BIOLOGICAL INSTRUMENTS USED IN LABORATORY AND IT's APPLICATIONS

Introduction

Biology it the study of living organisms , divided into many specialized fields that cover there morphology , anatomy , physiology, behavior, origin and distribution.1)Botany (Pharmacology),2)Genetics (Paleontology),3)Mycology (Biochemistry),4)Ichthyology (Physiology)5)Ecology (Taxonomy) these are the branches of biology. Science progress is directly related to advancements and techniques and modern instruments and techniques are used in biological studies some of them are quit complex to make optimal use of there is need to know their working principles. Labs have become very important now a days experiments often take place in research.

Spectrophotometer measures either the amount of light reflected from a sample, objects or the amount of light that is absorbed by the sample object. Source or objects from visual colon matches , meaning that the eye of the observers is used as tool able to estimate whether two colored stimuli are identical or not. The device used to separate heavier partials from the lighter one bye the action of centrifugal force .Laminar air flow is a air moving at the same speed and in the same direction.

Electrophoresis may be the main technique for molecular separation in today's cell biology laboratory.In biology an incubator is a device used to grow and maintain microbiological cultures or cell cultures. Microtome is tool used to cut extremely thin slices of material known as section. Hot air oven is an electric device which is widely used medical industries. Autoclave is process of sterilization by saturated steam under reduced pressure. A pH meter is a scientific instrument that measure the hydrogen ion activity in water based solution.

Result/discussion- Science can be fun but it can also be dangers because we can be working many kind of objects, chemicals or minerals that may be able to harm us or someone else. we must know your lab equipment and how to use it for not only our experiments but also faults that may occur during or after the experiment.
They help in caring experiments safe and successful.

1) Spectrophotometer :

- Aim - To determine lambda max (wavelength of maximum absorption of light/color)
- Principle- a spectrophotometer consist of two instruments namely a spectrometer for producing light of any selected color (wavelength)

and a photometer for measuring the instruments are arranged. the amount of light passing through the tube is measure by photometer.

- Working of spectrophotometer- A lamp provides the source of light. the beam of light sticks the diffraction gratting,which work like a

prism and separate the light into it's components wavelengths. the grating is rotated so that only a specific wavelength of light reaches the
exits slit, then the light interacts with the sample from this point, the detector measure the transmittance of the samples transmittance refers
to the amount of light that passes completely through the sample and sticks the detector. Absorbed by the sample the detector sense the light
being transmitted through the sample and converts this information into a digital display.

- Applications- 1)Quality analysis :the visible and UV spectrophotometer may be used to identify classes of compound in biological

presentation. This is done by plotting absorption spectrum curves.

2)Quantitative analysis- it is used in the quantitative analysis of biochemistry chemicals. This method developing for determining an
unknown concentration of given species by absorption spectrometry.

3)Enzyme assay- this is the basic application of spectrometry. this assay is carried out most quickly and conveniently when the substrate
(or)the product is color (or) absorbs light in the UV range.
e.g. Pyruvate kinase - phosphoenolpyruvate + ADP <-> Pyruvate - ADP

4)Molecular weight determination- molecular weight of amine picrates,sugar and many aldehyde and ketone compounds have been determined by this method. molecular weight of only small molecules may be determined by this method.

2)Centrifuge :

- Aim-the particle get separated according to their size,shape,density,viscocity of the medium and rotter speed.
- Principle- the centrifuge works on the principle of increasing effective gravity to enhance the rate of setting of suspended particles more dense than the buffer.
- Working of centrifuge-

1) centrifugation is a process by which a centrifuge is used to separate component of complex mixture. by spinning laboratory

2)sample at very high speed, the components of given mixture are subjected to centrifugal force, by which cause more dense. particles to migrate away from the axis of rotation and lighter ones to more toward it. These particles can sediment at the bottom of the tubes.

- Applications : -

1) removing fat from milk to produce skimmed milk.

2) removing water from lettuce after washing it in a salad spinner.

3) Separating partials from an airflow

4) for clarification and stabilization

Add Appl^{n}

4)Electrophoresis

- Aim-Gel electrophoresis is used to separate macromolecules like DNA,RNA and proteins.DNA fragments are separated according to their size.

Proteins can be separated according to their size and their charge (different proteins have different charges)

- Principle- charged particles under the influence of liquid media placed in an electric field will migrate to the electrode of the opposite charge.

positive ions will migrates to the cathod,the negative electronegative ions will migrate to the anode, the positive electrode.

- Working-

1)Restriction enzymes cleaves DNA into smaller segments of various sizes.

2)DNA segments are loaded into wells in a porous gel. The gel floats in a buffer solution within a chamber between two electrodes.

3)Smaller DNA segments move faster than larger DNA segments.

- Applications-

1)DNA sequencing.
2)MedicalReaserch.
3)Protein purification.
4)Agricultural testing

Add

5)Incubator

- Aim-In biology and incubator is a device used to grow and maintain microbiological cultures or cell cultures.
- Principle-The incubator maintains optimal tempeture,humidity and other conditions such as the carbon dioxide.(CO_2) and oxygen content of the atmosphere inside.
- Working- In biology an incubator is a device used to grow and maintain microbiological cultures or cell cultures
- Applications-

1)Growing cell culture
2)Controlled sample storage.
3)Growing of crystals. / Protein crystals.
4)Breeding of insects and hatching of eggs in zoology.

6)Microtome

- Aim- microtome is a method for the preparation of thin section for materials such as bones materials and alternatives to electro polishing and ion milling.
- Principle- through the motion of the sample holder ,the sample is cut by the knife position 1 to 2, at which point the fresh section. remains on the knife.

the typical cut thickness for rotatory microtome is between 1 and 60 um

- working- the tissue is then cut in the microtome at thickness varying from 2 to 50 um. the ultamicrotome is also used with its glass knife or an industrial grade diamond knife to cut surrey section prior to thick sectioning.
- Application-

1)traditional histology technique

2)cry sectioning technique

3)electron microscopy technique

4)spectroscopy

7)Hot air oven-

- Aim- it is electrical device which is use dry heat to sterilize.
- Principle- it is good at the bacteria from the products in the process of sterilization.
- Working- it is works on the basis of hot air inside the chamber which is created due to forced air circulation. it is universal fact that in chamber the hot air first rise up and once it reaches the top of the instruments it come back to bottom in the chamber. the circulating fans and fan motor that are equipped with the instrument helps to create even temperature inside the chamber which inside the hot air oven.
- Application-

1)it is used for the sterilization of powders, such as the sulphacetamides , sulphadiazen , kaolin, zinc , oxide.

2)it is used for the sterilization of glass water, such as pestle and motor.

8)Autoclave

- Aim-autoclave is a process of sterilization by saturation steam under reduced pressure above steam sterilization carried out in pressure chamber.
- Principle-the principle of the autoclave is that water boils when its vapor pressure equals that of the surrounding atmosphere.
- Working-the sufficient quantity of water is poured into chamber after removing the perforated chamber. The level of the water adjusted in such a way

That is does not touch the bottom of the perforated chamber. The material is packed in the perforated chamber. The lid is than closed with the wing nuts and bolts.

The autoclave is a switched on the heat. The vent is opened and safety valve is settled the required pressure.

- Application-

1)typical loads include laboratory glass wear other equipment and west surgical instrument and medical waste.

2)it is used to sterilized the container and closures.

3)sterilized is the total destruction of all forms of life including bacterial spores.It is best done with heat either, dry heat in an oven or steam under
Pressure.

10)Colorimeter

- Aim- The aim behind this science is to measure color & to predominantly quantity thaw color or light source or objects from visual color matches (this means

that the eyes) are used as a tool to identify if the color is identical or not.

- Principle- When a monochromatic light passes through a cultured solution, some specific wavelength of light are absorbed which is ~~wavelength of light are~~

~~absorbed which is~~ related to color identify.

- Working- a colorimeter device is used to test the concentration of a solution by measuring it's absorbance of a specific wavelength of light.

to used this device,diffffferent solutions must be made & a control is first filled into a cuvette & placed inside a colorimeter to calibrate the machine.

- Application-

1)A common application of a colorimeter is there force to determine the concentration of a known solute in a given solution.

2)It is widely used in hospital & laboratories for estimation of biochemical samples, like plasma,serum,cerebrospinal fluid (cuff),urine.

3)It is also used to quantitative estimation of serum components as wells glucose,protien & other various biochemical compounds.

4)They are used by the food industries & by manufacturing of paints & textiles.

Conclusion- Instruments have revolutionized how we look at the world and refined and extends the range of our senses. integral part of nation. growth since explorers first set of to map the continent. the establishment of the us geological survey had it's roots in the exploration of the critically on advanced surveying instruments. the scope of research that instrumentation enable has expanded considerable, now encompassing not only the natural(physical and biological) world.

9) pH meter

- Aim- The pH is based on the amount of the hydrogen ions available in a solution. pH is a measurement related to an aqueous solution.
- Principle- pH meter is the unit of measure that describes the degree of acidity or alkalinity. It is measured on a scale of 0 to 14.
- Working-if it turns pink it's acid & if it turns into blue is an alkali. Measuring acids & alkali with litmus paper is everyone learns how to do in school . It's relatively easy to compare little strip of wet paper with the colors on a chart.
- Application-

1)the pH meter is used in many applications ranging from laboratories experimentation to quality control.

2)a pH meter is an electronic device used for measuring the pH. Of liquid.

3)the device have been miniaturized enabling direct measurement of pH. Inside of living cell.

4)this pair is a glass electrode & calomel electrode.

3)Laminar Airflow

- Aim-In a laminar flow the air is passed through a HEPA (High Efficiency Particulates Air) filter which removes all airborne contamination to maintain sterile condition
- Working of laminar air flow :-

The process of laminar air flow can be describe as airflow where an entire body of airflows with steady uniform velocity . Laminar flow cabinets work by the use of in flow laminar air drawn through one or more HEPA filters designed to create a particle free working and environment and provide product protection . Air is taken through a filtration system and then exhausted a cross the work surface as part of the laminar flows process .

- Applications :-

1) It is used to maintain the aseptic condition that can be used for microbiological activities .

2) Apply in laminar air flow techniques in burn treatment .

3) They provide an excellent clear air environment for a number of laboratory requirement .

4) In Aeronautics industry air fuel uses of planes .