Sri Adichunchanagiri First Grade College
Channarayapatna
Est. 1979

INTERNSHIP REPORT ON

"STUDY OF LABORATARY EQUIPMENTS IN BIOCHEMISTRY LABORATRY AT ADICHUNCHANAGIRI UNIVERSITY, B.G NAGARA"

SUBMITTED BY

NAME: SUCHITHRA. K.R

REG.NO: U016F21S0013

SUBMITTED TO:

Dr. Nirupama. M, Assistant Professor of zoology,
Sri Adhichunchanagiri First Grade college,
channaraypatna – 573116.

SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE

(Affiliated to University of Mysore)

Channarayapatana, Hassan (D) 573116

VALUED
DURING THE I/II/III B Sc.,
PRACTICAL EXAMINATIONS
HELD ON 16/6/2024
EXAMINERS:
1)
2)

Principal
Sri Adichunchanagiri First Grade College
Channarayapatna

DECLARATION

I hereby declare that the Internship Report entitled **"STUDY ON LABORATORY EQUIPMENTS IN BIOCHEMISTRY LABORATARY AT ADHICHUNCHANAGIRI UNIVERSITY, B. G NAGARA"** is a genuine record of project work done by me under the guidance of Dr. Nirupama. M, Assistant Professor of Zoology and the work presented in this report has not been submitted earlier.

Suchitra KR

Sri Adichunchanagiri First Grade College
Channarayapatna
Est. 1979

CERTIFICATE

This is to certify that the Internship Project work report entitled **"STUDY ON LABORATORY EQUIPMENTS IN BIOCHEMISTRY LABORATARY AT ADHICHUNCHANAGIRI UNIVERSITY, B. G NAGARA"** is a bonafide project report carried out by Ms. Suchithra . K.R Third BSc (CZ) with REG No. U01GF21S0013 Submitted to the Department of Zoology of Sri Adichunchanagiri First Grade College, Channarayapatana for the partial fulfillment of Bachelor of Science in during the year 2023-2024.

Head of the Department
SAFGC College.
CRP-573116.

Principal signature
Principal
Sri Adichunchanagiri First Grade College
Channarayapatna

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INTRODUCTION AND SCOPE OF BIOCHEMISTRY

Biochemistry is the branch of life science which deals with the study of chemical reactions occurring in living cells and organisms. The term 'Biochemistry' was first introduced by the German Chemist Carl Newberg in 1903. It takes into account the studies related to the nature of the chemical constituents of living matter, their transformations in biological systems and the energy changes associated with these transformations. Biochemistry may thus be treated as a discipline in which biological phenomena are analyzed in terms of chemistry. The branch of Biochemistry for the same reason, it has been variously named as 'Biological Chemistry' or 'Chemical Biology'.

Modern biochemistry has two branches, **descriptive biochemistry** and **dynamic biochemistry.** Descriptive biochemistry deals with the qualitative and quantitative characterization of the various cell components and the dynamic biochemistry deals with the elucidation of the nature and the mechanism of the reactions involving these cell components. Many newer disciplines have been emerged from biochemistry such as enzymology (study of enzymes), endocrinology (study of hormones), clinical biochemistry (study of diseases), molecular biochemistry (study of biomolecules and their functions) etc. Along with these branches certain other specialties have also come up such as agricultural biochemistry, pharmacological biochemistry etc. Biochemistry is related to almost all the life sciences and without biochemistry background and knowledge, a thorough understanding of health and well-being is not possible. Those who acquire a sound knowledge of biochemistry can tackle the two central concerns of the biomedical sciences (1) the understanding and maintenance of health

and [2] the understanding and treatment of disease.

COMMONLY EMPLOYED EQUIPMENTS IN BIOCHEMISTRY LABORATORY

- Centrifuge
- Desiccator
- Mortar and pestle
- Refractometer
- Micro centrifuge
- Vortex mixer
- Rotary shaker
- Homogenize
- colorimeter
- Laminar air flow cabinet
- Vortex mixer
- Magnetic stirrer
- Water bath
- Ph meter
- Microscope
- Refractometer
- Microwave oven
- Spectrophotometer
- Deep freezer
- BOD incubator
- Hot air oven
- Flow hood

BASIC INSTRUMENTS

1. Centrifuge

A centrifuge is the equipment generally driven by an electric motor that puts an object to rotate around fixed axis, and a perpendicular force is applied to axis. The particles get separated according to their size, shape, density, viscosity of the medium and rotor speed.

Principle

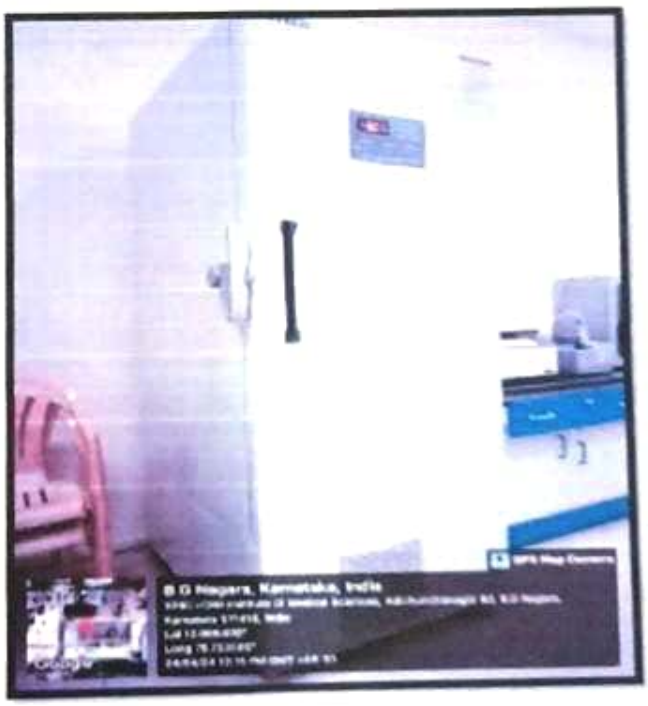
The centrifuge involves principle of sedimentation, where the acceleration at centripetal force causes denser substance to separate out along the radial direction at the bottom of the tube. In centrifugation, the lysate is rotated at a certain speed (expressed as rotations per minute (RPM)). This rotation imposes a force on the particles perpendicular to the axis of rotation. The force is called a relative centrifugal force ('CF), expressed as a multiple of the force of Earth's gravitational force (x g). When a particle is subjected to centrifugal force; it will migrate away from the axis of rotation at a rate dependent on the particle's size and density.

2. Deep freezer

Deep freezers are elegantly designed with the best quality refrigeration system to meet the elevated standards of performance and controlled temperature storage needs of the pharmacy, medical, industry, biotech and clinical applications.

Principle

The basic principle behind a freezer is evaporation. When a liquid evapourates, it causes the surrounding area to cool. Water can't be used in freezer though, because it evapourates at too high a temperature. But some liquids evapourate at very low temperatures. For example, Isobutene (becoming more common in domestic freezers) evapourates at very low temperatures. This ability to evaporate at very low temperatures means that it cools surfaces which are already very cold.

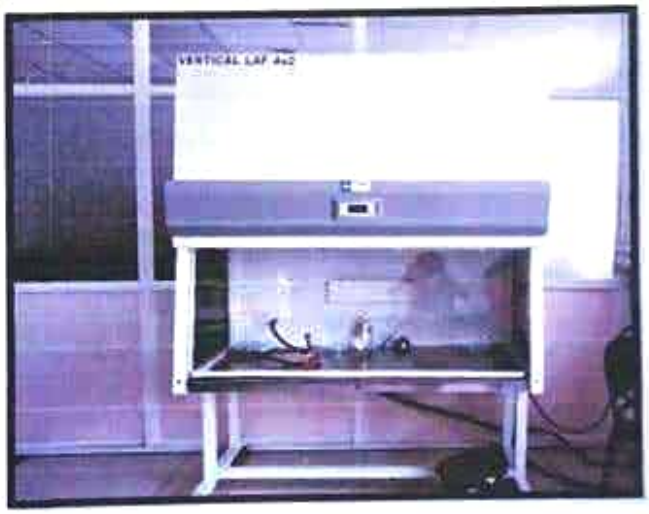


3. Laminar air flow cabinet

A laminar flow cabinet or laminar flow closet or tissue culture hood is a carefully enclosed bench designed to prevent contamination of semiconductor wafers, biological samples, or any particle sensitive materials.

Principle

The principle behind laminar air flow is the passage of continuous air flow at uniform velocity. HEPA filters designed to create a particle free working environment and provide product protection. Air taken through the filtration system is then exhausted across the work surface. Commonly, the filtration system comprises of a prefilter and a HEPA filter. The laminar air flow cabinet is enclosed on the sides and constant positive air pressure is maintained to prevent the intrusion of contaminated room air.

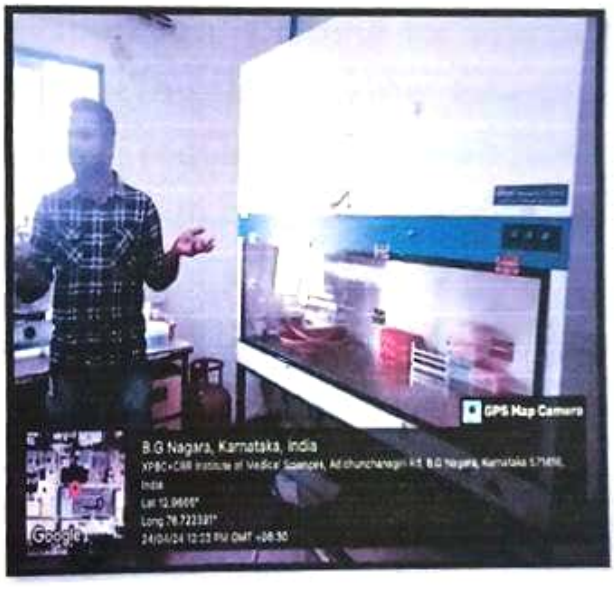


4. LAMINAR FLOW HOOD

A fume hood is a type of local ventilation device that is designed to limit exposure to hazardous or toxic fumes, vapors or dusts. A fume hood is typically a large piece of equipment enclosing five sides of a work area, the bottom of which is most commonly located at a standing work area, the bottom of which is most commonly located at a standing work height. Two main types exists, ducted and recirculating.

Principle

The speed of the air moving through the hood opening is known as face velocity. Air is drawn in from the front (open) side of the cabinet, and either expelled outside the building or made safe through filtration and fed back into the room.



5. ROTARY EVAPORATOR

A rotary evaporator or rotovap is a device used in chemical laboratories for the efficient and gentle removal of solvents from samples by evaporation.

principle

Rotary evaporation is a technique which employs a rotary evaporator in order to remove excess solvents from samples by applying heat to a rotating vessel at a reduced pressure. An important concept that this technique applies is that liquids boil when the vapor pressure is equal to the external pressure or atmospheric pressure. The machine utilizes a lower pressure than atmospheric pressure which allows Solvents to boil at lower temperatures. Furthermore, the rotation increases the surface area and therefore evaporation proceeds more rapidly. Rotary evaporation is useful for evaporating solvents that have high boiling points. This is because evaporating these solvents at atmospheric pressure requires high temperatures which may cause side reactions such as oxidation or decomposition of the compound to occur. Therefore, by lowering the pressure and boiling at a lower temperature, solvents with high boiling points are removed efficiently without the occurrence of unwanted side reactions.

6. BOD INCUBATOR

BOD incubators often called low temperature incubators, which is one of most important lab equipment in many research centres, hospitals and other pharmaceutical labs. Bacteriological incubators are known as exceptional lab incubators specially designed for a variety of incubation and testing applications. The series of BOD incubator is perfect for BOD testing and other related jobs of research.

Principle

The major principle behind the BOD incubator is to maintain constant environment condition for any particular kind of study such as cell cultures, microbiological etc.

7. MICROWAVE OVEN

Microwave ovens are used for heating and defrosting in laboratories. Microwave heating, which uses electromagnetic energy in the frequency range 300- 3000 MHz, can be used successfully to heat many dielectric materials.

However, improper use of a microwave can pose a number of hazards including:

- Ignition of flammable vapours
- Electrical shock from ungrounded or faulty units
- Ignition of materials being heated
- Pressure build-up in sealed containers
- Integrity of containers holding materials
- Sudden boiling of liquid in an open container following removal.

Principle

A microwave oven heats samples by passing microwave radiation through it. Microwaves are radio waves. In the case of microwave ovens, the commonly used radio wave frequency is roughly 2,500 Megahertz (2.5 gigahertz). Radio waves in this frequency range have an interesting property: they are absorbed by water, fats and sugars. When they are absorbed they are converted directly into atomic motion and motion is converted into heat. Microwaves in this frequency range have another interesting property: they are not absorbed by most plastics, glass or ceramics. And metal reflects microwaves, which is why metals cause spark in a microwave oven. The reason that metal reflects microwaves is that no electronic waves resident in inside of conductor because conductors conductivity is infinity as we studied in our course. The property is possible because the frequency 2,500 megahertz is resonance frequency of water. Molecules of all food are consist of a dipole and have positive charge in one side and have negative charge in another side. If we put electromagnetic fields in this,

all molecules are rearranged: positive charge is to negative.

8. pH METER

pH meter used for potentiometrically measuring the pH, which is either the concentration or the activity of hydrogen ions, of an aqueous solution. It usually has a glass electrode plus a calomel reference electrode, or a combination electrode. pH meters are usually used to measure the pH of liquids, though special probes are sometimes used to measure the pH of semi-solid substances.

Components of pH meter

Basic potentiometric pH meters simply measure the voltage between two electrodes and display the result converted into the corresponding pH value. They comprise a simple electronic amplifier and a pair of probes, or a combination probe, and some form of display calibrated in pH. The probe is the key part; it is a rod-like structure usually made of glass, with a bulb containing the sensor at the bottom. Frequent calibration with solutions of known pH, perhaps before each use, ensures the best accuracy. To measure the pH of a solution, the probe is dipped into it.

Principle

pH measurement is based on the use of a pH sensitive electrode (usually glass), a reference electrode, and a temperature element to

provide a temperature signal to the pH analyzer. The pH electrode uses a specially formulated, pH sensitive glass in contact with the solution, which develops a potential (voltage) proportional to the pH of the solution. The reference electrode is designed to maintain a constant potential at any given temperature, and serves to complete the pH measuring circuit within the solution. It provides a known reference potential for the pH electrode. The difference in the potentials of the pH and reference electrodes provides a milli volt signal proportional to pH.

9. VERTEX MIXER

A vortex mixer, or vortexer, is a simple device used commonly in laboratories to mix small vials of liquid. In a analytical laboratory they may used to mix a reagents.

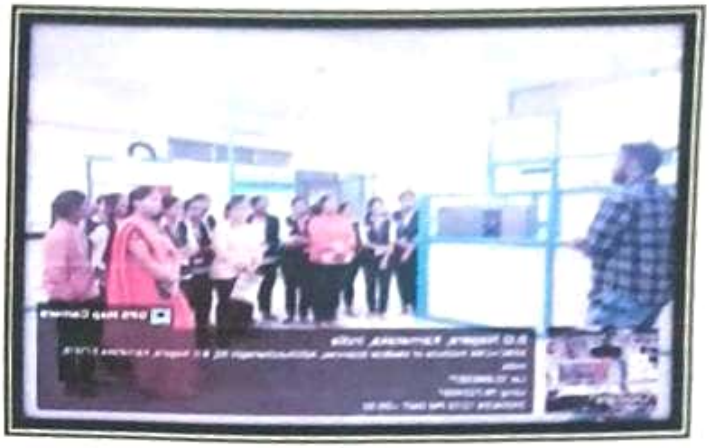
Working

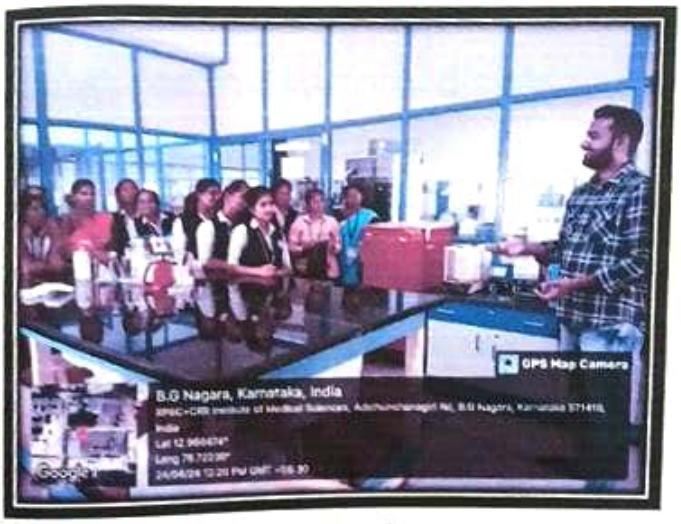
When a test tube or other appropriate container is pressed into the rubber cup (or touched to its edge) the motion is transmitted to the liquid inside and a vortex is created. Most vortex mixers have variable speed settings and can be set to run continuously, or to run only when downward pressure is applied to the rubber piece.

Parts of vortex mixer

It consists of an electric motor with the drive shaft oriented vertically and attached to a cupped rubber piece mounted slightly off-center. As the motor runs the rubber piece oscillates rapidly in a circular motion.

Photo Gallery:





The faculty of ACU explaining regarding various equipments and methods used in biochemistry laboratory.

CONCLUSION

The laboratory is central to science instruction, it is in the laboratory that the students learn to handle apparatus, think independently and to draw conclusions on the basis of experiment and observation. Laboratory work is an essential component of science education. The main objective are the making abstract scientific concepts and principles, training in scientific method, development of scientific skills, attitude, interests and appreciation.

The visit to the Biochemistry laboratory at ACU, B.G. Nagara, as an intern provided me comprehensive understanding of the different laboratory equipments employed in the various biochemistry research works. The visit offered valuable insights into the role of biological science and chemical sciences in the Biochemistry research field to discover various drugs for the various diseases.

REFERENCE:

- https://www.slideshare.net/kusumjain9/various-lab-instruments-in-biochemistry1
- https://prsvkm.kau.in/sites/default/files/documents/prsvkm_laboratory_manual_of_biochemistry.pdf

Zoology

Core Course Lab Content

Semester III (Practical III)

Course Title: **Molecular Biology, Bioinstrumentation and Techniques in Biology**	Course Credits: **2**
Course Code: DSCC5ZOOP3	L-T-P per week: 0-0-4
Total Contact Hours**: 56**	Duration of ESA: 3 Hours
Formative Assessment Marks: **25**	Summative Assessment Marks:**25**

Course Outcomes (COs):

At the end of the course the student should be able to:

1. At the end of the course, students will be able to understand the applications of biophysics and principle involved in bio-instruments.
2. Understand the methodology involved in bio techniques.
3. Students can Demonstrate knowledge and practical skills of using instruments in biology and medical field.
4. They can perform techniques involved in molecular biology and diagnosis of diseases.

Lab Course Content

List of experiments	14 units (1unit- 4hrs)
1. To study the principle and applications of simple, compound and binocular microscopes.	1
2. To study the principle and applications of various lab equipments- pH meter, Electronic balance, Vortex mixer, use of glass pipette and micropipettes, Laminar air flow, Incubator, shaker, Water bath and centrifuge.	2
3. To prepare Buffer solutions (Phosphate, Citrate, Tris-HCl buffer)	1
4. To estimate amount of RNA by Orcinol method.	2
5. Demonstration of differential centrifugation to fractionate components in a given mixture.	1
6. To estimate amount of protein by Lowry's method.	2
7. To identify different unknown amino acids using ascending paper chromatography.	1
8. Extraction of DNA from the given animal tissue sample.	2
9. To estimate amount of DNA by di-phenyl amine (DPA) method.	2

Suggested Readings:

1. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell, 4th edition. New York: Garland Science (2002).
2. Daniel L. Hartl and Maryellen Ruvolo. Genetics: Analysis of Genes and Genomes, 8th Edition. Burlington, Mass.: Jones & Bartlett Learning (2012).
3. Gerald Karp. Cell and Molecular Biology: Concepts and Experiments, 5th Edition. Wiley Publication (2008).
4. Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Freeman. Molecular Cell Biology, 5th edition. W. H. & Company (2003).
5. James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, RichardLosick. Molecular Biology of the Gene, 5th edition. Cold Spring Harbor Laboratory Press (2003).
6. Stryer, Lubert. Biochemistry, 2nd Edition. W. H. Freeman and Company, New York (1981).

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	10
Class performance/Participation	10
Total	**25**