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Q1. Define the following terms.

I. PH Meter

The pH meter was developed in 1934 by the American chemist Arnold O. Beckman to measure the sourness of lemons. PH was formerly an abbreviation for French clause "pouvoir hydrogène," which may be translated into English as "power of hydrogen," or "potential of hydrogen". It is a device used for the measurement of PH of solution. A simple and speedy device to live the acidity and alkalinity of a fluid. A pH meter will be made of probe. Probe is made up of two electrode which passes electrical signals to a meter. One is glass sensor electrode and the other is a reference electrode (calomel electrode).

II. Vortex Mixer

Vortex mixer was the invention of the Kraft Brothers while working for Scientific Industries way back within the 1960s. A vortex mixer, or vortexer, may be a simple device used commonly in laboratories to combine small vials of liquid. The Vortex mixer is one such device that's commonly found during a laboratory. The chief purpose of a Vortex Mixer is to combine small vials of liquid. It is a fairly simple device which has an electric motor with a drive shaft that is vertically oriented and also attached to a cupped rubber piece mounted slightly off center. The way it works is that the motor drives the rubber piece at the top in a circular motion.

III. Balance

A weighing scale may be a device for measuring weight. Balance measure the mass of an object and are used in science. Analytical/lab balances are designed for great precision in quantitative chemical analysis. They yield readability to four decimal places to the proper of the percentage point (up to .0001 g).

IV. Water still

It is an instrument used in laboratory for Purification of water. It works on Principle of Distillation. Distillation is the process of converting liquid into its vapors by heating and

reconverting it again into liquid by condensing the vapors. It is method of separating substances which differ in their vapor pressures. The distillation process is administered in an apparatus which consists of (a) Still, during which volatile material is boiled. (b) Condenser, in which vapors are condensed. (c) Receiver, in which distillate is collected.

V. Deionizer

It is an instrument used in laboratory for Purification of water. It works on Principle of Deionization. Deionization might be a chemical change that uses particularly manufactured ion-exchange resins, which exchange hydrogen and hydroxide ions for dissolved minerals, then recombine to make water. Water that has had most of its mineral ions removed, like cations like sodium, calcium, iron, and copper, and anions like chloride and sulfate.

Q2.Describe Electrophoresis and its importance?

Electrophoresis

Means migration with electricity. Involves the separation of components of a sample by differential rate of migration in the presence of electric field. Theory was first proposed by Prof. Ferdinand F reuss by doing experiment on migration of colloidal clay particles. Many significant biological molecules such as amino acids, peptides, proteins, nucleotides, nucleic acids have ionisable groups and, consequently, at any given pH, exists in solution as electrically charged species either as cations or anions. Under the charge of an electric field these charged particles will transfer either to cathode or to anode, depending on the nature of their net charge. This is one of the most fundamental processes used in all types of molecular biology and RDT experiments.

Following are the components used in electrophoresis

- Gel casting assembly.
- Buffer container or electrophoresis tank
- Power supply
- Glass plate to hold the gel
- Comb to load sample in the gel before solidification

Applications/importance of Electrophoresis:

1. Separating serum proteins for diagnostic purpose.
2. Hemoglobin separation.
3. Lipoprotein separation and identification.
4. Isoenzyme separation and their analysis.
5. Nucleic acid studies.
6. Determination of molecular weight of the proteins.
7. DNA Sequencing
8. Medical Research
9. Protein research/purification
10. Agricultural testing
11. Separation of organic acid, alkaloids, carbohydrates, amino acids, alcohols, phenols, nucleic acids, insulin.
12. It is employed in biochemical and clinical fields i.e. in the study of protein mixtures such as blood serum, hemoglobin's and in the study of antigen- antibody interactions.
13. Electrophoresis in combination with autoradiography is used to study the binding of iron to serum proteins.
14. Used for analysis of terpenoids, steroids and antibiotics.
15. For testing purity of thyroid hormones by zone electrophoresis.
16. Paper chromato-electrophoresis is used to separate free Insulin from plasma proteins.
17. It is used for diagnosis of various diseases of kidney, liver and CVS.
18. It is also used for separation of Scopolamine and Ephedrine using buffer at PH 4.2.

Q3.Write a note on Flow Cytometery?

Flow cytometry

Flow cytometry may be a technology that's wont to analyze physical and chemical characteristics of particles during a fluid because it passes through a minimum of one laser. Cell components are fluorescently characterized then excited by the laser to emit light at variable wavelengths. Up to thousands of particles per second can be analyzed as they pass through liquid stream.

Examples of properties measured include particle's relative granularity, size and fluorescence intensity also as its internal complexity.

Optical-to-electronic coupling system is used to record the way in which particle emits fluorescence and scatters incident light from laser

Contents of flow cytometer

I. FLUIDICS

Purpose of the fluidics system is to transport the particles in a stream of fluid to laser beam where they are interrogated. If cells are from solid tissue, they require disaggregation before they can be analyzed. Although cells from animals, plants, bacteria, yeast or algae are usually measured, other particles such as chromosomes or nuclei can also be examined.

Some particles like marine algae are naturally fluorescent, but generally, fluorescent labels are required to tag components of the particle. Section of fluid stream that contains particles is referred as sample core

II. OPTICS SYSTEM

Lasers which illuminate particles present in stream as they pass through and scatter light from laser. Fluorescent molecules that are on particle emit fluorescence, which is detected by carefully positioned lenses. Light scattered from up to six or more fluorescence's is determined for two different angles. Optical filters and beam splitters then direct light signals to relevant detectors, which emit electronic signals proportional to signals that hit them.

Data collected on each particle or event and characteristics of these events or particles are determined supported their fluorescent and lightweight scattering properties.

III. ELECTRONICS SYSTEM

Used to change light signals detected into electronic pulses that a computer can process. Data can then be studied to ascertain information about a large number of cells over a short period. Information on the heterogeneity and different subsets within cell populations can be identified and measured.

Some instruments have a sorting feature in electronics system that can be used to charge and deflect particles so that certain cell populations can be sorted for further analysis. Data are usually presented in the form of single parameter histograms or as plots of correlated parameters, which are referred to as cryptograms. Cryptograms may display data in the form of a dot plot, a contour plot or a density plot.

APPLICATIONS OF FLOW CYTOMETRY

Molecular biology, pathology, immunology. (Especially in transplantation, hematology, tumor immunology and chemotherapy, prenatal diagnosis, and genetics. Extensively used in research for detection of DNA damage.

Q4 .What do you know about Beer Lambert law (uses, principle)?

The law was first developed by Pierre Bouguer before 1729. It was later attributed to Johann Heinrich Lambert who cited Bouguer's findings. The law included path length as a variable that affected absorbance. Later, Beer extended in 1852 the law to incorporate the concentration of solutions, thus giving the law its name Beer-Lambert Law.

Beer –Lambert Law

When a monochromatic light of initial intensity Io passes through an answer during a transparent vessel, a number of the light is absorbed in order that the intensity of the transmitted light I is a smaller amount than Io .There is some loss of light intensity from scattering by particles within the solution and reflection at the interfaces, but mainly from absorption by the solution. The relationship between I and Io depends on the trail length of the absorbing medium, l, and therefore the concentration of the absorbing solution. These factors are related within the laws of Lambert and Beer.

Lambert's law

When a ray of monochromatic light passes through an absorbing medium its intensity decreases exponentially because the length of the absorbing medium increases.

Beer's law:

When a monochromatic light passes through an absorbing medium its intensity decreases exponentially because the concentration of the absorbing medium increases.

Uses

Beer-Lamberts law is applied to the analysis of a mix by spectrophotometry, without the necessity for extensive pre-processing of the sample. Examples include the determination of bilirubin in blood plasma samples. The spectrum of pure bilirubin is understood thus the molar absorbance is understood. Measurements are made at one specific wavelength almost unique for bilirubin and another measurement at a second wavelength so interferences or deviations are often eliminated or corrected. Generally, it are often wont to determine concentrations of a specific substance, or determine the molar absorptivity of a substance.

Principle

The Beer-Lambert law works on the principle of colorimetry. When two bodies of different temperatures (preferably a solid and a liquid) are placed in physical contact with each other, the heat is transferred from the body with higher temperature to the body with lower temperature until equilibrium is attained between them. The body at higher temperature releases heat while the body at lower temperature absorbs heat. The principle of calorimetry indicates the law of conservation energy, i.e. the total heat lost by the recent body is adequate to the entire heat gained by the cold body.

Q5.Explain Autoclave, its uses, and components?

Autoclave

Autoclave is a pressure chamber used for the sterilization .The instruments is also termed as sterilizer. This instruments was first developed in its crude form by Dr. Denis Papin and named it as a steam digester. The steam digester was the forerunner of laboratory autoclave invented in 1879 by Dr. Charles chamberland.

The Autoclave is an equipment used to remove microorganisms (Virus, Bacteria, fungus etc.) and spores using high pressure and high temperature steam Sterilization. Autoclave is a pressurized device planned to heat aqueous solutions above their boiling point at normal atmospheric pressure to achieve sterilization.

Uses of Autoclave

- Surgical instruments
- Plastic sharp containers
- Glassware
- Plastic tube and pipette tips
- Solutions and water
- Animal food and bedding
- Biohazard water

Components of Autoclave

1. Heating Elements

2. Temperature Controller

3. Pressure Sensor

4. Chamber

5. Door gasket

6. Solenoid valve

7. Water level Sensor