SO_4$. The phenate method can be used to calculate the amount of ammonia in the distillate, or titrimetrically using regular $H_2SO_4$ and a mixed indicator or a pH meter.

**Apparatus**:

Distillation apparatus/ Distillation assembly, pH Meter, 500 ml beaker, burette, pipette, glass rod, measuring cylinder.

**Reagents**:

Distilled water, borate buffer, 6N NaOH, boric acid indicator, 0.02 N $H_2SO_4$.

**Procedure**:

- 25 ml of each sample was taken in separate beakers.
- Beaker no. and name of the sample were noted.
- Sample was make up to 200 ml when distilled water was added to it.
- 25 ml of borate buffer was added to each sample solution and their pH was calculated. If the pH was less than 9.5 then NaOH was added to make the solution more basic.
- This sample solution was poured in distillation flask
- 30 ml of boric acid indicator was taken in each beaker.
- It was make sure that every connection of distillation apparatus is air tight, switch was put on and temperature was regulated at $100^0$C.

- Beakers with boric acid were placed right below distillation apparatus outlet.
- Condensed steam were collected at the outlet of distillation apparatus where beakers were placed.
- After sometime solution of beaker turn into green from blue, which indicated the presence of ammonia.
- pH of the solution was again checked to make sure that the solution is neutral.
- Each solution was titrated against 0.02 N $H_2SO_4$.
- Burette readings were noted down of each solution when green colour of solution turns to purple colour solution.

**Calculation**:

$$\textbf{(NH}_3\textbf{-N) (mg/L)} = \frac{(\mathbf{A}-\mathbf{B}) \times \mathbf{N} \times \mathbf{14000}}{\textbf{Sample volume,in mL}}$$

Where;

A = volume of $H_2SO_4$ titrated for sample, in mL,

B = volume of $H_2SO_4$ titrated for blank, in mL,

N = normality of standard $H_2SO_4$ titrant solution.

### 3.3.2 TOTAL DISSSOLVED SOLIDS (TDS):

**Method selection:** Filtration method

**Interferences:**

Abundant mineral water containing substantial amounts of Mg, Ca, Cl, and/or sulphate can be hydrophilic, necessitating extensive drying times, adequate desiccation, and swift weighing.

**Principle:**

Using a regular glass-fiber filter, filter a well-mixed sample. The filtrate should then be transferred to a pre-weighed dish, evaporated until dry, and dried to a constant weight in an oven at 180 ± 2°C. TDS is described by the rise in weight as compared to the weight of the empty pre-weighed dish.

**Apparatus:**

Beakers, sample solution, Whatman filter paper no. 42, Hot air oven, weighing balance, and desiccator.

**Procedure:**

- Beakers were washed and kept in hot air oven for 5-10 minutes.
- After 8 minutes beakers were taken out of oven and immediately put into desiccator so that they cannot come in contact with moisture.
- Beakers were allowed to keep in desiccator for 2 minutes more so that they can cool down.
- Initial weight of empty beakers were taken in weighing balance.
- 50 ml of each sample was taken in different beakers.
- Each effluent sample was then filtered using whatman filter paper no. 42.
- 25ml of filtered sample was added to each different beakers.
- These samples were kept in hot air oven and allowed to dry at 180°C temperature for 1 hour.
- Beakers were taken out in desiccator, they were allowed to cool and finally their final weight were taken using weighing balance.

**Calculation:**

$$\textbf{Total Dissolved Solids, in mg/L} = \frac{(A-B) \times 10^6}{Sample\ volume, in\ mL}$$

Where;

A= weight of dried residue + dish, gm, and

B = weight of the dish, gm.

### 3.3.3 TOTAL SUSPENDED SOLIDS (TSS):

**Method selection:** Filtration method

**Interferences:**

If suspended solids clog the filter, causing it to take longer to filter, consider raising the filter diameter or decreasing the sample volume. Handle all filters with care, wrinkled side up. Forceps are used to grip the residue-free edge of the filters as they are transferred. Unless using a Gooch crucible, weigh just the filters and not the help pans or dishes.

**Principle:**

A well-mixed sample is filtered through a pre-weighed standard glass-fibre filter and then let dry and the residue will be retained on it to a constant weight in an oven at 103°-105°C (Gaona et al., 2017).

Total suspended solids are represented as the increase in the filter weight.

To estimate the TSS concentration of an unknown sample matrix, calculate the difference between the initial and the final weight of the standard glass-fibre filter paper disc. (Dlangamandla et al., 2018).

**Apparatus**:

Beakers, pipette, conical flasks, measuring cylinder, glass fiber filter paper, funnel, Vacuum assembly/ TSS assembly, hot air oven, weighing balance.

**Procedure:**

- Glass fiber filter paper were kept in hot air oven for 10 - 15 minutes.
- Filter paper were taken from oven and then immediately placed in desiccator.
- Initial weight of filter paper were taken using weighing balance.
- The samples were mixed well to make them uniform throughout and 25ml of each sample was taken in pipette.
- Filter paper was placed (with name of sample written on it) on vacuum pump (instrument) of TSS assembly.
- Note - filter paper side with name of sample should be on downward side and blank side should be upward.
- 25ml of sample was poured on filter paper and then it was placed in hot air oven for 30 minutes at $110^0$C.
- Filter paper were taken out in desiccator and their final weight were measured in weighing balance.

**Calculation:**

**Total Suspended Solids, in mg/L** = $\frac{(A-B) \times 10^6}{Sample\ Volume, in\ mL}$

Where;

A = weight of dried residue + filter paper; gm, and

B = weight of empty filter paper, gm.

### 3.3.4 TOTAL ORGANIC CARBON (TOC):

**Interferences:**

Volatile organics are lost when carbonate and bicarbonate are removed through acidification and removing with purified gas. The size and uncertainty of the blank is a significant constraint for high-temperature techniques. Instrument manufacturers have created new catalysts and techniques that result in fewer blanks and, as a result, lower detection levels. Hydrochloric acid must not be used to acidify samples for the Heated Persulfate Oxidation process because chloride disrupts with persulfate oxidation. Incomplete extraction of inorganic carbon will result from improper acidification or sparging.

**Principle:**

TOC stands for Total Organic Carbon analyser, which converts organic carbon into $CO_2$ using a catalytic oxidation combustion technique at high temperatures (up to 720°C). (Tamburini et al., 2017)A non-dispersive infrared (NDIR) sensor is used to calculate the $CO_2$ produced by oxidation. A conventional total carbon (TC) study counts both total organic carbon (TOC) and total inorganic carbon (TIC), the latter indicating the amount of non-organic carbon present, such as carbon in carbonate minerals (Geng et al., 2019). TOC is calculated by subtracting inorganic carbon from total carbon.

**Apparatus:**

Beakers, vials, TOC Analyzer

**Reagents:**

Potassium hydrogen phthalate, sodium carbonate, sodium bicarbonate.

**Procedure:**

- Clean the TOC Analyzer
- The samples of effluents were collected in the vials (approx. 7 ml)
- All the vials were kept in TOC Analyzer stand.
- TOC Analyzer was calibrated by Potassium hydrogen phthalate with 1000 ppm, 2000 and 4000 ppm solution as per requirements in total carbon mode.
- Same process was repeated for Inorganic carbon by sodium carbonate and sodium bicarbonate with 500 and 1000 ppm solution as per requirements.
- Calibration of TOC Analyzer is a inbuilt facility and it was carried out as below -
- Standard ppm solution was kept in big vials for total carbon and inorganic carbon mode calibration.
- Start TOC Analyzer and put it in calibration mode.
- Now the syringe will collect the sample from the big vials.
- The sample will be burned in TOC Analyzer chamber.
- From the standard solution of total carbon and inorganic carbon, the total carbon and inorganic carbon will be removed from the sample.
- Total carbon and inorganic carbon will be analyzed in TOC Analyzer.
- Based on above total organic carbon is calculated.
- This procedure is repeated second time.
- If the results found matching then calibration OK will be indicated.
- If there is a major variation in two analyses, then third sample is drawn by TOC Analyzer.
- Two matching results will indicate “Calibration OK” on TOC Analyzer.
- Once calibration is OK, TOC Analyzer was put on testing mode.
- Enter the vial number and file number in the TOC Analyzer.
- Start analysis.
- TOC Analyzer collected sample from vials through syringe.
- Then TOC Analyzer analyzed the total carbon and inorganic carbon from the sample.
- Based on total carbon and inorganic carbon, TOC Analyzer calculated the total organic carbon.
- Total organic carbon displayed on the screen.
- Same method was applied for all the samples that were present on vials, automatically by TOC Analyzer it gives and stores the data as well as results.

- Take print out of total organic carbon after completion of analysis of all samples.

**Calculation:**

TOC, (ppm) = TC – IC

Where;

TC= Total Carbon

IC= Inorganic Carbon

### 3.3.5 BIOCHEMICAL OXYGEN DEMAND (BOD):

**Interferences:**

The accuracy and precision of BOD readings can be influenced by a variety of parameters, including soluble vs. particulate organics, oxidation of reduced iron and sulphur compounds, Settleable and floatables solids and an inappropriate mixing. There are currently no practical changes or modifications that can be made to compensate for these variables.

**Principle:**

BOD is characterized as the weight of oxygen consumed per unit volume of water over 3 days at 26°C; BOD is proportional to the amount of biodegradable organic matter in the water sample; during oxidative degradation of organic matter, aerobic microorganisms consume oxygen present in the water as a dissolved gas (J. J. Zhu et al., 2018). A water sample is diluted with a dilution solution (which may or may not contain a bacterial seed); the sample is incubated for 3 days at 293°K, and the amount of oxygen absorbed is measured (Abeysiriwardana-Arachchige and Nirmalakhandan, 2019). To choose the solution with an oxygen consumption equal to 40 to 60% of the initial oxygen concentration, several solutions with various dilutions must be prepared (Baki and Aras, 2018).

**Apparatus:**

Incubation bottles, pipette, burette, BOD incubator

**Reagents:**

Phosphate buffer solution, magnesium sulfate, calcium chloride, ferric chloride, acid and alkali solutions (conc. $H_2SO_4$ and NaOH), sodium sulfite, glucose glutamic acid (GGA), ammonium chloride, alkali azide and distilled water.

**Procedure:**

- 5 litre of distilled water was taken and it was aerated with fish aerator up to 1 hour.
- Nutrients like phosphate buffer, calcium chloride, magnesium sulfate, ferric 1ml/litre distilled water were added.
- 1ml/litre aeration tank filtrate water was added.
- Aerate it with fish aerator up to 1 hour.
- Sample 800/COD in a BOD bottle was taken.
- Diluted water was added in it and it was taken as sample.
- Sample taken from step 5 is marked as Blank.
- Both of the above bottles were kept in BOD incubator up to 72 hours at 26°C.
- After following above steps, bottles were taken out and following processes were done with both the bottles one by one.
- 2 ml $MnSO_4$ and 2 ml Alkali azide were added. After shaking them thoroughly they were allowed to settle for 15 minutes.
- 2ml of $H_2SO_4$ was added.
- 200 ml of sample was taken out in a separate beaker.
- Saturated starch solution was added in it till blue colour appears.
- It was titrated with sodium thiosulphate (0.025 N).
- Same procedures were followed for other sample bottles.
- The burette readings are known as DO - dissolved oxygen.

**Calculation:**

For Undiluted Sample: **BOD (mg/L) =** $D_1 - D_2$

For Diluted Sample (Not Seeded): **BOD (mg/L)** = $\frac{D_1 - D_2 \times 1000}{P}$

For Diluted Sample (Seeded): **BOD (mg/L) =** $\frac{(D_1-D_2) - (B_1- B_2)\, f \times 1000}{P}$

Where;

$D_1$= initial DO of sample in mg/L,

$D_2$ = DO of the sample after incubation, in mg/L,

$B_1$ = DO of seed control before incubation, in mg/L,

$B_2$ = DO of seed control after incubation, in mg/L,

f = Volume (mL) of seed in diluted Sample/ Volume (mL) of seed in seed control

P = Sample volume (mL) diluted to 1 litre with dilution water.

### 3.3.6 CHEMICAL OXYGEN DEMAND (COD):

**Method selection:**

Open reflux method – Followed by the titrimetric method. The chemical oxygen demand test determines the oxygen required for chemical oxidation of organic matter with help of a strong chemical oxidant.

**Interferences:**

Most organic compounds are oxidized to 95 to 100 percent of their theoretical value. Pyridine and similar chemicals are resistant to oxidation, while volatile organic molecules react in proportion to the amount of oxidant they come into contact with. In the presence of a silver sulphate catalyst, straight-chain aliphatic molecules are more efficiently oxidized.

**Principle:**

A boiling mixture of chromic and sulfuric acids oxidizes most types of organic matter. A sample is refluxed in a strongly acidic solution containing a known amount of potassium dichromate (Geerdink et al., 2017). The amount of potassium dichromate ingested is

determined by titrating the remaining unreduced potassium dichromate with ferrous ammonium sulfate after digestion, and the oxidable matter is measured in terms of oxygen equivalent. When using sample volumes larger than 50ml, keep the reagent weights, volumes, and strength ratios constant (Wei et al., 2019). If it has been shown that a shorter duration produces the same effects, the standard 2hour reflux time can be shortened. To obtain the most accurate results, some samples with very low COD or highly heterogeneous solids contents may require duplicate analysis. Reacting the full amount of dichromate improves the results even further, as long as there is some residual dichromate (Bankole et al., 2017).

**Apparatus:**

COD flask, COD reactor, beakers, burette, and pipette.

**Reagents:**

Potassium dichromate, mercuric sulphate, concentrated sulfuric acid, silver sulfate, ferrous ammonium sulfate (FAS), ferroin indicator.

**Procedure:**

- 10ml of potassium dichromate was (0.25N) was taken in COD flask.
- 0.4g of mercuric sulphate was added to it.
- 30ml COD sulfuric ($H_2SO_4$ + $Ag_2SO_4$) was taken and cool down till room temperature.
- Effluent sample was added in COD flask till yellowish green colour appears.
- If (x) ml effluent was added then 20-(x) ml distilled water should be added to flask.
- It was all kept for digestion in COD reactor at 150°C for 2 hours.
- It was allowed to cool down till room temperature.
- This solution was titrated with ferrous ammonium sulphate (0.1N), using ferroin indicator. This was pen down as actual reading.
- Another titrated sample was made apart from effluent sample using ferroin indicator and it was marked as blank reading.

**Calculation:**

$$\textbf{Chemical Oxygen Demand (mg/L)} = \frac{(A-B) \times N \times 8000}{SampleVolume, in\ mL}$$

Where;

A = volume of standard FAS solution used in blank titration, in mL,

B = volume of standard FAS solution used in sample titration, in mL,

N = normality o standard FAS solution.

### 3.3.7 ELECTRICAL CONDUCTIVITY (EC):

**Method selection:** Instrumental method

**Interference:**

Calibration techniques differ each instrument, so it's best to stick to the manufacturer's guidelines. Use Distilled water to rinse probe carefully before and after calibration and cautiously wipe the probe dry with a Kim Wipe.

**Principle:**

The capability of a substance or solution to carry an electric current is evaluated by its electrical conductivity (ions and the chemical changes that take place in the solution carry this electric current). The Electrical Conductivity of a sample is measured with an Electrical Conductivity meter (EC meter). Temperature and storage time affect conductivity. The principle for measuring Electrical Conductivity with this instrument is relatively straightforward two plates are inserted in a sample, a potential is supplied all across plates (often a sine wave voltage), and the current is measured. The electric conductivity usually depends on temperature of the solution, specific nature of the ions and concentration of ions.

**Apparatus**:

pH/ EC meter, beakers with sample, glass rod.

**Procedure**:

- Switched ‘ON’ the instrument and pressed the key ‘CAL’, by which the display had shown ‘STD Y/N’, then pressed the enter key for doing the fresh calibration. After which display showed ‘PUT STD’ so pressed the 'PUT STD' key repeatedly until the 0.1 M KCL was selected.
- Immersed the conductivity electrode and temperature probe in standard KCL solution and pressed the ‘CAL’ key, display flashed as ‘CAL’ and the temperature probe was ‘OK’ then the instrument had displayed ‘X.XX’ cell for few seconds then it displayed ‘PUT SOLU’. Which indicated that the instrument had been ready for measurement.
- Then the conductivity cell had been dipped in the solution of the samples under test.
- Pressed the 'COND' key and the display flashed 'BUSY' and after few seconds the instrument display showed the temperature and conductivity of the solution simultaneously.
- For the measurement of the next sample, the 'ABORT' key was pressed and the unit displayed ‘PUT SOLU’.

### 3.3.8 POTENTIAL OF HYDROGEN (pH):

**Method selection:** Electrometric method

**Interferences:**

Apart from a sodium error at pH >10, the glass electrode is relatively free of disturbance from colour, turbidity, colloidal particles, oxidants, reluctant, or high salinity. Using special “low sodium error” electrodes can serve to minimize this error. Temperature influences pH parameters in two ways: mechanical effects induced by changes in electrode properties and chemical effects due to changes in equilibrium. Standard pH buffers have a defined pH at stated temperatures because chemical equilibrium affects pH. Often note the temperature at which the pH was taken.

**Principle:**

The basic principle of electrometric pH measurement is the determination of the activity of hydrogen ions by potentiometric measurement using a standard hydrogen electrode and reference electrode (Vonau et al., 2020). The pH is determined by measurement of the

electromotive force of a cell comprising of an indicator electrode responsive to hydrogen ions such as a glass electrode immersed in the sample solution to be tested and the reference electrode (calomel electrode). Contact is achieved utilizing liquid junctions, which form a part of the reference electrode. Since the pH is determined operationally on a potentiometric scale, the measuring instrument is also calibrated potentiometrically with an indicating (glass) electrode and a reference electrode using standard buffer solutions having an assigned pH value.

**Apparatus**:

pH/ EC meter, glass electrode, reference electrode, beakers, stirrer.

**Procedure:**

- The beaker containing solution/sample whose pH is to be determine was placed in such a way that the electrode of pH meter immersed properly in the beaker having sample.
- The pH meter showed the pH of the sample directly.

# CHAPTER 4

# RESULTS AND DISCUSSION

## 4.1 SITE DESCRIPTION:

Green Environment Service Co-operation Society Ltd., is located in Vatva industrial estate (22°57'18.8" N, 72°38'21.9" E) in Ahmedabad, Gujarat, formed in 1992 with the main objective to subdue pollution and environmental resources to achieve sustainable growth and development in Vatva. The city is enclosed in the north by Mehsana and Gandhinagar district and on the south of Gulf of Cambay and Bhavnagar district and in the east by Kheda district. The city is one of the industrially developed districts of Gujarat consisting of micro, medium, small and large industries related to textiles, dye and dye intermediates, chemicals, machinery, metal products, pharmaceuticals, engineering plastics, electrical utilization, electronics, and passenger cars. There are about 12 industrial estates in the Ahmedabad district and is an industrial hub for textiles and is popularly known as Manchester of India. Vatva Industrial Estate houses have more than 4000 enterprises, comprising 15% of large corporate houses and 85% of MSMEs. The area of existing units and structures of CETP is 11669$m^2$.


**Figure 4:** Secondary Treatment Plant, Vatva, Ahmedabad

The CETP handles wastewater from 674 industrial units. Among them, the majority of the industries about 88% produce dye and dye intermediates, 4% are of Pharmaceuticals and Food industries, 3% are of textile Processing industries, 3% of Engineering and Plastic Processing, 2% of Ice Factories are present. For each associate unit, it is obligatory to organize for pre-treatment of the effluent to reach the CETP inlet norms.

**Table 3 - CETP member's profile**

| Type of industry | Micro | Small | Medium | Large | Total |
|---|---|---|---|---|---|
| Dyes, intermediates and chemicals | 47 % | 36% | 4% | Greater than 0.5 % | 88 % |
| Pharmaceuticals and food industries | 1% | 3% | - | - | 4 % |
| Textile processing | 2% | 1% | Greater than 0.2 % | - | 3 % |
| Engineering and Plastic processing | 1% | 2% | Greater than 0.2 % | Greater than 0.2 % | 3 % |
| Ice factories | 2% | - | - | - | 2 % |
| Total (rounded off) | 53% | 42% | 4 % | 1 % | 100 % |

## ❖ System Overview:

- **Internal Collection System (ICS) and Conveyance Network:**

The 674 associate units, which are dispersed across the complex, are served by 92 Sump Rooms, from which wastewater is gravity-fed to six Pumping Stations. The effluent from these Propelling Stations is propelled into the CETP for treatment.

All of the associate units release their effluent into their corresponding sumps from their overhead discharge tanks. Each sump room has butterfly valves and magnetic flow meters for measuring the effluent flow rate from each associate unit. Every associate is required to install an overhead effluent collection tank with an adequate holding capacity to allow gravity flow to the appropriate sump.

The gravity mains of the ICS have an overall channel length of about 18000 meters; with sizes changing from 250 mm to 600 mm diameter.

- **Treatment Process:**

The CETP comprises of the following units:

- Equalization Tank
- Flash Mixer
- Clariflocculator
- DAF unit

A collection cum screening tank is the first course in effluent treatment which receives preliminary treated effluent as an inlet of CETP. The condensate from MEE and spray dryer are also pumped to the collection tank. The treated effluent from Novel is also sent to GESCSL CETP for further treatment. From the collection tank, the wastewater is flash mixed where coagulants and flocculants are mixed. The cationic and anionic coagulants are added through the dosing pump from the chemical tanks and are thoroughly mixed in the Flash mixer. After comprehensive mixing of the coagulants with the effluent, the effluent is clarified in Clariflocculator with a designed detention time of 3.45 hrs. The equalization tank receives the pre-treated effluent. Under peak flow conditions, the Equalization tank is configured to have a 24-hour residence period. With the aid of coarse bubble diffused aeration enhanced by a Turbo Aerator, the contents of the Equalization Tank are thoroughly mixed / equalized. The wastewater flows from the Equalization Tank via a flow-control preparation to the Flash Mixer, where coagulators and flocculants are introduced. Subsequently, the chemicals have been thoroughly mixed with the effluent, it flows into the Flocculator, where suspended solids, colloids, and other dissolved contaminants are coagulated and flocculated. The Dissolved Air Floatation (DAF) Unit receives the overflow from the Flocculator. The device operates on the theory of liquid super saturation with dissolved air. By combining pressurized recycled

wastewater with compressed air, super saturation is achieved. In the DAF Tank, the saturated reprocess flow is released at around atmospheric pressure, resulting in the creation of fine bubbles. These fine bubbles float to the top of the tank after being bound to flocculated particles. The top and bottom scrappers scrape and collect these elements, along with those that have accumulated at the lowermost of the tank, as primary sludge, which is accumulated in the Primary Sludge Holding Tank before being directed to the Centrifuge Decanter for dewatering. The sludge is then dewatered and discarded at a Secured Landfill Site.

The suspended solids concentration in DAF's outlet is held at less than 100 mg/l. The elimination of organics in a colloidal state often results in a reduction in COD material. Gravity transports this effluent to the Aeration Tank. The Aeration Basin has a total capacity of 27800 cubic meters. Medium bubble aeration, accompanied by 18 Triton-style aerators, provides enough air to sustain the optimal DO level while still keeping the MLSS suspended. The microorganisms in the activated sludge use aerobic decomposition to degrade the organic matter. Nitrogen and phosphorus-containing compounds, as well as other nutrients, are added as desired. To achieve optimum organic degradation, various parameters such as MLVSS, MLSS, F/M ratio, DO level, and nutrient concentration are thoroughly supervised and sustained.

After flowing through the Flow Distribution Chamber, the MLSS-containing effluent flows through the two Secondary Clarifiers. In the Clarifiers, there is a provision for adding coagulants depending on the requirement. Gravity settles the suspended solids, which are deposited at the bottom of the Clarifiers and transported to the Sludge Sump. This is activated sludge with biomass and inactive materials. A part of the activated sludge is reprocessed into the Aeration Tank to retain the desired amount of biomass in the form of MLVSS. The remaining sludge is propelled to the Centrifuge Decanter for dewatering from the Sludge Holding Tank. The dewatered sludge is then transferred to SLF for disposal.

Later mixing with treated sewage discharged from Ahmedabad Municipal Corporation's Pirana STP, the supernatant from the Clarifiers is accumulated in a Holding Tank / Pumping Station and driven to the Mega Pipeline for eventual transmission into the river Sabarmati at Pirana.

- **Monitoring and Laboratory Facilities:**

A sophisticated monitoring system is used to determine and manage the consistency of effluent from the member units. As a result, regular sampling of each member industry's effluent is carried out throughout the discharge period, and the consistency of all effluent samples is calculated in terms of pH and TOC. Other parameters such as Ammonical nitrogen, phenolic compounds, and heavy metals are also calculated depending on the raw materials and products. With the aid of magnetic flow meters, the amount of effluent released by the member units is also determined discretely. The findings are communicated to the member units, who are also paid depending on the effluent quantity and consistency.

The following parameters are used to evaluate CETP's efficiency.

- Primary Treatment Stage: Once per shift, the DAF unit's steady raw effluent and outlet are tested for pH, TOC, BOD, COD, TSS, TDS, Ammoniacal Nitrogen, and Heavy Metals.
- Secondary Treatment Stage: pH, MLVSS, MLSS, TOC, BOD, COD, and TSS are determined by analysing the contents of the Aeration Tank. The overflows from the Clarifiers are tested for pH, TOC, BOD, COD, TSS, TDS, Ammoniacal Nitrogen, and Heavy Metals to check that the GPCB's requirements are met.

Wastewater samples were obtained from the Vatva secondary treatment plant, and various physical and chemical parameters of wastewater were analysed to determine the overall output of the CETP and the effects of contamination caused by its treated effluent discharge into the atmosphere.

Water, the most vital resource for life, is harmed in both qualitative and quantitative ways by various human activities on land, in water, and in the air. Pollution is caused by a rising population, which is related to urban expansion and increased industrial development. Another factor is flooding, which causes water bodies to silt up.

**Table 4**: **Inlet norms of CETP, Vatva by GPCB**

| Sr. No. | Parameter | Industrial Units Having Effluent Quality >50KLD | Industrial Units Having Effluent Quality <50KLD | Industrial Units Having Effluent from Textile Units |
|---|---|---|---|---|
| 1. | pH | 6.5 to 8.5 | 6.5 to 8.5 | 6.5 to 8.5 |
| 2. | Temperature | 40 | 40 | 40 |
| 3. | Color | 100 | 100 | 100 |
| 4. | Suspended Solids | 300 | 300 | 300 |
| 5. | Oil and Grease | 10 | 10 | 10 |
| 6. | Phenolic compounds | 1 | 1 | 1 |
| 7. | Sulphides | 2 | 2 | 2 |
| 8. | Ammonical Nitrogen | 50 | 50 | 50 |
| 9. | Total Chromium | 2 | 2 | 2 |
| 10. | Hexavalent Chromium | 0.1 | 0.1 | 0.1 |
| 11. | BOD | 500 | 700 | 400 |
| 12. | COD | 1500 | 2000 | 1000 |

All parameters are expressed in mg/l except pH, temperature ($^{o}$C) and color (Pt. Co. Scale in units)

## 4.2 ANALYSED PARAMETERS FOR EFFICIENCY EVALUATION OF CETP:

### 4.2.1 Potential of Hydrogen (pH):

The pH is a unit less negative log base of hydrogen ion concentration. The concentration of hydrogen ions is an effective quality indicator. In the present study of wastewater, the pH value observed on the 2$^{nd}$ of March in the inlet sample was 7.99 and pH value of EQ sample was 7.18. After the treatment, the value recorded on the 3$^{rd}$ of March in the FPS sample was 7.05 which lies in the acceptable range of 6.7-8.4, assigned by GPCB.

### 4.2.2 Electrical Conductivity:

The ability of water to pass electrical current is measured by its conductivity. This ability is proportional to the ion concentration in the water. Conductive ions are generated by dissolved salts and inorganic materials including alkalis, chlorides, sulphones, and carbonate compounds.

In the present study, the value of EC recorded on the 2nd of March in the inlet sample and EQ sample was 22.1 and 16 micro-Siemens/centimeter respectively. On the 3rd of March in the treated FPS sample it was reduced to 13.8 micro-Siemens/centimeter which indicates the desirable quality of treated effluent. There is no recommended EC value, however, values above 400 micro-Siemens per centimeter can affect the chemical property of water bodies.

### 4.2.3 Total Suspended Solids:

TSS refers to all particles in a specified volume of liquid that do not pass through a 1.2-micrometer pore size filter and is measured in milligrams per liter. The dry weight of non-dissolved suspended particles in a sample of water that can be trapped by a filter and can be analyzed using a filtration apparatus is known as total suspended solids (TSS) (Leroy et al., 2018). In the present analysis, the value of TSS recorded on 2nd of March in the inlet sample and EQ sample was 196 and 100 mg/l respectively. On 3rd of March in the treated FPS sample it was reduced to 40 mg/l which is within the permissible range of 100mg/l assigned by GPCB and shows desirable efficiency of secondary treatment in TSS reduction.

### 4.2.4 Total Dissolved Solids:

TDS represents the volume of dissolved compounds in water and is analogous to conductivity. Any minerals, salts, metals, cations, or anions that are dissolved in water are referred to as dissolved solids. The value of TDS recorded in the present study on the 2nd of March in the inlet sample and EQ sample was 19,930 and 17,960 mg/l respectively. On the 3rd of March in the treated FPS sample it was reduced to 12810 mg/l which is above the permissible limit of 2000 mg/l assigned by GPCB. Further improvements to achieve a desirable reduction in dissolved solids are required with advanced treatments.

### 4.2.5 Ammonical Nitrogen:

The amount of ammonia in landfill leachate (Abdul Aziz et al., 2004) and waste products like sewage, liquid manure, and other liquid organic waste products is measured in Ammoniacal nitrogen ($NH_3$-N). In the present study, the value of $NH_3$-N recorded on the 2nd of March in the inlet sample and EQ sample was 56 and 54.88 mg/l respectively. On the 3rd of March in the treated FPS sample is reduced to 12.32 mg/l which lies in the permissible range of 50mg/l assigned by GPCB.

### 4.2.6 Total Organic Carbon:

The total amount of carbon in organic compounds in wastewater and aqueous environments is measured by total organic carbon (TOC). In the present study, the value of TOC recorded on the 2nd of March in the inlet sample and EQ sample was 280.8 and 170.4 ppm respectively. On the 3rd of March in the treated FPS sample is reduced to 147.02 ppm. There is no assigned range of TOC by GPCB for CETP.

### 4.2.7 Biochemical Oxygen Demand:

The easily biodegradable organic carbon is estimated by the Biological Oxygen Demand, or BOD. In the present study, the value of BOD recorded of the inlet sample and EQ sample was 250 and 210 mg/l respectively. BOD recorded of the treated FPS sample was reduced to 20 mg/l which lies within the permissible limit of 30 mg/l stated by GPCB.

### 4.2.8 Chemical Oxygen Demand:

The amount of oxygen required to chemically oxidize the organics in water is known as Chemical Oxygen Demand or COD. In the present study, the value of COD recorded on the 2nd of March in the inlet and EQ sample was 1168.8 and 1143.2 mg/l. On the 3rd of March in the treated FPS sample it reduced 463.2 mg/l which is exceeding the range of 250 mg/l assigned by GPCB. Further study on advanced treatments to achieve a desirable reduction of COD is required.

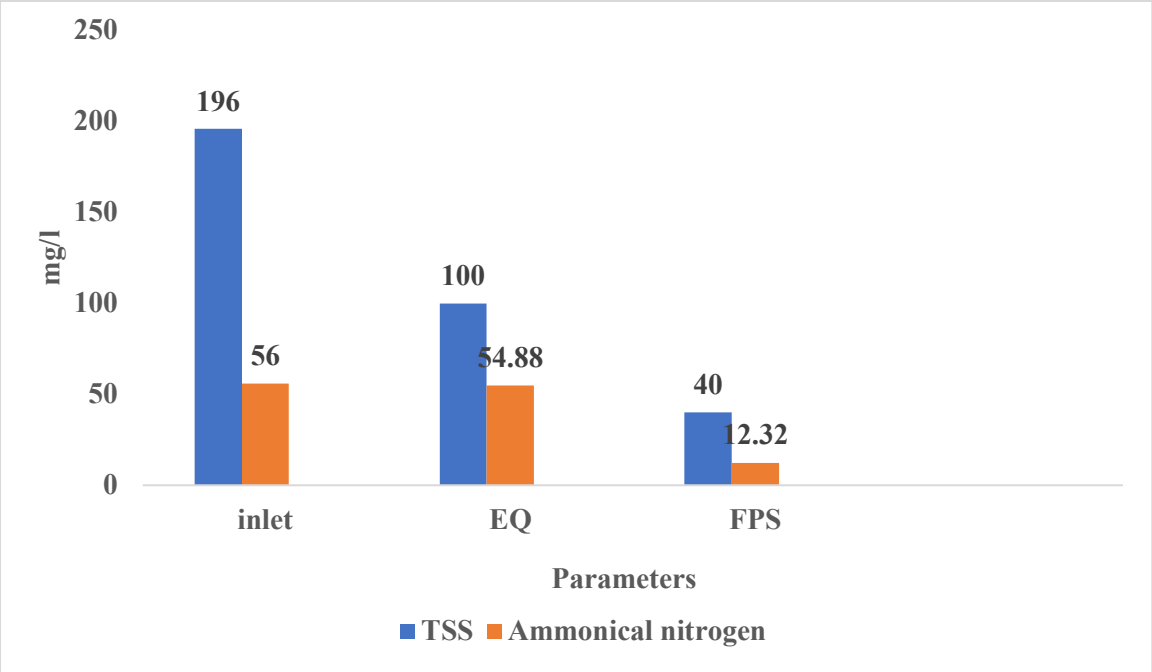


**Figure 5**: Estimation of TSS and Ammonical Nitrogen

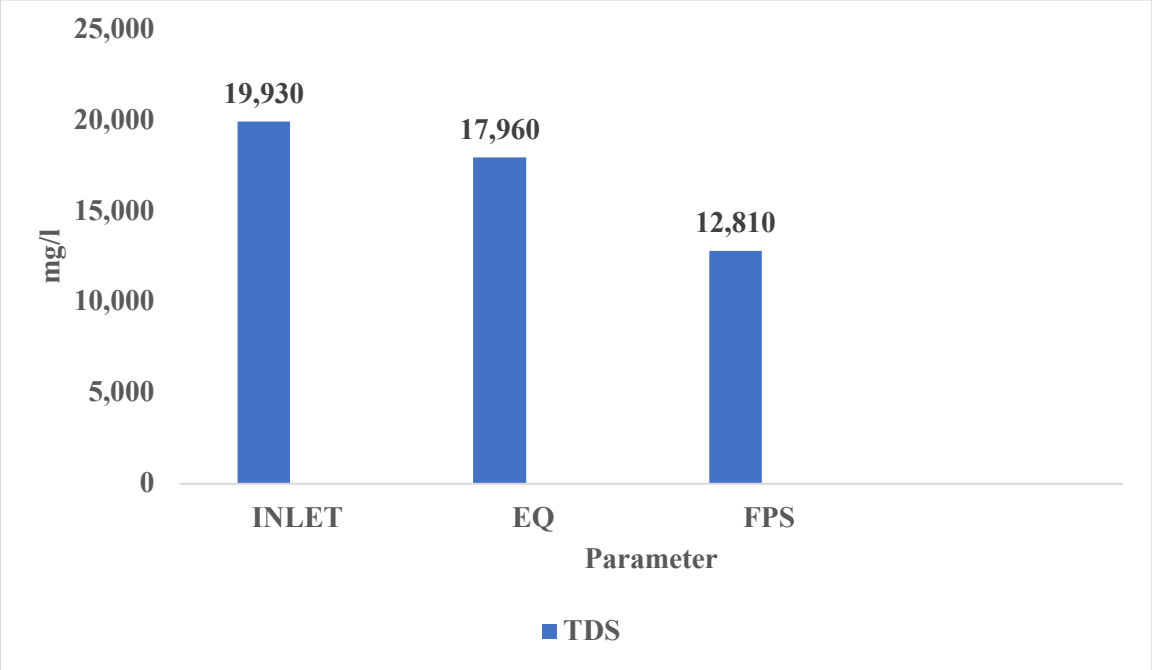


**Figure 6** : Estimation of TDS

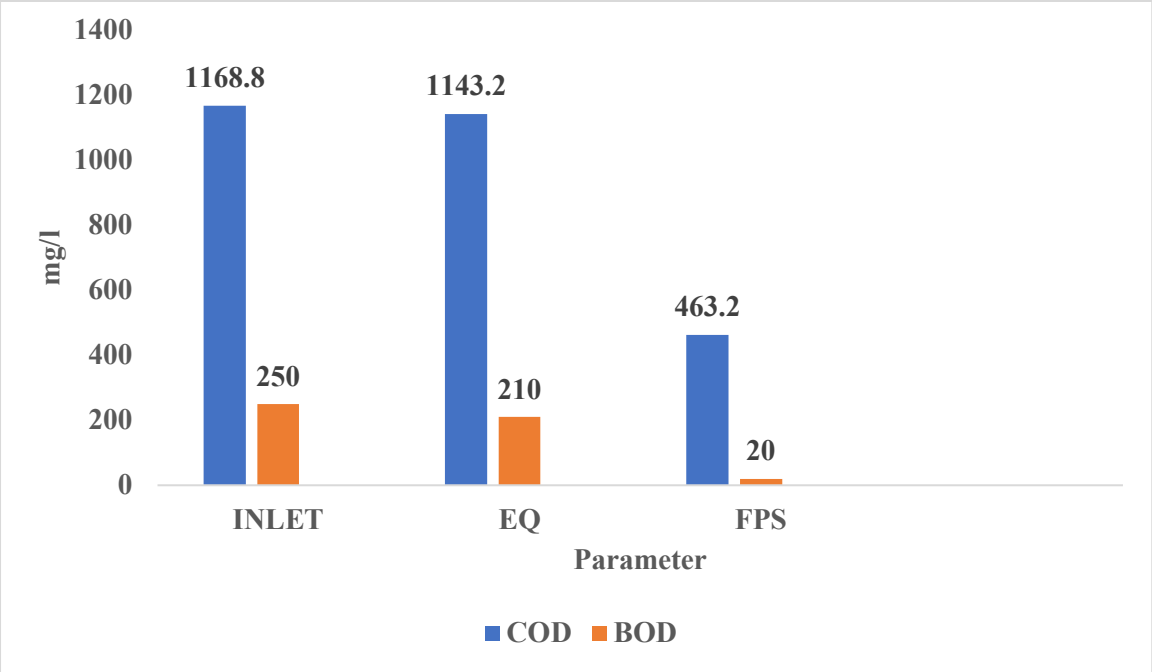


**Figure 7**: Estimation of COD and BOD

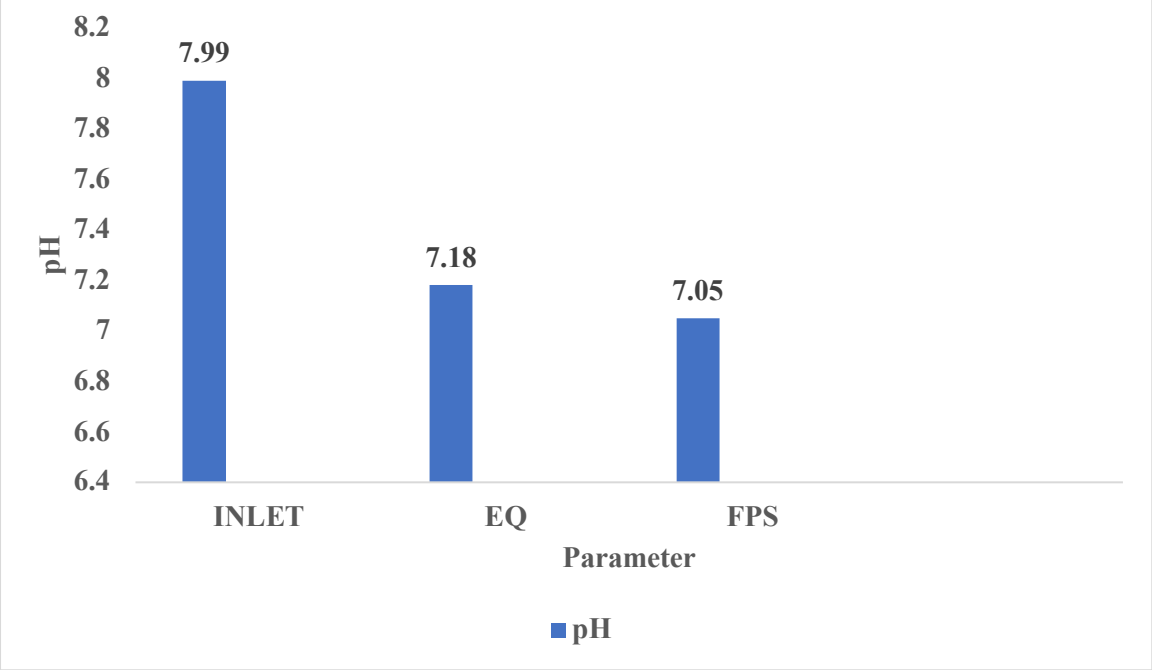


**Figure 8**: Estimation of pH

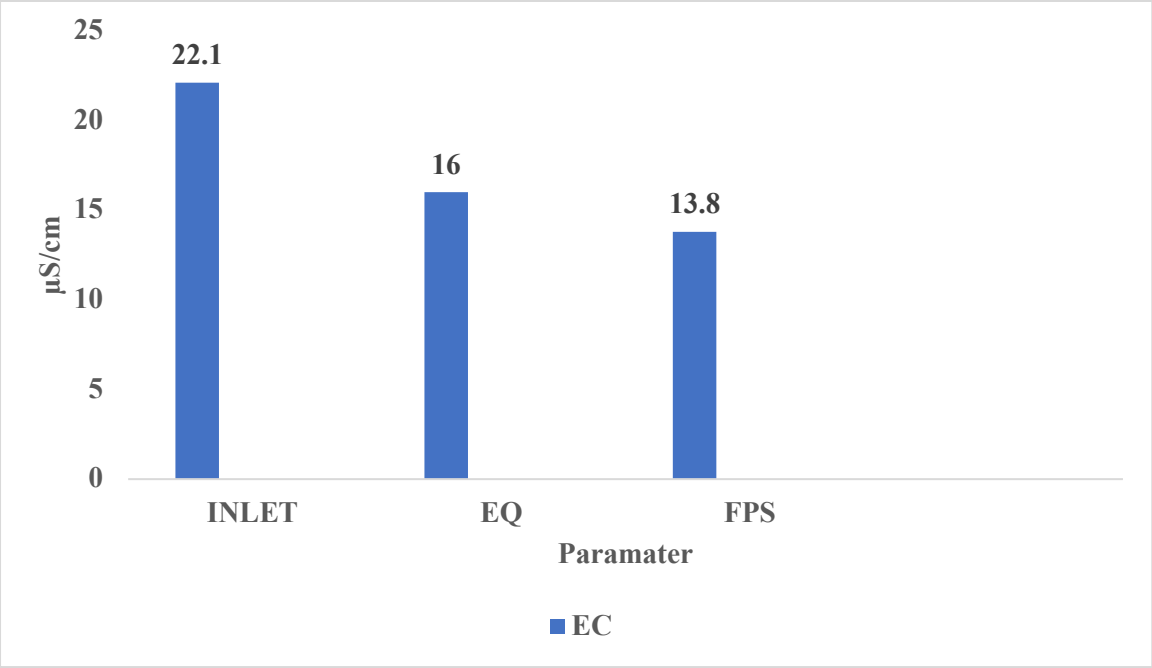


**Figure 9**: Estimation of Electrical conductivity

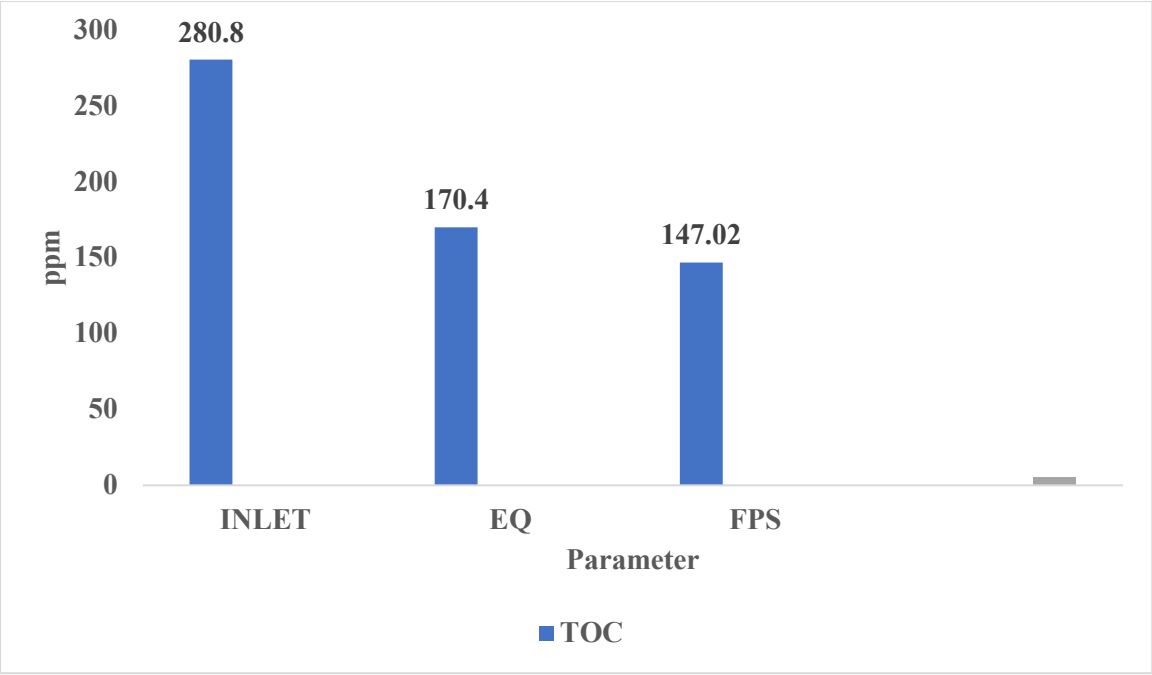


**Figure 10:** Estimation of TOC

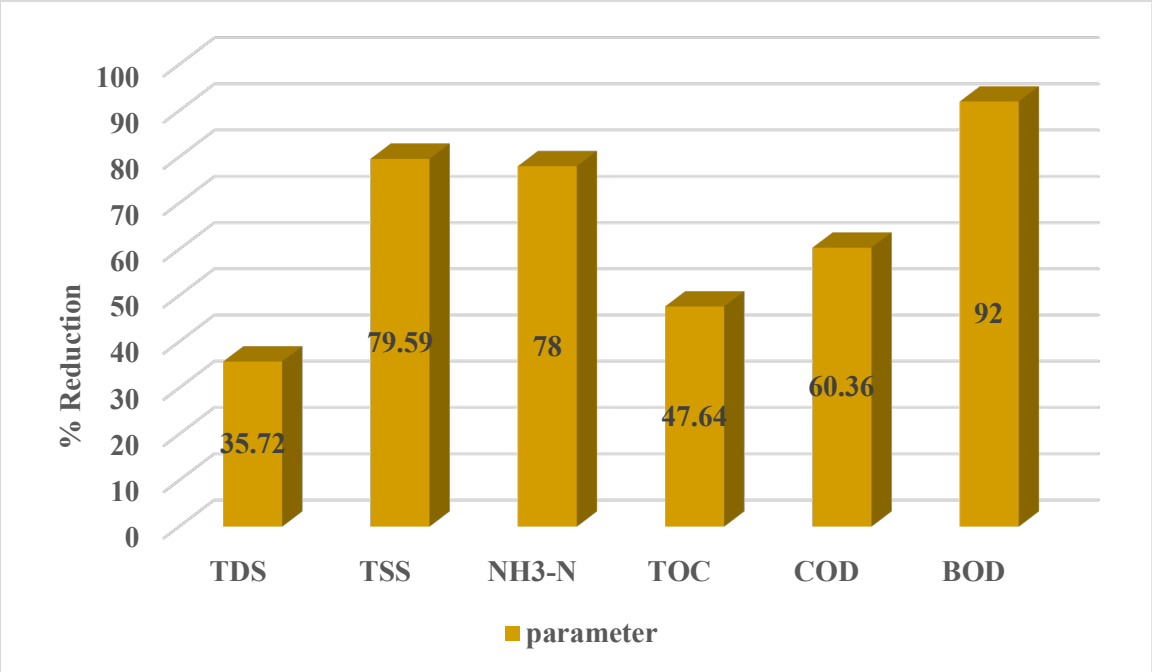


**Figure 11:** Percentage Reduction in Parameters of Inlet and FPS samples

## 4.3 COMPARISON OF TREATED WASTEWATER QUALITY WITH THE OUTLET NORMS OF CETP ASSIGNED BY REGULATORY AUTHORITY

- Comparison of treated wastewater quality with the norms stated by GPCB is very important for maintaining the sustainability of freshwater bodies. The norms restrain consumers who are carrying on an industry that falls within the provisions to affix meters for the purpose of evaluating the quality of water used in the act. This legislation was presented to make available the prevention and control of water pollution and the monitoring or restoring of the freshness of water.
- The table below shows a comparison of the results of Physico-chemical parameters of treated wastewater with the recommended standards stated by GPCB.

**Table 5: Comparison of Treated Effluent Quality with the Outlet Norms of CETP by GPCB**

| Physico-chemical parameters | Results of treated effluent | Outlet norms of CETP by GPCB |
|---|---|---|
| pH | 7.05 | 6.5 TO 8.5 |
| EC | 13.8 µS | - |
| TSS | 40 mg/l | 100 mg/l |
| TDS | 12,810 mg/l | 2100 mg/l |
| TOC | 147.02 mg/l | - |
| $NH_3$-N | 12.32 mg/l | 50 mg/l |
| BOD | 20 mg/l | 50 mg/l |
| COD | 463.2 mg/l | 250 mg/l |

# CHAPTER 5

# CONCLUSIONS

- The present investigation was undertaken to study the impact of secondary treatment on the industrial wastewater received at CETP.
- Quality of treated effluent from a common effluent treatment plant at Vatva, Ahmedabad by was evaluated for colour, Potential of Hydrogen (pH), Electrical Conductivity (EC), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Suspended Solid (TSS), Total Dissolved Solid (TDS), Total Organic Carbon (TOC), and Ammoniacal Nitrogen ($NH_3$-N) & results were recorded. The findings are desirable on the contrary they show the quality of wastewater was well within the permissible limits.
- The colour of the influent appeared from different types of colour shades, faint yellow, blackish, brownish, yellowish, muddy, and milky. This is depending on various types of effluents entering into CETP and their treatment.
- Based on the results obtained, it can be concluded that the secondary treatment of wastewater showed a notable reduction of BOD, TSS, TDS, $NH_3$-N, and TOC in the treated effluent. Treated effluent showed 79.59% TSS, 78% $NH_3$-H, 47.64% TOC, 60.36% COD, and 92% BOD reduction, which indicates the desirable efficiency of CETP in reducing the pollutants from wastewater.
- As far as stagewise % reduction is considered TSS reduced to 48.97 % from inlet to EQ sample (stage 1) and 60% from EQ (Equalization Tank) to FPS (Final Pumping Station) sample (stage 2). Ammoniacal nitrogen reduced to 2% from inlet to EQ sample and 77.55% from EQ to FPS sample, COD reduced to 2.19 % from inlet to EQ sample and 59.48 % from EQ to FPS sample, BOD reduced to 16% from inlet to EQ sample and 90.47 % in the second stage, TOC reduced 39.31 % from inlet to EQ sample and 13.72 from EQ to FPS sample. Finally, TDS reduced to 9.88 % from inlet to EQ sample and 28.67 % from EQ to treated FPS sample. These results also indicate the stagewise desirable efficiency of CETP in reducing the pollutants from the wastewater. Also, the degree of reduction in pollutants is higher in second stage of treatment than in first stage of treatment.
- If the CETP is running successfully and strict provision can make at the stage of operation and maintenance, restricted entry of effluent in the CETP, alternate arrangement for power failure then the project is very beneficial to the small scale and medium scale industrial units. It is a desirable project for all industrial estates in India.

- The results of the physicochemical parameters of wastewater obtained after the treatment showed that the treated effluent matches the permissible limits assigned by regulatory authorities.
- Based on the studies carried out the treated effluent can be used as an alternative source of freshwater for various other purposes such as on land irrigation, gardening and plantation or for various other industrial activities. However, further studies on advanced methodologies which will aid to achieve more reduction in the pollution load are desirable.

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Accelerate Pheno™ system for rapid identification and antimicrobial susceptibility testing of Gram-negative bacteria in bloodstream infections. *European Journal of Clinical Microbiology and Infectious Diseases*, *37*(8), 1573–1583. https://doi.org/10.1007/s10096-018-3287-6

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*Cleaner Production*, *217*, 503–509. https://doi.org/10.1016/j.jclepro.2019.01.224

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# COMPARATIVE STUDY OF WATER AND SEDIMENT MATRIX OF THREE WETLANDS IN THE KAMRUP REGION OF ASSAM

**Dissertation Submitted in partial fulfilment of the requirement for the Degree of Master of Science in Environmental Sciences**


**Submitted by**

**Kashmiri Sarma**

**Enrolment No. 190502021**




**School of Environment and Sustainable Development**
**Central University of Gujarat**
**Sector-29, Gandhinagar-382030 Gujarat, India**


**Under the supervision of**


**Dr. Arundhuti Devi**
**Associate professor**
**Environmental Chemistry**
**Institute of Advanced Study in Science and Technology**
**Boragaon, Guwahati-781035**
**Assam, India**

**Dr. Paulami Sahu**
**Assistant professor**
**School of Environment and Sustainable Development**
**Central University of Gujarat**
**Sector-29,Gandhinagar-382030**
**Gujarat, India**

# *"ASSESSMENT OF SOIL POLLUTION IN CHROMITE MINED AREAS OF ODISHA WITH SPECIAL REFERENCE TO HEAVY METALS IN SOIL"*

*A*

*Thesis submitted to*

Central University of Gujarat,

Gandhinagar

For partial fulfillment of the requirements for the degree of Masters in Environmental Sciences.

*By*

Kashyapi Kamalini

Enrol.ID.: 190502019

*Under supervision of*

Dr. A.K. Nayak

&

Dr. Dheeraj Rathore

गुजरात केन्द्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF GUJARAT

CENTRAL UNIVERSITY OF GUJARAT

DISSERTATION ON

# Detecting and analyzing Land Use Land Cover changes in Five Reserve forest of Sonapur range of Kamrup Metropolitan District and its surrounding area using Remote Sensing and GIS its Impact on Environment.


Dissertation Submitted to

School of Environment and Sustainable Development

Under the supervision of

**Dr. Dhanjit Deka**

Assistant Professor, Department of Geography, Gauhati University

**Dr. Rina Kumari**

Assistant Professor, School of Environment and Sustainable Development,

Central University of Gujarat

Submitted By:

**Madhurjya Deka**

Enrollment No: 190502006

M.Sc. in Environmental Science (SESD)

Central University of Gujarat

# Organic waste utilization for manure production, and assessment of impact of metaphysical energy on compost quality and yield.

**Field work and Project Submitted to the**


**Central University of Gujarat**

**for the award of the degree of**

## Ph.D.

**In**

## Environment and Sustainable Development

**Parul Vats**

**Research Scholar**

**Under the guidance of supervisor**

**Prof. R.Y. Hiranmai**

**School of Environment and Sustainable Development**

**Central University of Gujarat**

**Gandhinagar, India**

**August 2021**


# Wastewater Treatment and Energy Recovery by using Microbial Electrolysis System

**Course Code- 692**

**Under the Guidance of:-**

**Dr. Rajesh Singh**

**Asst. Prof., SESD**

**Central University of Gujarat**

**Submitted by:-**

**Renju**

**Enrollment no : 200705005**

# Climate change and Urbanization impact in and around Jaipur city, Rajasthan

Project Report Submitted to the


Central University of Gujarat

For the partial fulfilment of PhD course work

**ESD-692 Project**

Submitted by

Sandeep Kumar

(Enroll no. 200705001)

Supervised by

Prof. Bhawana Pathak

School of Environment and Sustainable Development

Central University of Gujarat

Gandhinagar, India

August 2021

ESD – 691 FIELD WORK

# “Impact of Climate Change on Hydrology “


Submitted by

**Saurabh Choubey**

(Research Scholar)

**Roll No. – 31230006**

Batch: 2020-21

Submitted to

**Dr. Rina Kumari**

Assistant professor

School of Environment and Sustainable development

Central University of Gujarat, Gandhinagar

# ESD692 – Project

# “Precipitation trend analysis over Gujarat, Western India


Submitted by:

Saurabh Choubey

200705004

Under the guidance of

Dr. Rina Kumari

ASSISTANT PROFFESOR

SESD CUG

# EVALUATION OF MUNICIPAL SOLID WASTE FOR VALUE CREATION IN SURAT, GUJARAT

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF

**MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES**

BY


**SWAYANSU SABYASACHI MOHANTY**

ENROLMENT NO.190502016




**SCHOOL OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

**CENTRAL UNIVERSITY OF GUJARAT**

**SECTOR-29, GANDHINAGAR-382030**

**GUJARAT, INDIA**


**GUIDED BY**


**DR. SUNITA VARJANI**

GUJARAT POLLUTION CONTROL BOARD

GANDHINAGAR-382030

GUJARAT, INDIA


**JULY-2021**

# Solid Waste Production, Management strategies and the Possibility of bioconversion of decomposable waste to bio fertilizers in Patna city, Bihar, India.

**A Dissertation Submitted to the**


**Central University of Gujarat**

**for the award of the degree of**
**Master of Science**
**in**
**Environmental Sciences**

**Submitted by**
**SWETA CHOUDHARY**
**(Enrolment no. 190502001)**
SESD, CUG

**Submitted to**
**Dr. R.Y. Hiranmai**
Professor
SESD, CUG

**School of Environment and Sustainable Development**
**Central University of Gujarat-382030**
**Gandhinagar, Gujarat (India)**

**June 2021**

Dissertation on

# Ambient Air Quality Analysis of Ernakulum City Using Air Quality Index


Dissertation Submitted to

School of Environment and Sustainable Development

Central University of Gujarat

MAY 2021

**AIR AND WATER QUALITY ASSESSMENT OF BIOMEDICAL WASTE TREATMENT FACILITY AND ITS ENVIRONMENTAL IMPLICATIONS**

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF

**MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCES**

BY

**YAMINI KOUL**

ENROLMENT NO.190502012

गुजरात केन्द्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF GUJARAT

**SCHOOL OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**
**CENTRAL UNIVERSITY OF GUJARAT**
**SECTOR-29, GANDHINAGAR-382030**
**GUJARAT, INDIA**

**CO-GUIDE**

**V. D. RAKHOLIA**
DEPUTY ENVIRONMENTAL ENGINEER
GUJARAT POLLUTION CONTROL BOARD
GANDHINAGAR, INDIA
**JULY – 2021**

**GUIDE**

**DR. SUNITA VARJANI**
SCIENTIFIC OFFICER
GUJARAT POLLUTION CONTROL BOARD
GANDHINAGAR, INDIA
**JULY – 2021**

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof. Atanu Mohapatra
Professor & Dean (I/C)
School of Library & Information Science

By Hand/Speed Post/E-Mail/Fax

Date : 17.08.2021

To,
The
Librarian
Tetso College Library
Dimapur, Nagaland

**Subject: Library Internship**

Dear Sir/ Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with Tetso College Library. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Abam Lungbamle Ngaubui
Roll No. : 200306026
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-79, Gandhinagar 382030

Sector-29 , Gandhinagar-382 030, Fax : 079 23260076
E-Mail: atanu@cug.ac.in, Website : www.cug.ac.in

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof. Atanu Mohapatra
Professor & Dean (I/C)
School of Library & Information Science

By Hand/Speed Post/E-Mail/Fax

Date : 17.08.2021

To,
The Librarian
Government Medical College Library
Ratlam, Madhya Pradesh

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with Government Medical College Library, Ratlam. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Abhishek Dharwa
Roll No. : 200306022
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean(I/c)

Dean
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

Sector-29 , Gandhinagar-382 030, Fax : 079 23260076
E-Mail: atanu@cug.ac.in, Website : www.cug.ac.in

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date :- 17.08.2021

**To,**
**Mr. Saroj das**
**Librarian**
**Institute of Plasma Research (IPR)**
**Ahmedabad**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at IPR Library, Ahmedabad. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Abhishek Raj
Roll No. : 200306016
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

**Prof. Atanu Mohapatra**
**Dean (I/c)**

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

# गुजरात केन्द्रीय विश्वविद्यालय

(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)

# CENTRAL UNIVERSITY OF GUJARAT

(Established by an Act of Parliament of India, No 25 of 2009)

Date :- 09.12.2021

To,
The Librarian
Central Library
Central University of Gujarat
Sector 30, Gandhinagar

**Subject: Library Internship**

Dear Sir,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the internship with the Central Library at Central University of Gujarat, Gandhinagar. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format attached). The duration of the internship will be 168 hours.

**Name of the Student: Amar Singh**
**Roll No.: 200306010**
**Start Date: 10th December 2021**
**Timing: 4:00 – 8:00pm**

I request your kind co-operation and acceptance for the same.

Thanks & regards,

**Prof. Atanu Mohapatra**
**Dean (I/c)**
**School of Library & Information Science**

Head
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

सेक्टर-29, गांधीनगर-382030, फोन नं - 07923260341, फेक्स-07923260076
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COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
Human Resource Development Group
EXTRAMURAL RESEARCH DIVISION – II
CSIR COMPLEX
Opp. Institute of Hotel Management,
Library Avenue, Pusa, New Delhi 110 012
Dated:-02-08-2019

No. 02(0315)17/EMR-II

From:
Head (HRDG)

To

Dr G. Nagaraj Gururaja, PI
School of Chemical Sciences,
Central University of Gujarat,
Gandhinagar – 382 030 (Gujarat)

**Sub**: Award of **SRF** Ship in the scheme on "Enantioselective .....*Reactions".*

Sir,

With reference to your e-mail dated 11-07-2019 on the above subject, I am directed to inform you that based upon your recommendations the approval for the award of fellowship of **SRF** to. **Mr. Ankush Gupta w.e.f. 20-03-2019 @ Rs.35,000/- p.m.** on a monthly stipend in the above mentioned scheme has been accorded.

1. In addition to stipend, House Rent Allowance will also be payable as per the rules of your Institution subject to the limit as admissible to the Central Government employees of that area. The stipend payable/paid will be treated as pay for the purpose of House Rent Allowance.

2. The tenure of this award is **for co-terminus of the scheme.** No T.A. is admissible at the time of joining or its termination.

3. The award is subject to the CSIR Terms & Conditions already sent to you with the initial sanction of the above scheme or as may be modified from time to time.

4. CSIR reserves the right to cancel or withdraw the award in case any discrepancy is found in the candidature at any stage of the fellowship.

Yours faithfully,

(Sunita Kureel)
SECTION OFFICER

**Copy to**:

The Registrar, Central University of Gujarat, Gandhinagar – 382 030 (Gujarat) for information and record.

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date : 17.08.2021

**To,**
**Dr. Neeta Bharti**
**Assistant Librarian**
**Central Library**
**National Institute of Technology**
**Jamshedpur 831014**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at Central Library, NIT, Jamshedpur. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Anupama Kumai
Roll No. : 200306021
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

**Prof. Atanu Mohapatra**
**Dean (I/c)**

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-79, Gandhinagar 382030

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009)



Date :- 09.12.2021

To,
The Librarian
Central Library
Central University of Gujarat
Sector 30, Gandhinagar

**Subject: Library Internship**

Dear Sir,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the internship with the Central Library at Central University of Gujarat, Gandhinagar. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format attached). The duration of the internship will be 168 hours.

**Name of the Student: Amara Ram**
**Roll No.: 200306012**
**Start Date: 10th December 2021**
**Timing: 4:00 – 8:00pm**

I request your kind co-operation and acceptance for the same.

Thanks & regards,

**Prof. Atanu Mohapatra**
**Dean (I/c)**
**School of Library & Information Science**



सेक्टर-29, गांधीनगर-382030, फोन नं - 07923260341, फेक्स-07923260076
Sector-29, Gandhinagar, Phone No. 07923260341, Fax-07923260076
Email: atanu.kumar@cug.ac.in, website: www.cug.ac.in

# Microwave assisted synthesis of reduced graphene oxide (RGO)

**Dissertation Submitted to the**


**Central University of Gujarat**
for the award of the degree of
**Master of Science**
**In**
**Nanotechnology**

Under the supervision of
***Dr. Charu Lata Dube***
Assistant Professor, SNS, CUG

डॉ. ...
Dr. C... bo
सहायक प्रा... rofesso
अ... स्थान
School of ... no Sciences
गुज... विश्वविद्यालय
Central University of Gujarat
गांधीनगर-३८२०३०, Gandhinagar - 30

Submitted by:

***Arujit Samal***
M. Sc 4th semester
Enrolment No.- 190505002

डॉ. चारु ...
Dr. Ch...
सहायक प्राध्यापक ...
School of ... Sciences
गुजरात केन्द्रीय विश्वविद्यालय
Central University of Gujarat
गांधीनगर-३८२०३०, Gandhinagar - 30

**School of Nano Sciences**

## Central University of Gujarat

**Gandhinagar, India**

**June, 2021**

Pallavi Sharma
Prof. Pallavi Sharma
Dean (I/C), SNS

# SYNTHESIS OF SELENIUM NANORODS USING GREEN ROUTE METHOD

**Dissertation Submitted to the**


**Central University of Gujarat**
**for the award of the degree of**
**Master of Science**

**In**

**Nanotechnology**

***Alok Pratap Singh***
**Master Student**

***Dr. Charu Lata Dube***
**Research Supervisor**

**School of Nano Sciences**
**Central University of Gujarat**
**Gandhinagar, India**

**June, 2021**

Dr. Charu Lata Dube
सहायक प्राध्यापक/Associate Professor
अतिथि, प्रेषण संस्थान
School of Nano Sciences
गुजरात केन्द्रीय विश्वविद्यालय
Central University of Gujarat
गांधीनगर-३८२०३०, Gandhinagar-382030

Prof. Pallavi Sharma
Dean (I/c), SNS

"SYNTHESIS OF ***CARBOXY METHYL CELLULOSE-LUTEOLIN*** (CMC-LU) LOADED NANOPARTICLES BY **SIMPLE PRECIPITATION METHOD"**

DISSERTATION SUBMITTED TO THE


**CENTRAL UNIVERSITY OF GUJARAT**

FOR THE AWARD OF THE DEGREE OF

***MASTERS OF SCIENCE***

IN SCHOOL OF NANOSCIENCES

SUBMITTED BY:

**ASHOK KUMAR BANOTH**

ER. NO: 190505007

**DR. UMESH KUMAR**

(SUPERVISOR)

SCHOOL OF NANOSCIENCES

**CENTRAL UNIVERSITY OF GUJARAT**

GANDHINAGAR

INDIA

Pallavi Sharma
Prof. Pallavi Sharma
Dean (I/c), SNS

Dr. Umesh Kumar
सहायक प्राध्यापक/Assistant Professor
School of Nanosciences
Central University of Gujarat
गांधीनगर-382030, Gandhinagar - 30.

# Synthesis of SDS Treated BSA Nanoparticles for Delivery of Nutraceuticals

**Dissertation Submitted to the**


**Central University of Gujarat**

for the award of the degree of

**Master of Science**

**In**

**Nanotechnology**

***Rahul H Patel***

**Master Student**

***Dr. Umesh Kumar***

**Research Supervisor**

**School of Nano Sciences**

**Central University of Gujarat**

**Gandhinagar, India**

**June, 2021**

Prof. Pallavi Sharma
Dean (I/c), SNS

डॉ. उमेश कुमार
Dr. Umesh Kumar
सहायक प्राध्यापक / Assistant Professor
School of Nano Sciences
Central University of Gujarat
Gandhinagar - 30.

# *Synthesis and characterization of hollow zein nanoparticles for potential medical applications*

***DISSERTATION SUBMITTED***

***TO***


**CENTRAL UNIVERSITY OF GUJARAT**

***FOR THE AWARD OF THE DEGREE OF***

***MASTER OF SCIENCE (M.Sc)***
***IN***
***NANOTECHNOLOGY***

***By :***
***Vivek mani Tripathi***
***School of Nano Sciences***
***(Enrolment No: 190505010)***

***Under the supervision of :***
***Dr. Umesh kumar***
***Assistant professor***

Prof. Pallavi Sharma
Dean (I/c), SNS

डॉ. उमेश कुमार
Dr. Umesh Kumar
सहायक प्राध्यापक / Assistant Professor
School of Nano Sciences
गुजरात केन्द्रीय विश्वविद्यालय
Central University of Gujarat
गांधीनगर-382030, Gandhinagar - 30.

# Green Synthesis of Magnesium Oxide (MgO) Nanoparticles using Soursop (annona muricata) Plant Extract

**DISSERTATION**

**SUBMITTED TO**

**SCHOOL OF NANO SCIENCES**

गुजरात केन्द्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF GUJARAT

**FOR THE AWARD OF THE DEGREE OF**

**Master of Science**

In

**NANOTECHNOLOGY**


**Submitted By**

**Anju Kunwar**

**Enrollment Id-190505014**

**School of Nano Sciences**

**Central University of Gujarat**

**Under the Supervision of**

**Dr. Umesh Kumar**

**Assistant Professor**

**School Of Nano Sciences**

**Central University of Gujarat**


**June 2021**

Prof. Pallavi Sharma
Dean (I/C), SNS

डॉ. उमेश कुमार
Dr. Umesh Kumar
सहायक प्राध्यापक / Assistant Professor
School of Nano Sciences
Central University of Gujarat
Gandhinagar - 30

# Designing of Waste Orange Peel Derived Activated Carbon Supported Tin Sulfide Nanostructures

**DISSERTATION SUBMITTED TO**

**THE CENTRAL UNIVERSITY OF GUJARAT**


**FOR THE AWARD OF THE DEGREE OF**

**Master of Science (M.Sc.) in Nanotechnology**

**By**

***Janmi Kalita***

**Enrolment no.: 190505006**

**Under the supervision of**

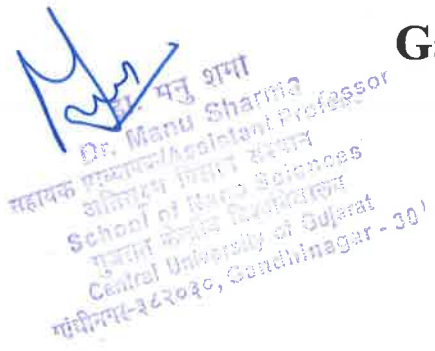
***Dr. Manu Sharma***

**School of Nano Sciences**

**Central University of Gujarat**

**Gandhinagar, India**

**June 2021**




# Facile controlled synthesis of silver phosphate nanostructures under the effect of various solvents

**Dissertation submitted to the**


**Central University of Gujarat**
**for the award of the degree of**

**Master of Science**
**in**
**Nanotechnology**

***Sreeraj P***

***Under the supervision of***

***Dr. Manu Sharma***

**School of Nano Sciences**
**Central University of Gujarat**
**Gandhinagar, India**

Pallavi Sharma
Prof. Pallavi Sharma
Dean (I/c), SNS

# Designing of Cobalt Tungstate Nanostructures for Benfuracarb Sensing

Dissertation Submitted to the


Central University of Gujarat

By: **Jashpal Singh**

Enrollment no:190505003

M.Sc. 2nd year Nanotechnology

Under the Guidance of

**Dr. Manu Sharma**

Assistant Professor,

School of Nano Sciences

Central University of Gujarat

Dr. Manu Sharma
सहायक प्राध्यापक/Assistant Professor
शोधगुरु नैनो विज्ञान संकाय
School of Nano Sciences
केन्द्रीय विश्वविद्यालय
Central University of Gujarat
गांधीनगर-382030, Gandhinagar - 30

Pallavi Sharma
Prof. Pallavi Sharma
Dean (I/C), SNS

# Designing of Manganese Tungstate Nanostructures for Glucose Sensing

Dissertation Submitted to the


Central University of Gujarat

By: **Debashish Mahanta**

Enrollment no:190505004

M.Sc. 2nd year Nanotechnology

Under the Guidance of

**Dr. Manu Sharma**

Assistant Professor,

School of Nano Sciences,

Central University Of Gujarat

Dr. Manu Sharma
सहायक प्राध्यापक/Assistant Professor
स्कूल ऑफ नैनो विज्ञान
School of Nano Sciences
केन्द्रीय विश्वविद्यालय
Central University of Gujarat
गांधीनगर-382030, Gandhinagar - 30

Prof. Pallavi Sharma
Dean (I/C), SNS

# Synthesis and characterization of phenylboronic acid conjugated dendrimers for targeted anticancer drug delivery

DISSERTATION

Submitted to

*School of Nano Sciences*

AT THE


**Central University of Gujarat**

*FOR THE AWARD OF THE DEGREE OF*

**MASTER OF SCIENCE**

In

Nanotechnology

By

**Meheli Ghosh**

Enrollment number: 190505012

Under the Supervision of

**Dr. Hitesh Kulhari**

Assistant professor

School of Nano Sciences

Central University of Gujarat

Gandhinagar -382030

**JUNE 2021**

Pallavi Sharma

Prof. Pallavi Sharma
Dean (I/c), SNS

# Development of Catalase enzyme-dendrimer complex to improve its stability

**DISSERTATION SUBMITTED TO THE**

**CENTRAL UNIVERSITY OF GUJARAT**


**For the award of the degree of**

**MASTER OF SCIENCE**

**IN**

**NANOTECHNOLOGY**

**Submitted by**


## Priyodarshini Hazarika

**(Enrolment no – 190505008)**

**Under the supervision of**

## Dr. Hitesh Kulhari

**Assistant Professor**

**School of Nanosciences**

**Central University of Gujarat**

**Gandhinagar, India**


**June, 2021**

Pallavi Sharma
Prof. Pallavi Sharma
Dean (I/c), SNS

# Development of dendrimer-mediated nanoformulation of bilirubin to improve its solubility

**DISEERTATION SUBMITTED**

**TO**


**THE CENTRAL UNIVERSITY OF GUJARAT**

**FOR THE AWARD OF THE DEGREE OF**

## Master of Science

In

Nanotechnology

*By*

***DHANYA S J***

***(Enrolment No:190505009)***

**Under the supervision of**

***Dr. Hitesh Kulhari***

**School of Nano Sciences**

**Central University of Gujarat**

**Gandhinagar, India**

Pallavi Sharma

Prof. Pallavi Sharma
Dean (I/c), SNS

# गुजरात केन्द्रीय विश्वविद्यालय

(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)

# CENTRAL UNIVERSITY OF GUJARAT

(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date :- 17.08.2021

**To,**
**Dr. Neeta Bharti**
**Assistant Librarian**
**Central Library**
**National Institute of Technology**
**Jamshedpur 831014**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at Central Library, NIT Jamshedpur. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Ashutosh Mishra
Roll No. : 200306013
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date : 17.08.2021

**To,**
**Mr Saroj Das**
**Librarian**
**Institute of Plasma Research (IPR)**
**Ahmedabad**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at IPR Library, Ahmedabad. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Debashish Banchhor
Roll No. : 200306008
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

Bhakti Gala, PhD
Assistant Professor

# गुजरात केन्द्रीय विश्वविद्यालय

(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)

# CENTRAL UNIVERSITY OF GUJARAT

**School of Library and Information Science**

## SUPERVISOR'S CERTIFICATE

This is to certify that the dissertation entitled ***"National Digital Libraries of South Asian Countries: An Evaluative Study "***, being submitted by **Chandrakant Mahto, Enrolment No. 190306004** to School of Library and Information Science of Central University of Gujarat, Gandhinagar in partial fulfilment of the award of the degree of Master of Library and Information Science, is a record of bonafide work carried out by him under my supervision and **Chandrakant Mahto** fulfils the requirements of the regulations for completion of the dissertation work.

**Signature of Supervisor**
**Name: Dr. Bhakti Gala**
**School: Lib. & Inf. Sc.**
**Place: Gandhinagar**
**Date: 15th July 2021**

**Signature of Dean**
**Name:** Prof. A. Mahesh
**Centre / School:** School of Library & Information Science
**Place:** Gandhinagar
**Date:** 15.07.2021

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar

सेक्टर-29, गांधीनगर-382030. फोन नं - 07923977428,
Sector-29, Gandhinagar-382030. Phone No. 07923977428,
Email: bhakti.gala@cug.ac.in; website: www.cug.ac.in

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009)

# SUPERVISOR'S CERTIFICATE

This is to certify that the dissertation entitled ***"ILMS as A Smart Technological Solution for Academic Libraries: A Comparative Study of Open and Proprietary Systems"***, being submitted by **Manoranjan Satpathy, Enrolment No. 190306005** to School of Library and Information Science of Central University of Gujarat, Gandhinagar in partial fulfilment of the award of the degree of Master of Library and Information Science, is a record of bonafide work carried out by him/her under my supervision and **Manoranjan Satpathy** fulfils the requirements of the regulations for completion of the dissertation work.

**Signature of Supervisor**
**Name:** Dr. Minaxi Parmar
**Centre / School:** School of Library and Information Science
**Place:** Central University of Gujarat, Gandhinagar, Gujarat
**Date:** 20th July 2021

**Signature of Dean**
**Name:** Prof Atanu Mohapatra
**Centre / School:** School of Library and Information Science
**Place:** Central University of Gujarat, Gandhinagar, Gujarat
**Date:** 20th July 2021

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar-382030

गुजरात केन्द्रीय विश्वविद्यालय
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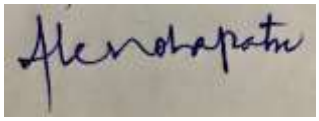
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009)

# SUPERVISOR'S CERTIFICATE

This is to certify that the dissertation entitled ***"Digital Film Archives: Metadata Analysis for the Discovery and Access to Works of Satyajit Ray"***, being submitted by **Ananya Deka, Enrolment No. 190306003** to School of Library and Information Science of Central University of Gujarat, Gandhinagar in partial fulfilment of the award of the degree of Master of Library and Information Science, is a record of bonafide work carried out by ~~him~~/her under my supervision and **Ananya Deka** fulfils the requirements of the regulations for completion of the dissertation work.

**Signature of Supervisor**
**Name: Rashmi T Kumbar**
Centre / School: School of Library And Information Science
Place: Gandhinagar
Date: 19th July 2021



**Signature of Dean (I/c)**
**Name: Prof. Atanu Mohapatra**
Centre / School: School of Libraray and Information Science
Place: Gandhinagar
Date: 19.07.2021

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009)

# SUPERVISOR'S CERTIFICATE

This is to certify that the dissertation entitled *"**Identification, Evaluation and Promotion of Online Resources on Hindustani Vocal Classical Music: A Study**"*, being submitted by **Shilpi Dey & Enrolment No. 190306001** to School of Library and Information Science of Central University of Gujarat, Gandhinagar in partial fulfilment of the award of the degree of Master of Library and Information Science, is a record of bonafide work carried out by ~~him~~/her under my supervision and **Shilpi Dey** fulfils the requirements of the regulations for completion of the dissertation work.

Rashmi K

**Signature of Supervisor**

**Name:** Rashmi T Kumbar

**Centre / School:** School of Library And Information Science

**Place:** Gandhinagar

**Date:** 19th July 2021

**Signature of Dean**

Dean,
School of Library and Information Science
Central University of Gujarat
Sector 29, Gandhinagar-382030

**Name:** Prof. Atreyee Sinha

**Centre / School:** School of Library & Information Science

**Place:** Gandhinagar

**Date:** 19.07.21

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date : 17.08.2021

**To,**
**Dr. Monita Shastri**
**Librarian**
**Nirma University**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at Nirma University, Ahmedabad. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Hemal Trivedi
Roll No. : 200306003
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

# Atal Bihari Vajpayee Institute of Policy Research and International Studies (AIPRIS)

The Maharaja Sayajirao University of Baroda, Vadodara

सत्यं शिवं सुन्दरम्
Estd. 1949

Date:30/06/2021

## TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mr. Hiren Patel worked as a Junior Research Fellow at the Atal Bihari Vajpayee Institute of Policy Research and International Studies (AIPRIS), The Maharaja Sayajiao University of Baroda, from 2nd November 2020 to 31st May 2021.

As Junior Research Fellow, Mr. Patel assisted the Institute in terms of collection of qualitative and quantitative data for the projects of the Institute and helped in the preparation of proposals for funding. In particular, he was involved in the collection of data on maritime and coastal security of Gujarat, ports' sector in Gujarat, environmental challenges to the Gujrat coast and issues relating to community policing.

His association and support were beneficial for the Institute. He carried out the given tasks with diligence and presented the data collected in categorized and systematic manner. He was polite and cordial in his conduct with superiors and peers alike.

I wish Mr. Patel all the best in his future academic and professional endeavors.

(Prof. Amit Dholakia)
Joint Director, AIPRIS

Joint Director
Atal Bihari Vajpayee Institute of Policy Research and International Studies
The Maharaja Sayajirao University of Baroda
Vadodara - 390 002.

Atal Bihari Vajpayee Institute of Policy Research and International Studies (AIPRIS) Office:
Maharaja Pratapsinhrao Gaekwad Parisar, Opp. The M. S. University of Baroda Head Office,
Fatehgunj, Vadodara - 390 002, Gujarat (INDIA) Mobile: +91 84696 59321 E-mail: office-aipris@msubaroda.ac.in, info.aiprismsu@gmail.com

# Supervisor's Certificate

This is to certify that the dissertation work entitled "**Computational Analysis of human SARS-CoV-2 sequences from different countries"** submitted by **HiuenTsang Mochahary** with **Enrolment No. 190504009** in partial fulfilment for the degree of Master of Life Science is a bona-fide record of the research work carried out by the candidate under my guidance in **GUIST, Gauhati University, Gauhati**. This work is original and has not been submitted in part or full for any other degree or diploma to this or any other University or Institution.

Dr. Kandarpa Kr. Saikia
Associate Professor & Head
Dept of Bioengineering & Tecnology
GUIST, Gauhati University
Guwahati-14, Assam, India

Date: 23.06.2021

Dr. Kandarpa Kumar Saikia
Associate Professor
GUIST, Gauhati University

---

**Dissertation forwarded for Evaluation**

Dean

Name:

School:

Place:

Date

# Declaration by the Supervisor

This is to certify that the dissertation entitled **"Antioxidative Study of Cerium Oxide Nanoparticles loaded Polycaprolactone-Gelatin Electrospun Nanofiber for Bone Regeneration"** submitted to Central University of Gujarat by **Juli Morang** bearing Registration number **190504012**, for the award of the degree of Masters in Life Science, is the bonafide record of original work done by the candidate under my supervision and guidance.

This is also to certify that the above said work has not been previously submitted to any other University/ Institute for the award of any Degree or Diploma.

Rajesh vasita

Date: 22-06-2021

Place: Gandhinagar

Dr. Rajesh Vasita

Assistant professor

School of Life Science

Central University of Gujarat, Gandhinagar

# Dissertation forwarded for Evaluation

Dean

Name

School:

Place:

Date:

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof. Atanu Mohapatra
Professor & Dean (I/C)
School of Library & Information Science

By Hand/Speed Post/E-Mail/Fax

Date : 17.08.2021

To,
Ms. N Lalitha
Secretary of District Grandalaya
Gurajada Memorial District Central Library
Vizianagaram, Department of Public Libraries
535002

Subject: Library Internship

Dear Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with Gurajada Memorial District Central Library Vizianagaram. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the Gurajada Memorial District Central Library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Kantubhuktha Surya Naveen
Roll No. : 200306025
Start Date : 11th August 2021

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

Sector-29 , Gandhinagar-382 030, Fax : 079 23260076
E-Mail: atanu@cug.ac.in, Website : www.cug.ac.in

सीएसआईआर – इमटैक
CSIR-IMTECH

सीएसआईआर – सूक्ष्मजीव प्रौद्योगिकी संस्थान
सैक्टर 39 – ए, चण्डीगढ़ – 160 036 (भारत)
CSIR-INSTITUTE OF MICROBIAL TECHNOLOGY
(A CONSTITUENT ESTABLISHMENT OF CSIR)
Sector 39-A, Chandigarh-160 036 (INDIA)

# CERTIFICATE

This is to certify that the Dissertation work entitled *"Evaluation of Immunomodulatory Properties of Steroidal Saponins on Murine Splenocytes and BMDM"* submitted by **Ms. Kalpana Choudhary** for the partial fulfillment of requirement for the award of **Masters of Life Sciences** submitted to **Central University of Gujarat** has been done under the guidance and supervision of **Dr. Rashmi Kumar**, Senior Scientist, CSIR-IMTECH from Jan 8, 2021 to June 23, 2021.Work reported in this dissertation is a part of ongoing research in my laboratory and cannot be used or shared without my consent.

**Dr. Rashmi Kumar**

Supervisor

**Place:** CSIR-IMTECH, Chandigarh

**Date:** June 24, 2021

डॉ. रश्मि कुमार/Dr. Rashmi Kumar
वरिष्ठ वैज्ञानिक/Senior Scientist
सीएसआईआर–सूक्ष्मजीव प्रौद्योगिकी संस्थान
CSIR-Institute of Microbial Technology
वैज्ञानिक एवं प्रौद्योगिकी मंत्रालय, भारत सरकार
Ministry of Science & Technology, Govt. of India
सैक्टर/Sector 39-A, चण्डीगढ़/Chandigarh-160036

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0172-6665..... (Direct)
फैक्स : { 0091-172-2690632 (COA)
Fax : { 0091-172-2690585 (Director)
0091-172-2690056 (Purchase)
एस. टी. डी. कोड : STD CODE : 172
तार : Gram : IMTECH
E.mail : system@imtech.res.in
Web : http://imtech.res.in

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date : 17.08.2021

**To,**
**The Librarian**
**Adani Institute of Infrastructure Management**
**Ahmedabad**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at AIIM Library, Ahmedabad. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Khushboo Choudhary
Roll No. : 200306007
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

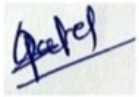
Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

# SUPERVISOR'S CERTIFICATE

This is to certify that the project report entitled ***"Effect of Plumbagin loaded BSA Nanoparticles on MCF-7 Cell line and other basic techniques"*** submitted by Miss. Kleopatra Eligy Prabina, to the School of Life sciences Central University of Gujarat for the partial fulfilment of requirement for the award of Master of Life Sciences. The report is a bonafide record of an original work done under the guidance of Dr. Sunita Patel, Assistant Professor, School of Life Sciences, Central university of Gujarat.

The results embodied in this thesis, in full or parts have not been submitted to any other University or Institute for award of any degree, diploma or titles.



Place: Gandhinagar

Date: 24 June 2021

Signature of Supervisor

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date :-17.08.2021

**To,**
**The Librarian**
**DA-IICT**
**Gandhinagar**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at DA-IICT Library, Gandhinagar. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Kratika Tawari
Roll No. : 200306006
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)
Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

# गुजरातकेन्द्रीयविश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
# CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009)

To
The Registrar
Central University of Gujarat
Gandhinagar Sector 29 & 30

Subject- Request for extension of tenure of JRF post in DST sponsored project titled "Low Cost- Renewable Energy Driven (LC- RED) Water Treatment Solutions Centre" F. No. DST/TM/WTI/WIC/2K17/124(C) Dated: 07/01/2019.

**Respected sir**

**Ms. Kritika Sharma** was appointed on 24-05-2019 for one year by the committee for the post of JRF in the DST sponsored project (DST/TM/WTI/WIC/2K17/124(C) Dated: 07/01/2019) at SCS, CUG. Her one-year tenure as JRF ended on 23-05-2020. Her research work performance is satisfactory. Based on her performance, I, PI of this project @CUG, recommend and request you to extend the tenure of her JRF.
All the terms and conditions of her appointment will remain the same.
**I humbly request you to continue her JRF fellowship as before.** (23-05-2021)

Kind regards
Thank you,

22-03-2021

Dr. Dinesh Kumar
Professor, SCS
PI, DST project

22.03.2021

23/3/2021

इमटैक
IMTECH

सूक्ष्मजीव प्रौद्योगिकी संस्थान
सैक्टर 39-ए, चण्डीगढ़-160 036 (भारत)
INSTITUTE OF MICROBIAL TECHNOLOGY
(A CONSTITUENT ESTABLISHMENT OF CSIR)
Sector 39-A, Chandigarh-160 036 (INDIA)

# CERTIFICATE

This is to certify that the dissertation work embodied **"AMR Burden in Poultry: Lessons from Barwala Poultry Farm of Haryana (India)"** has been carried out by **Mr. Kunal Arjun Mankar** under my guidance at **CSIR- Institute of Microbial Technology, Chandigarh** from **January 2021 to June 2021** and submitted to Central University of Gujarat, Gandhinagar for partial fulfillment of requirements for the award of Masters of Life Sciences. This work is original and has not been submitted in part or full for any other degree or diploma to any other University/Institute.

**Dr. Saumya Raychaudhuri**
**Supervisor**

डॉ. सौम्यराय चौधरी/Dr. Saumya Raychaudhuri
वरिष्ठ प्रधान वैज्ञानिक/Sr. Principal Scientist
सीएसआईआर–सूक्ष्मजीव प्रौद्योगिकी संस्थान
CSIR-Institute of Microbial Technology
सैक्टर/Sector 39-A, चण्डीगढ़/Chandigarh-160036

**Place:** CSIR- IMTech, Chandigarh

**Date:**

दूरभाष 0172-6665201
0172-6665202 } Reception
0172-6665..... (Direct)
फैक्स : 0091-172-2690632 (COA)
Fax : 0091-172-2690585 (Director)
0091-172-2690056 (Purchase)
एस. टी. डी. कोड : STD CODE : 172
तार : Gram : IMTECH
E.mail : system@imtech.res.in
Web : http://imtech.res.in

1.3.4
2.3.3


# CENTRAL UNIVERSITY OF GUJARAT

Sector - 29, Gandhinagar - 382 030, Gujarat, India, Tel: 08866823510
Email: prakash.jha@cug.ac.in; prakashcjhaindia@gmail.com
Website: www.cug.ac.in

**Prof. Prakash C. Jha**
**Dean & Professor**
**Centre for Applied Chemistry (CAC)**
**School of Applied Material Sciences**


**Date 02.01.2021**

## Notice

The school has decided to allotment of mentor for the students of M.Sc. IC 4th semester. They are advised to contact their mentor for Project Work. The allotment of Mentor for Project Work each student are as below:

**Prof. Prakash C Jha**

1. Tanay Das
2. Aparajita Ghosh
3. Yogesh Verma
4. Jyoti Ghosh

**Dr. Raju Chowhan**

1. Ketan Kumar

**Dr. E Begari**

1. Malobika Kar
2. Nitika

Copy to:
1. All faculty members
2. School Notice board

pcjha.
Dean

2.3.3, 1.3.4


# CENTRAL UNIVERSITY OF GUJARAT

Sector - 29, Gandhinagar - 382 030, Gujarat, India, Tel: 08866823510
Email: prakash.jha@cug.ac.in; prakashcjhaindia@gmail.com
Website: www.cug.ac.in

**Prof. Prakash C. Jha**
**Dean & Professor**
**Centre for Applied Chemistry (CAC)**
**School of Applied Material Sciences**


**Date 02.01.2021**

## Notice

The school has decided to mentor for the students of M.Sc. IC 4th semester. They are advised to contact their mentor for academic and other related issues. The allotment of Mentor for each student are as below:

Prof. Prakash C Jha

1. Tanay Das
2. Aparajita Ghosh
3. Yogesh Verma
4. Jyoti Ghosh

Dr. Raju Chowhan

1. Ketan Kumar

Dr. E Begari

1. Malobika Kar
2. Nitika

Copy to:
1. All faculty members
2. School Notice board

Dean

1.3.4
2.3.3


# CENTRAL UNIVERSITY OF GUJARAT

Sector - 29, Gandhinagar - 382 030, Gujarat, India, Tel: 08866823510
Email: prakash.jha@cug.ac.in; prakashcjhaindia@gmail.com
Website: www.cug.ac.in

**Prof. Prakash C. Jha**
**Professor & Dean**
**Centre for Applied Chemistry (CAC)**
**School of Applied Material Sciences**


**Date 02.03.2022**

## Notice

The school has decided to allotment of mentor for the students of M.Sc. IC 4th semester. They are advised to contact their mentor for Project Work. The allotment of mentor for Project Work each student are as below:

**Prof. Prakash C Jha**

1. Arzoo Rai
2. Baishali Paul
3. Shreya Mukherjee
4. Samudro Ghosh
5. Semanti Pramnick

**Dr. Raju Chowhan**

1. Ankita Das
2. Siddartha Swain
3. Mihir Patat
4. Shnehal Chawda
5. Lambodar Khadanga

**Dr. E Begari**

1. Vijay Burra
2. Tripti Mishra
3. Ashwini Bawankar
4. Simran Kumari
5. Suphal Sen

**Copy to:**

1. All faculty members
2. School Notice board

PCJha
Dean

1.3.4
2.3.3


# CENTRAL UNIVERSITY OF GUJARAT

Sector - 29, Gandhinagar - 382 030, Gujarat, India, Tel: 08866823510
Email: prakash.jha@cug.ac.in; prakashcjhaindia@gmail.com
Website: www.cug.ac.in

**Prof. Prakash C. Jha**
**Professor & Dean**
**Centre for Applied Chemistry (CAC)**
**School of Applied Material Sciences**


**Date 02.03.2022**

## Notice

The school has decided to mentor for the students of M.Sc. IC 4th semester. They are advised to contact their mentor for academic and other related issues. The allotment of Mentor for each student are as below:

**Prof. Prakash C Jha**

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2. Baishali Paul
3. Shreya Mukherjee
4. Samudro Ghosh
5. Semanti Pramnick

**Dr. Raju Chowhan**

1. Ankita Das
2. Siddartha Swain
3. Mihir Patat
4. Shnehal Chawda
5. Lambodar Khadanga

**Dr. E Begari**

1. Vijay Burra
2. Tripti Mishra
3. Ashwini Bawankar
4. Simran Kumari
5. Suphal Sen

**Copy to:**

1. All faculty members
2. School Notice board

**Dean**

# SUPERVISOR'S CERTIFICATE

This is to certify that the M.Sc. Dissertation entitled **"To investigate the anti-cancer activity of Plumbagin loaded Bovine Serum Albumin nanoparticles on MDA-MB-231"**submitted to Central University of Gujarat, Gandhinagar for the partial fulfilment of the requirements for the degree of M.Sc. Life Sciences is a bonafide research work carried out by **Niharika Aggarwal (190504007)** of **M.Sc. Life Sciences IV Semester in School of Life Sciences,** Central University of Gujarat, Gandhinagar. No part of this dissertation has been submitted elsewhere for award of any other degree or diploma.

Place: Gandhinagar
Date: 24 June 2021

Signature of Supervisor

**Dissertation forwarded for Evaluation**

Dean

Name:

School:

Place:

Date:

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof. Atanu Mohapatra
Professor & Dean (I/C)
School of Library & Information Science

By Hand/Speed Post/E-Mail/Fax

Date : 17.08.2021

To,
The Librarian
MES Kalladi College
Mannarkkad,
PO Palakkad District
Kerala 678583

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the MES Kalladi College, Kerala. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Muhammed Noufal T K
Roll No. : 200306002
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean(I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

Sector-29 , Gandhinagar-382 030, Fax : 079 23260076
E-Mail: atanu@cug.ac.in, Website : www.cug.ac.in

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009

Prof. Atanu Mohapatra
Professor & Dean (I/C)
School of Library & Information Science

By Hand/Speed Post/E-Mail/Fax

Date : 17.08.2021

To,
The Librarian
TSWRS, J/C
Jakaram,
Grow Book System

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the MES Kalladi College, Kerala. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Pendela Raveena
Roll No. : 200306015
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/C)

Dean
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

Sector-29 , Gandhinagar-382 030, Fax : 079 23260076
E-Mail: atanu@cug.ac.in, Website : www.cug.ac.in

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
**CENTRAL UNIVERSITY OF GUJARAT**
(Established by an Act of Parliament of India, No 25 of 2009

Prof. Atanu Mohapatra
Professor & Dean (I/C)
School of Library & Information Science

By Hand/Speed Post/E-Mail/Fax

Date : 18.08.2021

**To,**
**The Librarian**
**Tetso College Library**
**Dimapur, Nagaland**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with Government Medical College Library, Ratlam. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : S Line
Roll No. : 200306024
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

18/08/21

**Prof. Atanu Mohapatra**
**Dean(I/c)**

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

Sector-29 , Gandhinagar-382 030, Fax : 079 23260076
E-Mail: atanu@cug.ac.in, Website : www.cug.ac.in

इमटैक
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सूक्ष्मजीव प्रौद्योगिकी संस्थान
सैक्टर 39-ए, चण्डीगढ़-160 036 (भारत)
INSTITUTE OF MICROBIAL TECHNOLOGY
(A CONSTITUENT ESTABLISHMENT OF CSIR)
Sector 39-A, Chandigarh-160 036 (INDIA)

## DECLARATION BY THE SUPERVISOR

This is to certify that the dissertation report entitled **"Cloning, purification and characterization of predicted extracellular serine proteases of an alkaliphilic *Bacillus* sp. strain"** which is being submitted by **Mr. Sanjeev Kumar Sharma** for the partial fulfillment of the requirement for the award of **Masters in Life Sciences** to the Central University of Gujarat, Gandhinagar, has been carried out under my supervision and guidance at CSIR IMTECH, Chandigarh, from January 18, 2021 to April 16, 2021, and in a virtual mode till June 22, 2021, due to lockdown restrictions.

Work reported in this M.Sc. Life Science dissertation is part of an ongoing research in my laboratory. The work presented in this report cannot be shared or used in any form of publication in any scientific journal/ award of any other degree/ conference abstract/ fellowship/ proceedings etc. without my consent.

डॉ. बीना कृष्णन/Dr. Beena Krishnan
प्रधान वैज्ञानिक/Principal Scientist
सीएसआईआर–सूक्ष्मजीव प्रौद्योगिकी संस्थान
CSIR-Institute of Microbial Technology
सैक्टर/Sector 39-A, चण्डीगढ़/Chandigarh-160036

दूरभाष 0172-6665201, 0172-6665202 } Reception
0172-6665 (Direct)
फैक्स : Fax : 0091-172-2690632 (COA), 0091-172-2690585 (Director), 0091-172-2690056 (Purchase)
एस. टी. डी. कोड : STD CODE : 172
तार : Gram : IMTECH
E.mail : system@imtech.res.in
Web : http://imtech.res.in

## Report of Internship

Internship is an activity which provides hands on experiences to the students of the theory. It is considered as an important part of a curriculum. Internship prepares the students for future carrier. The M.Ed. curriculum consist of internship in two semesters, semester - II and III. The two papers are IS01 - Internship in School and IS02 - Internship in TEIs. Both the courses are designed to give the real setting experiences to the students which prepares them for future vocation. The first batch students of M.Ed. (2019-21) have completed both the papers of internship. The IS01 was completed in physical mode whereas IS02 was completed in online mode due to Covid19 pandemic. Following is the list of schools and TEIs where students were placed for internship.

1. Chaitanya Vidhyalay, Gandhinagar.
2. KV, CRPF, Gandhinagar.
3. Ved International School, Gandhinagar
4. Hill woods School, Gandhinagar.
5. R. H. Patel B.Ed. college, Kadi Sarva Vishwa vidhyalay, Gandhinagar.

Name of the first batch M.Ed. who have completed both the courses of Internship successfully.

1. N. Shilaja Kumari
2. Rakhi Kumari
3. Sweet
4. Vandana Singh

The second batch M.Ed. students (2020-22) have completed the first phase of internship in an online mode due to Covid19 pandemic and submitted the report for evaluation. Following is the name of students.

1. Pragya Tomar
2. Sangeeta Sahoo
3. Afzal Ahmed
4. Gautam Kumar
5. Deeptimayi
6. Ritika Singh
7. Daisy Meena

**School of Education, CUG, Gandhinagar**

**Attendance Sheet - Internship in TIEs (IS02)**

**M.Ed. Semster - III AY - 2020-21**

| Sr. No. | Enrollment No. | Name | 4.10.21 | 5.10.21 | 6.10.21 | 7.10.21 | 8.10.21 | 9.10.21 | 11.10.21 | 12.10.21 | 13.10.21 | 14.10.21 | 15.10.21 | 16.10.21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 200316002 | Pragya Tomar | P | P | P | P | P | P | P | P | P | P | P | P |
| 2 | 200316004 | Afzal Ahmed | P | P | P | P | P | P | P | P | P | P | P | P |
| 3 | 200316007 | Daisy Meena | P | P | P | P | P | P | P | P | P | P | P | A |
| 4 | 200316010 | Gautam Kumar | P | P | P | P | P | P | P | P | P | P | P | P |
| 5 | 200316015 | Deeptimayee Malik | P | P | P | P | P | P | P | P | P | P | P | P |
| 6 | 200316016 | Sangeeta Sahoo | P | P | P | P | P | P | P | P | P | P | P | P |
| 7 | 200316018 | Ritika Singh | P | P | P | P | P | P | P | P | P | P | P | P |

Name & Sign of Principal

Principal
District Institute of Education
& Training, Gandhinagar

01/11/2021

01/11/21

**School of Education, CUG, Gandhinagar**
**Attendance Sheet - Internship in TIEs (IS02)**
**M.Ed. Semster - III AY - 2020-21**

| Sr. No. | Enrolment No. | Name | 18.10.21 | 19.10.21 | 20.10.21 | 21.10.21 | 22.10.21 | 23.10.21 | 24.10.21 | 25.10.21 | 26.10.21 | 27.10.21 | 28.10.21 | 29.10.21 | 30.10.21 | 31.10.21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 200316002 | Pragya Tomar | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 2 | 200316004 | Afzal Ahmed | P | P | P | P | P | P | | P | P | P | P | P | A | |
| 3 | 200316007 | Daisy Meena | A | P | P | P | P | P | SUNDAY | P | P | P | P | P | A | SUNDAY |
| 4 | 200316010 | Gautam Kumar | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 5 | 200316015 | Deeptimayee Malik | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 6 | 200316016 | Sangeeta Sahoo | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 7 | 200316018 | Ritika Singh | P | P | P | A | P | P | | P | P | P | P | P | A | |
| | | | Mon (HOLIDAY) Tue | wed | Thu | Fri | Sat | | | Mon | Tue | Wed | Thu | Fri | Sat | Sun |

Name & Sign of Principal

Examination Duty Allotment :

1) 20/10/2021 - Pragya, Afzal } Ritika, Gautam — Daisy

2) 21/10/2021 - Daisy Meena, Gautam } Sangeeta, Afzal

3) 22/10/2021 - Deeptimayee, Sangeeta } Ritika, Pragya

4) 23/10/2021 - Ritika, Afzal. } Meena, Gautam.

01/11/2021

01/11/2021

**School of Education, CUG, Gandhinagar**
**Attendance Sheet - Internship in TIEs (IS02)**
**M.Ed. Semster - III AY - 2020-21**

| Sr. No. | Enrollment No. | Name | 13.12.21 | 14.12.21 | 15.12.21 | 16.12.21 | 17.12.21 | 18.12.21 |
|---|---|---|---|---|---|---|---|---|
| 1 | 200316002 | Pragya Tomar | P | P | P | P | P | P |
| 2 | 200316004 | Afzal Ahmed | P | P | P | P | P | P |
| 3 | 200316007 | Daisy Meena | P | P | P | P | P | P |
| 4 | 200316010 | Gautam Kumar | P | P | P | P | P | P |
| 5 | 200316015 | Deeptimayee Malik | P | P | P | P | P | P |
| 6 | 200316016 | Sangeeta Sahoo | P | P | P | P | P | P |
| 7 | 200316018 | Ritika Singh | P | P | P | P | A | P |

Name & Sign of Principal

Principal
Hillwoods Academy of Teacher Education
(Affiliated to Gujarat University)
Sector-25, G.I.D.C., Electronic Estate
382 044 (Gujarat)

**School of Education, CUG, Gandhinagar**
**Attendance Sheet - Internship in TIEs (IS02)**
**M.Ed. Semster - III AY - 2020-21**

| Sr. No. | Enrolment No. | Name | 18.10.21 | 19.10.21 | 20.10.21 | 21.10.21 | 22.10.21 | 23.10.21 | 24.10.21 | 25.10.21 | 26.10.21 | 27.10.21 | 28.10.21 | 29.10.21 | 30.10.21 | 31.10.21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 200316002 | Pragya Tomar | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 2 | 200316004 | Afzal Ahmed | P | P | P | P | P | P | | P | P | P | P | P | A | |
| 3 | 200316007 | Daisy Meena | A | P | P | P | P | P | SUNDAY | P | P | P | P | P | A | SUNDAY |
| 4 | 200316010 | Gautam Kumar | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 5 | 200316015 | Deeptimayee Malik | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 6 | 200316016 | Sangeeta Sahoo | P | P | P | P | P | P | | P | P | P | P | P | P | |
| 7 | 200316018 | Ritika Singh | P | P | P | A | P | P | | P | P | P | P | P | A | |
| | | | Mon (Holiday) Tue | | Wed | Thu | Fri | Sat | | Mon | Tue | Wed | Thu | Fri | Sat | Sun |

Name & Sign of Principal

Examination Duty Allotment :

1) 20/10/2021 - Pragya, Afzal } Ritika, Gautam. Daisy

2) 21/10/2021 - Daisy Meena, Gautam } Sangeeta, Afzal

3) 22/10/2021 - Deeptimayee, Sangeeta } Ritika, Pragya

4) 23/10/2021 - Ritika, Afzal. } Meena, Gautam.

## Supervisor's certificate

This is to certify that the M.Sc. Dissertation entitled **"*Purification and In silico Studies on Adenylosuccinate Synthase Protein from Leishmania donovani*"** submitted to Central University of Gujarat, Gandhinagar for the partial fulfilment of the requirements for the degree of M.Sc. Life Sciences is a bonafide research work carried out by **Shriya Pandita (190504019)** of **M.Sc. Life Sciences IV Semester in School of Life Sciences,** Central University of Gujarat, Gandhinagar. No part of this dissertation has been submitted elsewhere for award of any other degree or diploma.

Place: Gandhinagar, Gujarat

**Supervisor**: **Dr. Anju Pappachan**

**Date: 24th June, 2021**

**Assistant Professor**
**CUG, SLS**

अंजू पाप्पच्चन,Ph.D.
Anju Pappachan, Ph.D.
असिस्टेंट प्रोफेसर
Assistant Professor
जीवन विज्ञान संस्थान
School of Life Sciences
गुजरात केन्द्रीय विश्वविद्यालय
Central University of Gujarat

**Seal**

23/06/2021

**Signature of Supervisor**

---

**Dissertation forwarded for Evaluation.**

Dean

Name:

School:

Place:

Date

**SOW 541 Block Field Work,**

**Semester III, M.A in Social Work**

| Sr. No. | Enrollment number | Student Name | Organisation placed | Faculty Supervisor |
|---|---|---|---|---|
| 1 | 200310007 | KAMALIKA BISWAS | District Child Protection Unit, Gandhinagar | Dr. Sony Kunjappan |
| 2 | 200310006 | SONAM SMIRTI | Environment Sanitation Institute | Dr. Kunal Sinha |
| 3 | 200310030 | PRATEEK RANJAN | District Child Protection Unit, Ahmedabad | Dr. Parvathi K Iyer |
| 4 | 200310001 | TANYA GANDHI | District Child Protection Unit, Gandhinagar | Dr. Parvathi K Iyer |
| 5 | 200310028 | ASHVIN VINZUDA | Not opted | Dr. Hemant Kumar |
| 6 | 200310025 | CHAWLA SANDIPSINGH GURUDIPSINGH | Social Management Foundation | Dr. Sony Kunjappan |
| 7 | 200310003 | SHREOSY ACHARJEE | Social Management Foundation | Dr. Kunal Sinha |
| 8 | 200310011 | ARPITA SHARMA | District Child Protection Unit, Ahmedabad | Dr. Shiju Sam Varughese |
| 9 | 200310015 | RICHA SMRITI | Not opted | Dr. Parvathi K Iyer |
| 10 | 200310009 | RASAL RAHMAN A | Sabarmati Samruddhi Seva Sangh | Dr. Sony Kunjappan |
| 11 | 200310016 | KAJAL KUMARI | Sakhi, One Stop Centre | Dr. Hemant Kumar |
| 12 | 200310017 | VEENA M | Environment Sanitation Institute | Dr. Hemant Kumar |
| 13 | 200310027 | MUHAMMED HARIS U | Social Management Foundation | Dr. Hemant Kumar |
| 14 | 200310029 | MUHAMMED HASEEB | Special Children Home, Sector 19 | Dr. Kunal Sinha |
| 15 | 200310022 | MUHAMMED THAMEEM V K | District Child Protection Unit, Ahmedabad | Dr. Shiju Sam Varughese |
| 16 | 200310021 | PREETHY SONKAR | Sakhi, One Stop Centre | Dr. Parvathi K Iyer |
| 17 | 200310024 | JEETHUMOL C V | Special Children Home, Sector 19 | Dr. Shiju Sam Varughese |
| 18 | 200310008 | KHYATI SHARMA | District Child Protection Unit, Ahmedabad | Dr. Sony Kunjappan |
| 19 | 200310019 | DIKSHA BHIMSAGAR THOOL | District Child Protection Unit, Gandhinagar | Dr. Kunal Sinha |
| 20 | 200310004 | PRABHAT GUPTA | District Child Protection Unit, Gandhinagar | Dr. Kunal Sinha |
| 21 | 200310010 | PALAK BHARDWAJ | Sabarmati Samruddhi Seva Sangh | Dr. Shiju Sam Varughese |

28/12/2022

डॉ. सोनी कुन्जप्पन
Dr. Sony Kunjappan
अध्यक्ष, Chairperson
सामाजिक प्रबंधन अध्ययन केंद्र
Centre for Studies in Social Management
Central University of Gujarat

**SOM-341 Fieldwork and Report Writing**
**(Integrated/Dual Degree (BA (Hon) Social Management) – (MA Social Management)**

**Semester V**

| Sr. No. | Enrollment number | Student Name | Organisation placed | Faculty Supervisor |
|---|---|---|---|---|
| 1 | 190401002 | Somu Saurabh Prasad | QUEST Alliance | Dr. Litty Denis |

28/10/2021

Central University of Gujarat

# CENTRAL UNIVERSITY OF GUJARAT

## Offer of Appointment

No. ……..

Date: 01/05/2019

To,

Mr. Syed Kabir Hussain Shah

**Sub: Offer of Contractual appointment to the post of** PA-II in DST-SERB Project

Dear Mr. Syed Kabir Hussain Shah,

I have great pleasure in offering you contractual appointment in the University to the Post of PA-II in DST-SERB Project in the Research Project titled "Synthetic Oligomers as Inhibitors of Protein-DNA Interactions: Towards Novel Cancer Therapeutics". The said project is funded by DST-SERB, Govt. of India and is under the supervision of Project In-charge (P.I.) Dr. Panchami Prabhakaran at the School of Chemical Sciences, CUG, Sector 30, Gandhinagar.

Your appointment is on a monthly salary of Rs. 25,000/- and HRA …….% in the pay scale of N/A and it shall be valid for a period of One (1) Year from the date of joining. The appointment may be extended upon satisfactory performance till the period of project.

The terms and conditions governing the appointment being offered to you are given on the reverse side of this offer letter. You are requested to carefully read the terms and conditions before accepting the offer.

You are being given two copies of the offer letter containing the terms and conditions governing the Project post appointment. If the terms and conditions are acceptable to you, please sign one copy of the offer at the space provided below the terms and conditions on the reverse of this offer and return it to the undersigned as a proof of your acceptance of the offer and its terms and condition.

In case the aforesaid offer of contractual appointment, along with its terms and condition is acceptable to you, you may please report for duty by (date)……01/05/2019……to the P.I. Dr Panchami Prabhakaran, School of Chemical Sciences, CUG, Gandhinagar.

Panchami

Dr. Panchami Prabhakaran
Assistant Professor, School of Chemical Sciences

**Copy to:**

1. School Dean
2. Project P.I.
3. A.F.O. (Project Finance)
4. Office Copy (Registrar/ Human Resource section)

# गुजरात केन्द्रीय विश्वविद्यालय

(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)

# CENTRAL UNIVERSITY OF GUJARAT

(Established by an Act of Parliament of India, No 25 of 2009

Prof.Atanu Mohapatra
Dean (I/c)
School of Library and Information Science

Date :- 17.08.2021

**To,**
**Dr. Navin Upadhyay**
**Deputy Librarian**
**IIT-BHU**
**Banaras Hindu University**
**Uttar Pradesh 221005**

Subject: Library Internship

Dear Sir/Madam,

The following student pursuing 'Master of Library and Information Science' programme at the School of Library and Information Science, Central University of Gujarat, Gandhinagar is interested in doing the summer internship with the Central Library at IIT-BHU Library, UP. Internship is required for the successful completion of the M. Lib. I. Sc. programme by the students. The students are required to get hands on experience in various sections of the library and an evaluative report for the same needs to be submitted (format enclosed).

Name of the Student : Uday Deoghar
Roll No. : 200306014
Start Date :

I request your kind co-operation and acceptance for the same.

Thanks & regards,

Prof. Atanu Mohapatra
Dean (I/c)

Dean,
School of Library and Information Science
Central University of Gujarat
Sector-29, Gandhinagar 382030

गुजरात केन्द्रीय विश्वविद्यालय
(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)
CENTRAL UNIVERSITY OF GUJARAT
(Established by an Act of Parliament of India, No 25 of 2009)

## TERMS AND CONDITIONS GOVRNING THE PROJECT

Position offered: Project Assistant
Project title: Conformation control *via* fluorine – ammonium gauche effect: exploration of asymmetric reaction
Funding Agency: Science and Engineering Research Board (SERB). Govt. of India
Consolidated salary: Rs.22,000/- per month and no other allowances.
Project duration: 3 years.

1. The appointment is against temporary project post and will not continue in any circumstances beyond the duration of the said project. Any subsequent contract in the project or another project shall be sole discretion of the University and shall be treated as fresh of appointment.
2. The salary given is fixed and consolidated as sanctioned by the funding agency.
3. The appointment will be purely on temporary basis initially for a period of one year.
4. Appointment may be extended depending on the satisfactory work performance as assessed by the project head or till the validity of the project.
5. The selected candidate will directly report to the principal investigator regarding his/her work progress and project related matters
6. The services will be required 5 days a week as per the University rules and also on the weekends, if deemed necessary.
7. In addition to the regular work, the selected candidate will have to perform other duties and responsibility as may be assigned by the P.I. related to the project.
8. The appointment shall be for the concerned project only, and the project staff member will not have any claim/right for regular appointment to/on any post in the University.
9. TERMINATION OF SERVICE: The project staff shall be liable to be terminated without assigning any reason and/or without any notice.

PROVISON:
Subject to the satisfactory performance of the project staff, the University reserves the right to extend the period contract, on a year to year basis, till the validity of the project.

I, Mr. Vankar Jigarkumar here by accept the offer of contractual appointment to the above project as per the terms and conditions stated above on post of Project Assistant

Place: Gandhinagar
Date: 14/5/19

Signature
Name Vankar Jigar

2.4.1

2.

# गुजरात केन्द्रीय विश्वविद्यालय

(भारत की संसद के अधिनियम सं. 25, 2009 के तहत स्थापित)

# CENTRAL UNIVERSITY OF GUJARAT

(Established by an Act of Parliament of India, No 25 of 2009)

## Offer of Appointment

No. 505/795

Mr. Jigarkumar
569/3 vastunirman society
Sector 21, Gandhinagar

Sub: Offer of contractual appointment to the post of Project Assistant

Dear Mr. Vankar Jigarkumar Kiritbhai

I have great pleasure in offering you contractual appointment in the University to the post of project assistant in the research project entitled "conformation Control *via* fluorine- ammonium *gauche* effect: exploration of asymmetric reactions" The said project is funded by Science and Engineering Research Board (SERB).Government of India and is under the supervision of project in charge (P.I) Dr. Gururaja G.N at the School of Chemical Sciences CUG, Sector 30, Gandhinagar.

Your appointment is on monthly consolidated salary Rs. 22,000/- in the pay scale of N/A and it shall be valid for a period of one year from date of joining. The appointment may be extended upon satisfactory performance till the period of project.

The terms and condition governing the appointment being offered to you are on the reverse side of this offer letter. You are requested to carefully read the terms and conditions before accepting the offer.

You are being given two copies of the offer letter containing the terms and conditions governing the project post appointment. If the terms and conditions are acceptable to you. Please sign the copy of the offer at the space provided below the terms and conditions on the reverse of this offer and return it to undersigned as a proof of your acceptance of the offer and its terms and condition.

In case the afore said offer of contractual appointment along with its terms and condition is acceptable to you, you may please report for duty by 14 May 2019 to the under signed project in charge (P.I).

Dr. Gururaja G.N

डॉ. गुरुराजा जी. एन.
Dr. Gururaja G. N.
सहायक प्रोफेसर / Assistant Professor
रासायनिक विज्ञान संस्थान
School of Chemical Sciences
गुजरात केन्द्रीय विश्वविद्यालय
Central University of Gujarat
सेक्टर-30, गांधीनगर-382030
Sector-30, Gandhinagar-382030

Copy to:

1. School Dean/Chairperson
2. Project P.I
3. A.F.O (Project Finance)
4. Office Copy (Registrar/ Human Resource section)

NIICE
NEPAL INSTITUTE FOR
INTERNATIONAL COOPERATION AND ENGAGEMENT

**Date: 13 December 2021**

# To Whom It May Concern

This is to certify that Ms. Vivaksha Vats worked as Research Intern with the Nepal Institute for International Cooperation and Engagement (NIICE), Kathmandu. She joined the institute on 25 August 2021 and continued till 30 November 2021.

Ms. Vats is diligent, hard-working and responsible person. She has actively engaged in numerous challenging tasks concurrently without compromising the quality of the work. She has great leadership skills which she has demonstrated several times. She can work under pressure and deliver on time which I have observed during her engagement at NIICE.

I wish Ms. Vats success in all her academic endeavors.

Please do not hesitate to contact me in case of further queries.

Best Regards,

**Pramod Jaiswal, PhD**
Research Director,
Nepal Institute for International Cooperation and Engagement
Kathmandu
Email: pjaiswal@niice.org.np

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## JUNE TO AUGUST, 2020

**SL. NO.:** ....CSIR/SRTP/2020/NEIST/2791.....

**NAME:** .....VIVEK MANI TRIPATHI.....

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP) 2020 ONLINE HAS THE FOLLOWING ACTIVITIES

Eminent Scientist Lectures, Special Sessions, Project specific classes, Elocution video, Poster designing, Essay writing, Assignments / Project works given by mentor/coordinator & Summer Research Project Completion Report

CANDIDATE'S NAME: VIVEK MANI TRIPATHI SL. NO.: CSIR/SRTP/2020/NEIST/2791

GRADE: S

HOST INSTITUTE: CSIR-NEIST

MENTOR'S NAME: DR. BASAVAIAH CHANDU

REMARKS

.....

MENTOR

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

# CERTIFICATE

**Name:** VIVEK MANI TRIPATHI **Sl. No.:** CSIR/SRTP/2020/NEIST/2791

has completed all the requirements of the CSIR-Summer Research Training Program (CSIR-SRTP) 2020 online during June to August, 2020 coordinated by CSIR-NEIST, Jorhat

| DR. G. NARAHARI SASTRY | PROF. ALOK DHAWAN | DR. SHEKHAR C. MANDE |
|---|---|---|
| DIRECTOR | DIRECTOR | DIRECTOR GENERAL, CSIR |
| CSIR-NORTH EAST INSTITUTE OF SCIENCE AND TECHNOLOGY | CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH | SECRETARY, DSIR, GOVT. OF INDIA |


अनुसंधान भवन


CSIR-NEIST

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## JUNE TO AUGUST, 2020

**SL. NO.:** ....CSIR/SRTP/2020/NEIST/4992.....

**NAME:** .....ALOK PRATAP SINGH.....

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP) 2020 ONLINE HAS THE FOLLOWING ACTIVITIES

Eminent Scientist Lectures, Special Sessions, Project specific classes, Elocution video, Poster designing, Essay writing, Assignments / Project works given by mentor/coordinator & Summer Research Project Completion Report

CANDIDATE'S NAME: ALOK PRATAP SINGH SL. NO.: CSIR/SRTP/2020/NEIST/4992

GRADE: S

HOST INSTITUTE: CSIR-NEIST

MENTOR'S NAME: Dr. BASAVAIAH CHANDU

REMARKS

.....

MENTOR

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

# CERTIFICATE

**Name:** ALOK PRATAP SINGH **Sl. No.:** CSIR/SRTP/2020/NEIST/4992

has completed all the requirements of the CSIR-Summer Research Training Program (CSIR-SRTP) 2020 online during June to August, 2020 coordinated by CSIR-NEIST, Jorhat

| | | |
|---|---|---|
| DR. G. NARAHARI SASTRY<br>**DIRECTOR**<br>**CSIR-NORTH EAST INSTITUTE OF SCIENCE AND TECHNOLOGY** | PROF. ALOK DHAWAN<br>**DIRECTOR**<br>**CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH** | DR. SHEKHAR C. MANDE<br>**DIRECTOR GENERAL, CSIR**<br>**SECRETARY, DSIR, GOVT. OF INDIA** |


अनुसंधान भवन


CSIR-NEIST

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## JUNE TO AUGUST, 2020

**SL. NO.:** CSIR/SRTP/2020/NEIST/1071

**NAME:** JANMI KALITA

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP) 2020 ONLINE HAS THE FOLLOWING ACTIVITIES

Eminent Scientist Lectures, Special Sessions, Project specific classes, Elocution video, Poster designing, Essay writing, Assignments / Project works given by mentor/coordinator & Summer Research Project Completion Report

CANDIDATE'S NAME: JANMI KALITA SL. NO.: CSIR/SRTP/2020/NEIST/1071

GRADE: A

HOST INSTITUTE: CSIR-NEIST

MENTOR'S NAME: MS. S. POORNI

REMARKS

.....

MENTOR

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

# CERTIFICATE

**Name:** JANMI KALITA **Sl. No.:** CSIR/SRTP/2020/NEIST/1071

has completed all the requirements of the CSIR-Summer Research Training Program (CSIR-SRTP) 2020 online during June to August, 2020 coordinated by CSIR-NEIST, Jorhat

| | | |
|---|---|---|
| DR. G. NARAHARI SASTRY<br>**DIRECTOR**<br>**CSIR-NORTH EAST INSTITUTE OF SCIENCE AND TECHNOLOGY** | PROF. ALOK DHAWAN<br>**DIRECTOR**<br>**CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH** | DR. SHEKHAR C. MANDE<br>**DIRECTOR GENERAL, CSIR**<br>**SECRETARY, DSIR, GOVT. OF INDIA** |


अनुसंधान भवन


CSIR-NEIST

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## JUNE TO AUGUST, 2020

**SL. NO.:** CSIR/SRTP/2020/NEIST/1160

**NAME:** MEHELI GHOSH

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

## CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP) 2020 ONLINE HAS THE FOLLOWING ACTIVITIES

Eminent Scientist Lectures, Special Sessions, Project specific classes, Elocution video, Poster designing, Essay writing, Assignments / Project works given by mentor/coordinator & Summer Research Project Completion Report

CANDIDATE'S NAME: MEHELI GHOSH SL. NO.: CSIR/SRTP/2020/NEIST/1160

GRADE: A

HOST INSTITUTE: CSIR-NEIST

MENTOR'S NAME: MS. S. POORNI

REMARKS

.....

MENTOR

# CSIR-SUMMER RESEARCH TRAINING PROGRAM (CSIR-SRTP)2020 ONLINE

# CERTIFICATE

**Name:** MEHELI GHOSH **Sl. No.:** CSIR/SRTP/2020/NEIST/1160

has completed all the requirements of the CSIR-Summer Research Training Program (CSIR-SRTP) 2020 online during June to August, 2020 coordinated by CSIR-NEIST, Jorhat

| DR. G. NARAHARI SASTRY | PROF. ALOK DHAWAN | DR. SHEKHAR C. MANDE |
|---|---|---|
| **DIRECTOR** | **DIRECTOR** | **DIRECTOR GENERAL, CSIR** |
| **CSIR-NORTH EAST INSTITUTE OF SCIENCE AND TECHNOLOGY** | **CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH** | **SECRETARY, DSIR, GOVT. OF INDIA** |


अनुसंधान भवन


CSIR-NEIST

सीएसआईआर – इमटैक
CSIR-IMTECH

सीएसआईआर – सूक्ष्मजीव प्रौद्योगिकी संस्थान
सैक्टर 39 – ए, चण्डीगढ़ – 160 036 (भारत)
CSIR-INSTITUTE OF MICROBIAL TECHNOLOGY
(A CONSTITUENT ESTABLISHMENT OF CSIR)
Sector 39-A, Chandigarh-160 036 (INDIA)

# Declaration by Supervisor

This is to certify that the dissertation report entitled "**Synthesis, Characterization and Activity Screening of Potential Antimicrobial Peptide**" submitted by **Yashasvi** for partial fulfillment for the award of Degree of **Masters in Life Sciences** submitted to the **Central University of Gujarat** has been done under the guidance & supervision of **Dr. Vinod Chaudhari**, Principal Scientist, CSIR-IMTech from Jan 18, 2021 to April 16, 2021, however due to lockdown restrictions continued to work from home virtually on various aspects of the same topic till the end of five months (June 16, 2021). Work reported in this M.Sc. Life Sciences dissertation is a part of ongoing research in my laboratory and cannot be used or shared without my consent. It is further certified that to the best of our knowledge that the dissertation has not been the basis for the award of any degree/diploma/fellowship or similar title of any candidate of any university so far.

Dr. Vinod Chaudhari

Principal Scientist

CSIR- IMTech, Chandigarh

डॉ. विनोद चौधरी/Dr. Vinod Chaudhari
प्रधान वैज्ञानिक/Principal Scientist
सीएसआईआर–सूक्ष्मजीव प्रौद्योगिकी संस्थान
CSIR-Institute of Microbial Technology
सैक्टर/Sector 39-A, चण्डीगढ़/Chandigarh-160036