Sterilization: is the process of destruction or removal of harmful microorganisms from nonliving objects by chemical or physical methods.

Equipment of sterilization:

1- autoclave.

2 –Incubator.

3- Water bath.

4-Hot air oven.

2-Incubator:

In biology, incubator is a device used to grow and maintain microbiological or cell cultures. The incubator maintains optimal temperature, humidity and other conditions such as the carbon dioxide (CO_2) and oxygen.

Incubators are essential for a lot of experimental work in cell biology, microbiology and molecular biology and are used to culture both bacterial as well as eukaryotic cells.

types and size abound, the sizes ranging from small incubator to room size.The simplest incubators, typically going up to (60 to 65 °C) but some can go slightly higher (generally to no more the 100 °C). Most commonly used temperature both for bacteria such as the frequently used E.coli as well as for mammalian cells is approximately (37°C), as these organisms grow well under such conditions. For other organisms used in biological experiments, such as the budding yeast Saccharomyces cerevisiae, a growth temperature of (30°C) is optimal.

Parts of incubator:

1-Control Panel.

2- Thermostat.

3- Timer.

4- Thermometer.

5-Electric heater .

6-Some units have inner glass doors that permit the contents to be viewed without disrupting the atmosphere of the incubator.

Uses of Laboratory incubators:

A. **Biology applications**, such as

1- cell and tissue cultures

2-molecular biology.

3-microbiology.

4-biochemical and hematological studies.

B. Pharmaceutical and hematological studies.

C. Food analysis .

General types of incubators:

There are many different types of incubators, and the most commonly used are the following:

1-Standard incubators. These incubators can be gravity or fan assisted convection and their range of temperature is from ambient to a maximum of 80°C or 100°C

2- Cooled incubators: These incubators work at temperatures close to or below ambient temperature

3- Humidity incubators: These incubators control both, temperature and humidity, refrigeration system. The humidity is usually obtained from a tray of water which is constantly evaporating.

4-CO_2 (carbon dioxide) incubators: These incubators are widely used in maintenance and growth of Biological samples when it is necessary to maintain a constant pressure with CO_2 concentration in air ranging from 5 – 20%. The level of CO_2 is controlled by a thermal conductivity sensor or infra-red sensor.And digital display of CO_2 pressure monitor.

5- Shaking incubators: These incubators shakes in a temperature controlled atmosphere.

3-Water bath

A water bath is laboratory equipment made from a container filled with heated water. It is used to incubate samples in water at a constant temperature over a long period of time. Most water baths have a digital but some water baths have their temperature controlled by a current passing through a reader. Utilizations include warming of reagents, melting of substrates or incubation of cell cultures. It is also used to enable certain chemical reactions to occur at high temperature.

Parts of water bath :

1- Control panel .

2- Thermostat .

3-Electrical heater .

4-Thermometer.

5-Low water level alarm.

6- Drain valve.

Uses of water bath:

1- Warming of reagents gently and gradually to fixed temperatures

2-keep materials warm over a period of time:

1- melting of substrates .

2- incubation of cell cultures.

3-enable certain chemical reactions to occur at high temperature.

4- heating flammable chemicals instead of an open flame to prevent ignition.

Types of water bath :

1. Circulating Water Bath:

Circulating the water baths are ideal for applications when temperature uniformity and consistency are critical, such as enzymatic and serologic experiments. Water is thoroughly circulated throughout the bath resulting in a more uniform temperature.

2- Non-Circulating Water Baths:

This type of water bath relies primarily on convection instead of water being uniformly heated. Therefore, it is less accurate in

terms of temperature control.

3- Shaking Water Baths:

This type of water bath has extra control for shaking, which moves liquids around. This shaking feature can be turned on or off. In microbiological practices, constant shaking allows liquid-grown cell cultures grown to constantly mix with the air .

4-Hot Air Oven :

is an electrical instrument used for sterilization to kill microorganisms and their spores by hot air. Hence it is dry sterilization unit.

Dry oven:

It is used for sterilization of glassware's, such as test tube, pipettes and petri dishes. Such dry sterilization is done only for glassware's. Liquid substance, such as prepared media and saline solutions cannot be sterilized in oven, as they lose water due to evaporation. They are dried inside the drying oven at 100˚C till the glassware's dry up completely.

Oven structure

1- An insulated cabinet containing heating elements .

2-shelve.

3- circulating fan helps to circulate the air.

4- Electric heater .

5-thermostat .

6-thermometer .

7-Door .

Effective sterilization is done:

a. at 160 ℃ for two hours.

b. at 180 ℃ , for 20 minutes

c. At 120 ℃ . for 8 hours.

Uses of oven:

1-Drying glassware (drying temperature is 70).

a. test tube

b. petri dish

c. beakers

d. flasks

2- Dry and sterilize heat resistant materials (metallic tools like forceps, scissor , etc.

3- To dissolve fat waxes.

Materials should not be sterilized by oven:

1- Labile materials ex. nylon and plastics

2- Inflammable materials ex. Petrolium, paper,

Awareness:

1- don't open the oven immediately when it very hot because it may break or contaminate the operator.

2-Wait until the temperature reach 25 ℃ – 60 ℃

Advantages of Hot air ovens :

a. Moisture is almost negligible.

b. The pressure built up inside is much lesser compared to an autoclave.

c. Safer than autoclaves .

d. hot air ovens are much smaller in size.

e. have equal effectiveness when it comes to sterilization.

f. Temperatures can reach very high levels as in autoclave if it is non-moist.

g. they can sterilize a wider variety of devices and instruments safely.

Disadvantages of Hot air ovens :

the only disadvantage is that a few tough micro-organisms may not be killed in a hot air oven all the time .