Subject: Medical Instrumentations
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Class: Second Class
Academic year: 2023-2024
Lecture: Fourth lecture

➢ Definition the water bath:

A water bath is a laboratory equipment that is used to incubate samples at a constant temperature over a long period of time. Water bath is also used to enable certain chemical reactions to occur at high temperature. Water bath is a preferred heat source for heating flammable chemicals instead of an open flame to prevent ignition. The other areas of its utilizations include warming of reagents, melting of substrates, or incubation of cell cultures.

The water baths are mostly used up to 99.9 °C. When temperature is above 100 °C, alternative methods such as oil bath, silicone bath, or sand bath are preferred. Some water baths have an additional shaking or stirring mechanism that can be set at varying speeds.

➢ The main parts of water bath:

1- Container or tank bath
2- Heater.
3- Thermometer.
4- Thermostat or regulator.
5- Propeller or stirrer device

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1- **Container or Tank Bath:** In the container, the test samples are kept in hot water for a long period of time. The container of a Laboratory Water Bath is made up of insulated metal such as stainless steel.

2- **Heater:** A laboratory water bath contains a Cu50 temperature sensor, which helps to generate heat.

3- **Thermometer:** This helps to check the temperature of the water bath. It can be inbuilt or placed individually.

4- **Thermostat or regulator:** A thermostat helps to maintain the temperature of a water bath at a constant level.

5- **Propeller or stirrer device:** It helps to circulate the water inside the water bath (Found in Circulating water baths).

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➢ Types of Water Baths

1- Circulating water bath.

2- Non-circulating water bath.

3- Shaking water bath

Circulating Water Baths: Circulating 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.

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. In addition, there are add-ons that provide stirring to non- circulating water baths to create more uniform heat transfer.

Shaking Water Baths: This type of water baths has extra control for shaking, which moves liquids around. 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.

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➢ Uses of water bath:

What is the purpose of a water bath?

1- Used to improve the solubility of poorly soluble substances.
2- It used for melting of some substances.
3- It used for warming of chemical reagents.
4- It used for facilitating of some chemical reactions.
5- For incubation of cell cultures.
6- It is used as a heat source for some substance such as flammable chemicals.

➢ Practical application:

1. If the equipment has been stored in cold or humid conditions, condensation may form inside it. Therefore, allow time (at least 2 hours) for the condensation to evaporate before using the equipment.
2. It is not recommended to use water bath with moisture sensitive reactions.
3. Water level should be regularly monitored and filled with distilled water or deionized water. This is required to prevent salts from depositing on the heater.
4. Disinfectants or bactericidal agents can be added to prevent growth of organisms.
5. For the purpose of decontamination the temperature of water bath may be raise to 90°C or higher to once a week for half an hour.
6. If application involves liquids that give out vapors (gases), It is recommended to operate water bath in gas hood or in a well ventilated area

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7. The cover is closed to prevent evaporation and to help reaching high temperatures.
8. Set up on a steady surface away from flammable materials.
9. Change the water regularly and empty when not in use for prolonged periods.
10. Before emptying a bath, allow the water temperature to fall to a safe level
11. Do not use the equipment in an area where there are aggressive or explosive chemical nixtures.

- Do not use the bath to heat any material that could cause a fire or any other kind of hazard.

Other Types Baths:

Oil bath: instead of water, oil is used, such as soybean oil, cottonseed oil, etc. and it can maintain temperature up to 300 degrees Celsius. It can provide more uniform heat compared to other types.

Sand bath: sand is used as a heating substance, in which yellow sand is used where heat transfer of sand is weaker than water and oil.