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BS (MLT 4TH SEMESTER)

**SUBJECT: BIOMEDICAL
INSTRUMENTATION**

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ANS#01:

TERMS:

01) PH METER:

- The PH meter was invented in 1934 by the American chemist Arnold o Beckman to measure the sources of lemons.
- It is a device used for the measurement of PH of solution.

USES:

It is electric device used to measure hydrogen ion activity (acidity or alkalinity) in a solution .fundamentally a PH meter consists voltmeter attached to a PH responsive Electrode and a reference Electrode,
PH meter uses in many application to ranging for laboratory experimentation to Quality control,

COMPONENTS:

- 1) METER:
This can be moving coil meter or a digital meter,
- 2) ELECTRODE:
Two types:
Glass electrode,
Calomel electrode,
- 3) OUT put,

02) VERTEX MIXER:

The vertex mixer is a simple device used commonly in laboratories to mix small vials of liquid

It consists of an electric motor with the drive shaft oriented vertically and attached to a cupped

Rubber piece mounted slightly of center,

USES:

Liquid mixing

Other name:

Vortex shaker

Related items:

Magnetic stirrer, static mixer,

Components:

- Power supply
- Electric motor
- Drive shaft
- Cupped rubber piece,

Principle:

As the motor runs the rubber piece oscillates rapidly in a circular motion.

When a test tube or other appropriate container is pressed into the rubber cup the

Motion is transmitted to the liquid inside and a vertex is created,

MODES:

- 1 continuous
- 2 when down pressure is applied it starts,

USES:

- Used to mixed different reagents,

3) BALANCE:

- A weighing scale is a device for measuring weight,
- Balance measure the mass of an object and are used in science

1) Analytical balance:

Analytical balances are found throughout most laboratories,
They are mostly used to weigh substances and samples between 0.01 to 500 mg,
An analytical balance measures masses to within 0.0001g,
Uses these balances when you need this high degree of precision,

2) Weighing principles:

This basic of the rapid and exact working method of our weigh cells is the principle
Of electromagnetic force restoration,

4) WATER STILL:

Water still works by first heating water until it turns into steam, then collecting
The steam, in tubes or on a glass plate, and finally condensing the steam into new,
Purified water droplets that can be collect in a clean,

Components:

- Source heat
- Still pot
- Still head
- Thermometer
- Condenser
- Cooling water in
- Cooling water out
- Distillate
- Vacuum
- Still receiver
- Heat control
- Cooling bath

5) Deionizer:

- It is an instrument used in laboratory for purification of water,

Principle:

- It works on principle of deionization,

Process:

Deionization is a chemical process that uses specially manufactured ion exchange resins, which exchange hydrogen and hydroxide ions for dissolved minerals and then recombine to form ions removed, such as cations like sodium calcium iron etc.

ANS02#

Electrophoresis:

- Migration with electricity,
- Involves the separation of components of sample by different rate of migration in the presence of electric field,
- Theory proposed by prof Ferdinand F. Rues experiment on migration of clay particles,

Principles:

Molecules move with the speed dependent on their charge, shape and size and get separated in the presence of an electric field,

Components:

- Gel casting assembly
- Buffer container or electrophoresis tank
- Power supply
- Glass plate to hold the gel

Operation:

- Gel prepared by adding powdered agarose to liquid boiling the mixture.
- Comb is already placed which create rows of well for sample loading

- This agarose is then poured into casting tray and allows to solidify at room temperature.
- Apply desired voltage to initiate electrophoresis,

QUALITY CONTROL:

- Calibration of equipment
- Good quality and properly working of standards
- The standards should be run to check the validity
- Do not use expire reagent

APPLICATION:

Separation of proteins DNA RNA and other macro molecules,

Purification and analysis of vaccine and antibiotics,

IMPORTANCE:

It is used in DNA finger printing,

le:paternity testing, forensic testing molecular biology genetic etc,

Very useful in genetics

Commonly used in DNA sequence

Principles:

$$U=v/E=EQ/FE=q/E$$

ANS03#

FLOW CYTOMETRY:

Flow cytometer is a technique used to detect and measure physical and chemical

Characteristics of a population of cells or particles,

In this process a sample containing cells or particles is suspended in a fluid and

Injected into the flow cytometer instrument,

ANALYTES:

Cells or particles

Related:

Coulter counter

CYTOMETRY TEST FOR:

Flow cytometer analyzes your blood or bone marrow cells to determine whether a

High white cell count is the result of blood cancer,

The test identifies cells as they flow through an instrument called a flow cytometer,

PRINCIPLES OF FLOW CYTOMETRY:

The basic principles of flow cytometer is the passage of cells in a single file in front of

A laser, so they can be detected, counted and sorted, cell components are

Fluorescently labeled and then excited by the laser to emit light at varying wave

Length detected by detectors

PARAMETERS:

- Cell pigments such as chlorophyll,
- Total DNA content
- Total RNA content
- DNA copy number variation
- Protein expression and localization
- Cell surface antigens
- Intracellular antigens
- Nuclear antigens
- Enzymatic activity
- Membrane fluidity

ANS#4):

BEER LAMBERT LAW:

States:

Quantity of light absorbed by a substances dissolved in a fully transmitting solvent is directly proportional to the concentration of the substances and the path of length of a light through solution,

Importance:

There is linear relationship between the concentration and the absorbance of the solution,

Which enables the concentration of a solution to be calculated by measuring its absorbance..

FORMULA OF BEER LAW:

Here is an example of directly using the beer law equation (absorbance= $e L c$)

When you were given the molar absorptivity constant,

In this equation e is the molar extinction coefficient, l is the path of the cell holder, c is the concentration of the solution.....

ANS#05)

Autoclave:

Is a pressurized device designed to heat aqueous solutions above their boiling point at normal atmospheric pressure to achieve sterilization.

Uses:

- Surgical instruments
- Plastic sharp containers
- Solutions and water
- Animal food and bedding
- Bio hazardous waste

COMPONENTS:

- Pressure gauge
- Safety valve
- Autoclave lid
- Handles
- Autoclave body
- Steam release valve
- Vacuum release valve outer stand

Principles:

This principle is employed in sterilizing material by steam at temperature higher than 100c and the process is called autoclaving,

For autoclaving in the laboratory the most agreeable and commonly used method is to use steam at 121c for 15 to 30 minutes depending upon the Particular material to be sterilased,

TYPES of AUTOCLAVE:

- Pressure cooker type
- Common laboratory auto clave
- Vertical autoclave
- Horizontal auto clave
- Large automatic hospital autoclave...

