

Standard Operating Procedures for Instrument laboratories/ Balance rooms

1. RESPONSIBILITIES OF LABORATORY STAFF

- a) The lab staff members who have been assigned the duty are accountable for taking care of the instrument lab.
- b) Monitor the use of instruments by the students during the class.
- c) Students should be allowed to enter the lab and use the instruments only in presence of a class teacher/mentor.
- d) No one should be allowed to eat or drink in the instrument lab.
- e) Once the class is over, each instrument must be checked for proper storage and must be switched off.
- f) Any breakage must be immediately entered in the breakage register and the Teacher-in-charge informed about it.
- g) Any malfunctioning of an instrument must be immediately attended to.
- h) It must also be verified that all the electrodes have been dipped in a beaker containing clean distilled water.

2. RESPONSIBILITIES OF STUDENTS

- a) Please do not enter the instrument laboratory without the permission of your teacher.
- b) No instrument/balance should be moved from its place. In case of such a necessity, take the help of laboratory staff.
- c) Handle any instrument or weighing balance with extreme care.
- d) Notebooks or bags should not be kept on the working table or the instrument.
- e) Bags must always be put away from the instruments.
- f) Always read the instruction manual or learn from your teacher about how to operate an instrument.
- g) Take care not to spill any chemical on the instrument and clean up immediately if it happens.
- h) Do not weigh any chemical directly on the pan of a balance.
- i) Handle the electrodes which are made of glass with extreme caution.
- j) Follow the guidelines for instrument storage after use.

3. RESPONSIBILITIES OF TEACHERS

- a) All teachers are urged to read the instrument's user manual and familiarize themselves with the instrument's operation. They may even discuss with their colleagues.
- b) All teachers are urged to monitor the students closely while they are using the instruments to avoid break down of the instruments.
- c) Teachers are requested to make small batches of students for using instruments in order to avoid crowding.

INSTRUCTIONS FOR A CONDUCTOMETER (ELICO)

Power switch: It is located at the back of the instrument. When it is switched on, the display panel in the front glows.

Control units of conductometer

All other controls are present on the front panel. A brief description of the various controls meant for conductivity measurement is given below.

Temperature knob

With the help of this knob, the temperature can be set to values of 0 to 50° C. Before any measurement, the temperature of measurement is set to the required value with this control.

Mode selector

This is a toggle switch present on the front panel of the instrument. It has the position marked CAL & READ. This is used to set the instrument either at the CAL (calibration) or READ (read) mode. When the toggle switch is in the depressed position, it is in READ mode; otherwise it is in CAL mode.

CAL mode and the associated CAL knob

After selecting the CAL mode, the instrument is calibrated by rotating the CAL knob in clockwise or anticlockwise direction.

Cell constant

There are three keys for selecting the cell constant viz., 0.1, 0.5, 1.

Range selector

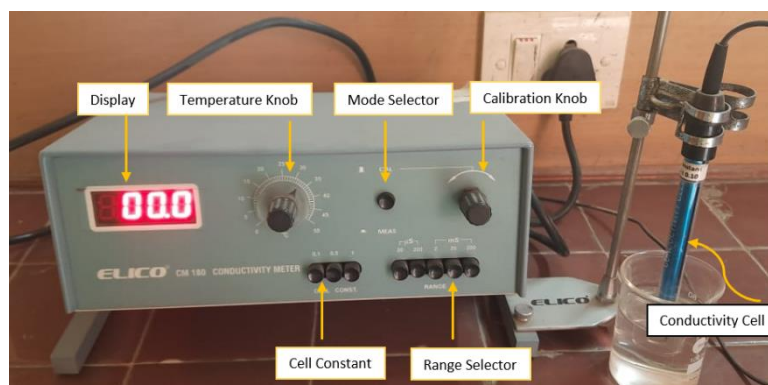
There are five switches for selecting the range within which the conductance of the sample lies. These are marked 20 μ S, 200 μ S, 2mS, 20mS and 200 mS.

When the range selector is at 20mS, the conductometer reads between 2 & 20 mS.

Conductivity cell

It consists of two platinized (coated black) platinum electrodes with a cylindrical glass or plastic outer covering which is open at the bottom. This open end is dipped into the solution

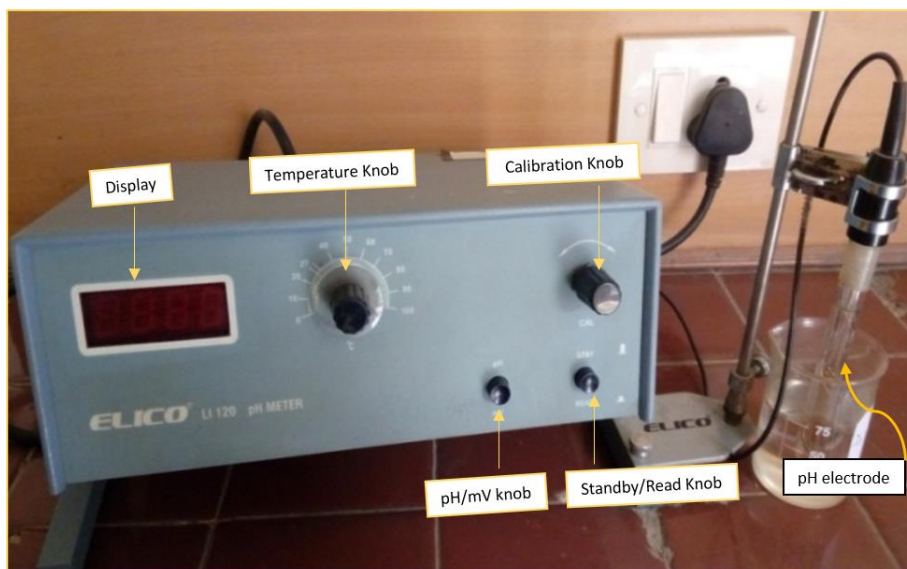
whose conductance is to be measured. From the top of the cell, emerge two leads which must be connected to the conductometer.



Operating Instructions

- 1) Switch on the instrument and give it a warm up time of at least 15 minutes.
- 2) Rinse the conductivity cell with the solution whose conductivity is to be measured.
- 3) Dip the cell into the test solution.
- 4) Set the READ/CAL key to CAL position.
- 5) Display must read 1000 irrespective of decimal. If it doesn't, then using the CAL knob set it to 1000.
- 6) Set the temperature at the room temperature value using temperature knob.
- 7) Set the cell constant at 1.
- 8) Dip the conductivity cell into a beaker containing the test solution taking care to dip the electrodes completely into the solution.
- 9) Shift the READ/CAL key at READ.
- 10) Select any one range by pushing the range keys by trial and error so as to obtain a display with maximum decimal points.
- 11) The display gives the specific conductance of the solution and since the cell constant is set to 1, it is also the observed conductance.

INSTRUCTIONS FOR A pH METER (ELICO)



Control units of a pH meter:

- a) **Power switch:** This switch is at the front of the instrument. When it is switched on, the display panel in the front glows.
- b) **Temperature knob:** With the help of this knob, the temperature is set to a value between 0 and 50 °C.
- c) **pH Calibration Knob:** This knob is used to calibrate the instrument with the given known pH solutions by rotating it clockwise/anticlockwise.
- d) **Standby/Read Knob:** While not in use, the instrument is kept at Standby mode. For readings, it is kept at Read position.
- e) **pH/mV Knob:** This knob is used to choose the display mode as pH or potential, as required.

Operating Instructions

Calibration of a pH meter

The very first step towards measuring the pH of a solution is to calibrate the instrument. The steps of calibration are given below.

- 1) Set the temperature to room temperature.

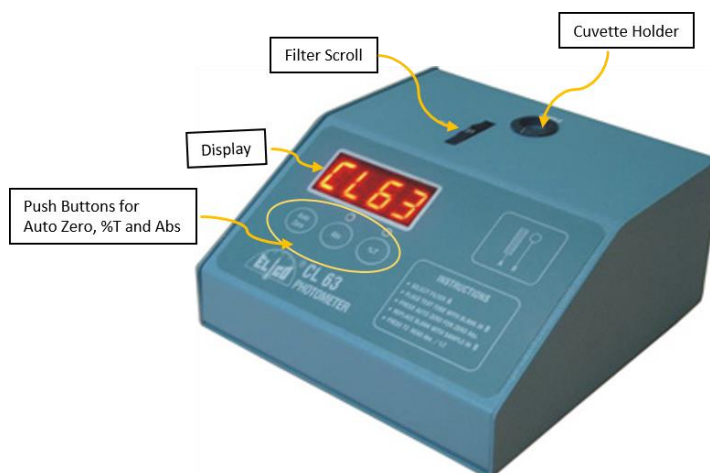
- 2) Set the instrument to pH mode by pressing the pH/mV knob. Calibrate the pH-meter using buffer solutions of pH 4.01 (or any suitable buffer) ,7.0, and 9.2 (or any suitable buffer).
- 3) Wash the electrode with water, wipe it gently with a soft tissue and rinse it with a buffer of pH 4.01.
- 4) Dip it into a fresh buffer solution of pH 4.01.
- 5) Swirl the solution and using the pH/mV push-button set the instrument to pH mode.
- 6) Similarly using the standby/read push-button, set it to Read mode.
- 7) Now note the pH from the display. If it is different from 4.01, then adjust the display to the desired value by rotating the CAL knob.
- 8) Bring the instrument to the standby mode, remove the electrode from the buffer, wash it thoroughly with water, dab it gently with a soft tissue, rinse it with a buffer of pH 7.0 and calibrate with this buffer.
- 9) Similarly calibrate the electrode with pH 9.2. Repeat the entire procedure of calibration with three buffer solutions at least three times or till the desired pH values are obtained for all the buffers used.

Measuring the pH of test solution

- a) Wash the electrode with water, wipe gently with soft tissue and rinse it with the test solution.
- b) Dip the electrode into another fresh aliquot of the test solution, set the instrument to pH or mV mode whichever is required and to Read mode by using standby/Read button.
- c) Read pH (or potential) from display panel. Set the instrument to standby mode.

By selecting the mode to mV, the potential may be measured in the same manner as given above.

INSTRUCTIONS FOR A COLORIMETER (ELICO)



A colorimeter consists of the following:

- A *display* which shows absorbance of a sample
- Filter scroll*: By rotating the scroll (wheel), the desired filter can be selected.
- Cuvette holder(or cell compartment)*: to hold the sample
- Three push buttons*
 - Auto zero** for setting absorbance to zero value
 - Abs** for displaying absorbance
 - %T** for displaying transmittance value

Cuvettes or cells: These are cylindrical in shape and are used to hold the sample. Path length is mostly of 1 cm.

Operating Instructions:

Switch on the power of Colorimeter at least 15-20 minutes before start of the experiment.

Measuring the absorbance of blank:

- Take a clean, dry cuvette and fill it with the solvent (most of the time it is water) in which stock solution was prepared.
- Wipe off the surface of the cuvette with the help of tissue paper to get rid of solvent and fingerprints.
- Insert the cuvette in the sample holder aligning the white mark with the mark on the instrument.
- Choose the desired wavelength using *Filter* knob and set the absorbance to zero using the “Auto Zero” button; this means that the solvent gives 100% transmittance.
- Remove the cuvette and pour off the solvent.

Measurement of absorbance of test solution

- a) Now rinse and fill the cuvette with solution whose concentration is to be determined (stock solution), dry it from outside using tissue paper and insert it again.
- b) Check that the wavelength is set at the desired value and for which the autozero has been performed.
- c) Note the value of absorbance by pressing the “Abs” button. This will give the absorbance of substance at that particular wavelength.
- d) In case the solution is highly concentrated, absorbance goes out of range and the display does not show any reading, then the sample must be diluted to yield a value within the limits of the instrument.
