Medical Instrumentation Laboratory

Incubator

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1 st Class

Incubator

in microbiology, is an insulated and enclosed device that provides an optimal condition of temperature, humidity, and other environmental conditions required for the growth of organisms.

An incubator is a piece of vital laboratory equipment necessary for the cultivation of microorganisms under artificial conditions.

An incubator can be used for the cultivation of both unicellular and multicellular organisms.

Principle/ Working of Incubator

An incubator is based on the principle that organisms require a particular set of parameters for their growth and development with the optimal condition (under artificial conditions) of temperature, humidity, oxygen, and CO2 levels.

Components/Parts of Incubator

1. Cabinet

• The cabinet is the main body of the incubator consisting of the double-walled cuboidal enclosure with a capacity ranging from 20 to 800L.

• The outer wall is made up of stainless steel sheets while the inner wall is made up of aluminum.

• The space between the two walls is filled with glass wool to provide insulation to the incubator.

• The insulation prevents heat loss and in turn, reduces electric consumption, thereby ensuring the smooth working of the device.

• The inner wall of the incubator is provided with inward projections that support the shelves present inside the incubator.

2. Door

• A door is present in all incubators to close the insulated cabinet.

• The door also has insulation of its own. It is also provided with a glass that enables the visualization of the interior of the incubator during incubation without disturbing the interior environment.

• A handle is present on the outside of the door to help with the maneuvering of the door.

3. Control Panel

• On the outer wall of the incubator is a control panel with all the switches and indicators that allows the parameters of the incubator to be controlled.

• The control panel also has a witch to control the thermostat of the device.

4. Thermostat

• A thermostat is used to set the desired temperature of the incubator.

• After the desired temperature is reached, the thermostat automatically maintains the incubator at that temperature until the temperature is changed again.

5. Perforated shelves

• Bound to the inner wall are some perforated shelves onto which the plates with the culture media are placed.

• The perforations on the shelves allow the movement of hot air throughout the inside of the incubator.

• In some incubators, the shelves are removable, which allows the shelves to be cleaned properly.

6. L-shaped thermometer

• A thermometer is placed on the top part of the outer wall of the incubator.

• One end of the thermometer provided with gradations remains outside of the incubator so that temperature can be read easily.

• The next end with the mercury bulb is protruded slightly into the chamber of the incubator.

7. HEPA filters

• Some advanced incubators are also provided with HEPA filters to lower the possible contamination created due to airflow.

• AN air-pump with filters creates a closed-loop system so that the air flowing inside the incubator generates less contamination.

8. Humidity and gas control

• The CO2 incubators are provided with a reservoir underneath the chamber that contains water.

• The water is vaporized to maintain the relative humidity inside the chamber.

• Similarly, these incubators are also provided with gas chambers to give the desired concentration of CO2 inside the incubator.

How do I choose a laboratory incubator?

1. The size and capacity of the incubator are the first, most basic considerations.

2. Estimating the number of samples that will be incubating at any one time will give a general idea of the proper internal volume.

3. What temperature, humidity, and CO2 ranges will be necessary for your work, and will a water source be required?

Types of Laboratory Incubators:

On the basis of the presence of a particular parameter or the purpose of the incubator, incubators are divided into the following types:

1. Benchtop incubators

• This is the most common type of incubator used in most laboratories.

• These incubators are the basic types of incubators with temperature control and insulation.

2. Portable incubator

• Portable incubators are smaller in size and are used in fieldwork, e.g. environmental microbiology and water examination.

3. CO2 incubators

• CO2 incubators are the special kinds of incubators (the most common equipment found in the laboratory) that are provided with essential variables related to replicating environment; automatic control requiring CO2 (5-10%) concentration, temperature (37°C), relative humidity (RH) (95%) and balanced controlled pH (7.2–7.4). The humidity control, water is kept underneath the cabinet of the incubator.

• This type of incubator is used for the growth of the cultivation of different bacteria and intended for tissue and cell culture applications

CO2 Incubator Applications:

1. Cell and Tissue Culture. 2. Immunology.

3. Genetic Engineering. 4. Protein Synthesis.

5. Virology. 6. Neurology.

7. Pharmacology. 8. In-vitro Fertilization.

9. Human Vaccines. 10. Veterinary Vaccines.

11. Carcinogenicity Testing 12. Monoclonal

4. Shaking Incubator

A thermostatically controlled shaker incubator is the requisite equipment for all those laboratories engaged in biomedical or biological research. Shaking incubators have combined shakers and incubators.

The most common application of a shaking incubator is used to cultivate microorganisms (bacterial culture only be used for broth or liquid culture media). Its advantage is that it provides a rapid and uniform transfer of heat to the culture vessel, and its agitation provides increased aeration, resulting in acceleration of growth.

5. Cooling Incubators

Cooling incubators are fitted with modified refrigeration systems with heating and cooling controls appropriately balanced. The main functions of cooling incubators include B.O.D. test, life cycle testing, shelf-life studies (insect), the culture of plant life, serum incubation studies, general incubation and refrigerated storage of sensitive cultures.

6. BOD Incubator Incubators are designed for conducting biochemical/ biological oxygen demand tests (B.O.D. Test). It is a chemical process that determines how fast biological organisms use up oxygen in a body of water. BOD incubators provide controlled temperature conditions for accelerated tests.

Uses of Incubator

Some of the uses of incubators are given below:

1. Incubators also provide a controlled condition for sample storage before they can be processed in the laboratories.

2. Laboratory incubators provide a controlled, contaminant-free environment for safe, reliable work with cell and tissue cultures under artificial conditions.

3. Microbiological incubators are used for the growth and storage of bacterial culture colonies and the determination of biochemical oxygen demand.

4. Laboratory incubators are essential for cell and tissue culture, biochemical and hematological studies, pharmaceutical work, and food analysis.

5. These are also used for breeding insects and hatching eggs in zoology.

Precautions

The following precautions are to be followed while running an incubator:

1. As microorganisms are susceptible to temperature change, the fluctuations in temperature of the cabinet by repeatedly opening the door should be avoided.

2. The required parameters growth of the organism should be met before the culture plates are placed inside the cabinet.

3. The plates should be placed upside down with the lid at the bottom to prevent the condensation of water onto the media.

4. The inside of the incubators should be cleaned regularly to prevent the organisms from settling on the shelves or the corners of the incubator.

5. While running the incubator for an extended period of time, sterile water should be placed underneath the shelves to prevent the culture media from drying out