VINAYAKA MISSION'S RESEARCH FOUNDATION

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR

DEPARTMENT OF CIVIL ENGINEERING

17CVCC87- ENVIRONMENTAL ENGINEERING LAB

STANDARD OPERATING PROCEDURES

Laboratory Guidelines

1. The class will be divided into groups of 4-5 students that will be working together in the lab and in writing the laboratory reports. Each group will submit only one lab report. Always bring lab manual, calculator and lab note book.

2. All lab data will be entered on a sheet of a paper and checked with a Teaching Assistant before attaching it with the lab report. The lab report will be submitted in laboratory itself.

3. All reports should strictly follow this outline (Name/Entry no./Group no.):

• Title: Include course title, experiment title, date of experiment, date of report submission, and names of group members

• Summary: A one paragraph statement covering the important objectives, background materials, procedures, results, and conclusions. It is considered to be the most influential parts of reports and it need to be written clearly and concisely.

• Objectives: Make a clear statement of experimental objectives.

• Background: In one paragraph explain the importance of the experiment in environmental engineering

• Methods: Briefly explain the methodology used.

• Results and Discussion: This section should include a presentation of reduced data (i.e. quantities calculated from raw data) in tabular or graphical format. Refer Tables and Graphs in text and include a title (Table 1, Table 2 or so; Figure 1, Figure 2, or so). Graph axes should be labeled always with units.

• Conclusions and Recommendations: Briefly list the results and recommendations for improving the experiments.

• References: Any citations should be documented here.

• Appendices: Raw data and statistical methods should be included here

Procedure for cleaning of glassware in laboratory Glassware

Glassware Cleaners

1. Clean the equipment thoroughly with soap and water for basic cleaning. You may need to use a wire brush to remove some residue. Detergent using bottle brushes and scouring pads can be used as needed.

2. After cleaning, rinse the glassware with running tap water. When test tubes, graduates, flasks and similar containers are rinsed with tap water, allow the water to run into and over them for a short time, then partly fill each piece with water.

3. Thoroughly shake and empty at least six times and ensure that all soap residue is removed.

Note:

• Do not use cleaning brushes that are so worn that the spine hits the glass. Serious scratches may result. Scratched glass is more prone to break during experiments. Any mark in the uniform surface of glassware is a potential breaking point, especially when the piece is heated. Do not allow acid to come into contact with a piece of glassware before the detergent (or soap) is thoroughly removed. If this happens, a film of grease may be formed.

• To prevent breakage when rinsing or washing pipets, cylinders or burets, be careful not to let tips hit the sink or the water tap.

Sterilizing Contaminated Glassware

• Autoclave glassware or sterilize it in large steam ovens or similar apparatus. If viruses or sporebearing bacteria are present, autoclaving is absolutely necessary. Handling and Storing

• Handling and Storing.

- Protect clean glassware from dust ,This is done best by plugging with cotton, corking, taping a heavy piece of paper over the mouth or placing the glassware in a dust-free cabinet.
- Store glassware in specially designed racks. Avoid breakage by keeping pieces separated.

Procedure for pH meter

- pH meter: Consisting of potentiometer, a glass electrode, a reference electrode and a temperature compensating device. A balanced circuit is completed through potentiometer when the electrodes are immersed in the test solution.
- Many pH meters are capable of reading pH or millivolt. Reference electrode: Consisting of a half cell that provides a standard electrode potential. Generally calomel, silver-silver chloride electrodes are used as reference electrode.
- Sensor (glass) electrode: Several types of glass electrodes are available. The glass electrode consists essentially of a very thick walled glass bulb, made of low melting point glass of high electrical conductivity, blown at the end of a glass tube. This bulb contains an electrode, which has a constant potential

Procedure :

a. Before use, remove electrodes from storage solutions (recommended by manufacturer) and rinse with distilled water+

b. Dry electrodes by gently blotting with a soft tissue paper, standardise instrument with electrodes immersed in a buffer solution within 2 pH units of sample pH.

c. Remove electrodes from buffer, rinse thoroughly with distilled water and blot dry. 19 Civil Engineering Department, Shantilal Shah Engineering College, Bhavnagar

d. Immerse in a second buffer below pH 10, approximately 3 pH units different from the first, the reading should be within 0.1 unit for the pH of second buffer. (If the meter response shows a difference greater than 0.1 pH unit from expected value, look for trouble with the electrodes or pH meter)

e. For samples analysis, establish equilibrium between electrodes and sample by stirring sample to ensure homogeneity and measure pH.

f. For buffered samples (or those with high ionic strength), condition the electrodes after cleaning by dipping them into the same sample, and read pH.

g. With poorly buffered solutions (dilute), equilibrate electrodes by immersing in three or four successive portions of samples. Take a fresh sample and record the pH.

Procedure for Conductivity meter

Conductivity is the capacity of water to carry an electrical current and varies both with number and types of ions in the solutions, which in turn is related to the concentration of ionized substances in the water. Most dissolved inorganic substances in water are in the ionized form and hence contribute to conductance.

Procedure :

Conductivity can be measured as per the instruction manual supplied with the instrument and the results may be expressed as mS/m or mS/cm.

Note the temperature at which measurement is made.

Conductivity meter needs very little maintenance and gives accurate results.

However few important points in this respect are:

a. Adherent coating formation of the sample substances on the electrodes should be avoided which requires thorough washing of cell with distilled water at the end of each measurement. B

. Keep the electrode immersed in distilled water c. Organic material coating can be removed with alcohol or acetone followed by washing with distilled water.

Standard Operating Procedures for Measuring Turbidity meter:

Calibration and Standardization

1. Calibration Instrument calibration is checked against primary standard formazin suspensions each use, to ensure linearity between ranges and to verify the actual turbidity of Gelex secondary standards used for routine standardization.

For true calibration and linearity adjustment of the instrument, refer to the HACH Model 2100A Laboratory Turbidimeter Instrument Manual.

2. Standardization Before each series of measurements, the instrument should be standardized with formazin standards, and then checked with Gelex secondary standards on the range setting for which sample turbidity will be measured . Refer to the HACH Model 2100A Laboratory Turbidimeter Instrument Manual to properly standardize the instrument. Standardization should be performed every time the measurement range is changed.

Procedure : Sample Preparation and Analysis

1. The instrument should be turned on and allowed to warm up for at least 30 minutes before use. Samples and standards should be at ambient temperature. Turbidity/CCAL 16A.1 June 2013 Page 6 of

2. Slowly invert formazin standard cells 2 – 3 times and then let the sample sit undisturbed for 5 minutes before measurement. Do not shake the standard cells as it can take hours for bubbles to dissipate.

3. Select appropriate sample range and standardize using the primary formazin standard. Check range against appropriate Gelex standard; should be within 10% of noted turbidity.

4. Gently invert samples to mix. Fill sample tube with 25mL of sample, introducing as little air as possible when pouring sample into cell. Make sure the outside of the sample tube, specifically the bottom and sides, is free from water and fingerprints.

5.Repeat the previous step for the first 10 samples, noting cell position in rack on data sheet, and allow them to sit undisturbed for 5 minutes.

6. Insert the first sample cell into the sample compartment and cover with the light shield.

7. Read the turbidity of the sample from the scale corresponding to the range switch selection. The reading obtained is turbidity in Nephelometric Turbidity Units (NTU).

HoD/Civil Engg.