CHAPTER TEN

Heat and temperature:

Heat:

- Is the type of energy which flows from the hot part to the cool part of a body.

Temperature:

- Is a number which tells us how hot or cold a body is.

Sources of heat:

- The main sources of heat include some natural and sometimes artificial sources. These include:
- Solar energy.
- Fossil fuel.
- Hydroelectric power.
- Nuclear energy.
- Geothermal energy.
- Friction.

Thermometer:

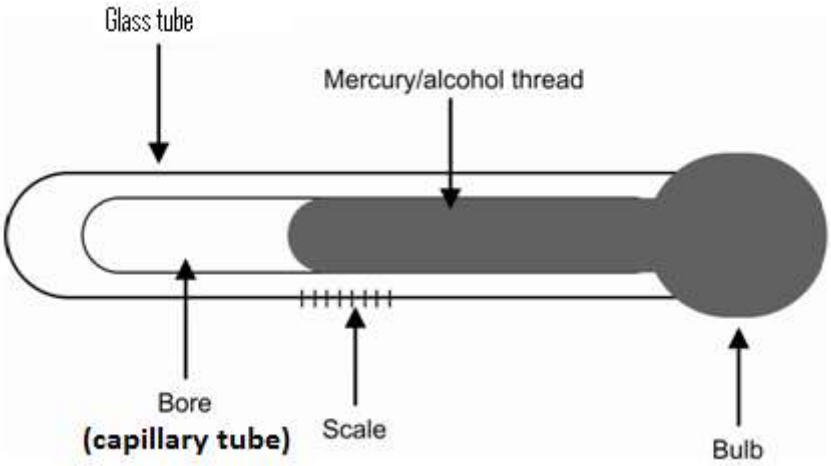
- This is a device used to measure temperature.

Types of thermometers:

(1) Liquid in glass thermometer.
(2) Thermoelectric thermometer.
(3) Platinum resistance thermometer.
(4) Gas thermometer.
(5) Pyrometer.
(6) Digital thermometer.

Liquid in glass thermometers:

- These thermometers contain a liquid and there are two types. These are:
  (a) Mercury thermometer.
  (b) Alcohol thermometer.

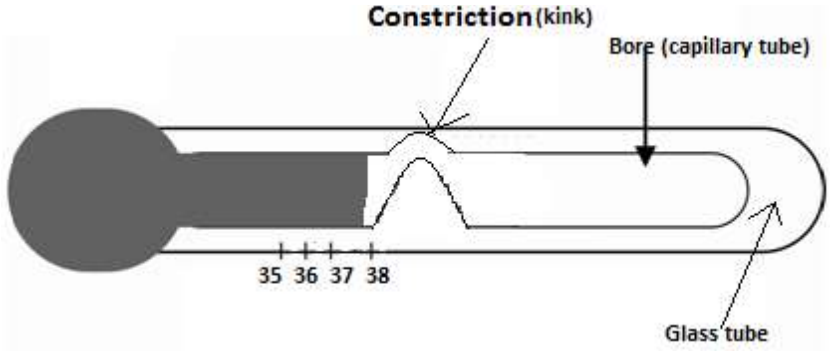


- The liquid in glass thermometer consists of a glass bulb, which contains a liquid, which is capable of rising or falling within a bore due to its expansion and contraction.
- It also has a temperature scale.

How a liquid in glass thermometer works.

- It works on the principle that matter expands when heated and contracts when cooled.
- When the thermometer is brought into contact with a hot body (or when the surrounding is hot), heat moves into the liquid in the thermometer from the hot body or the hot surrounding.
- This causes the liquid to expand and rise in the bore, to indicate a high temperature.
- If the thermometer is brought into contact with a cold body (or brought into a cold environment), heat will move from the liquid within the bulb into the cold body or surrounding.
- The liquid in the bulb becomes cool and contracts, causing the level of mercury or alcohol (alcohol or mercury thread) to fall indicating a low temperature.

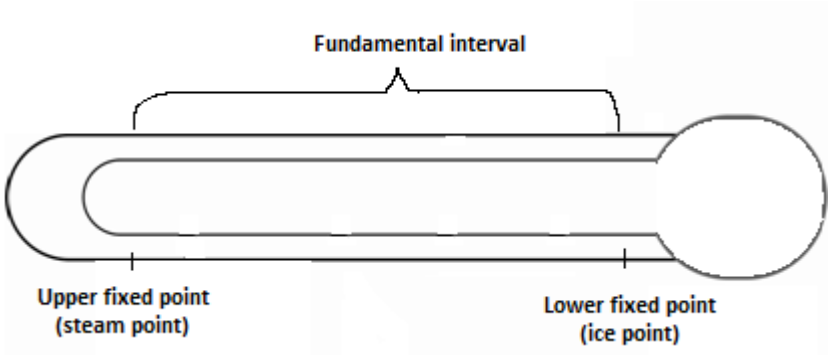
The clinical thermometer:



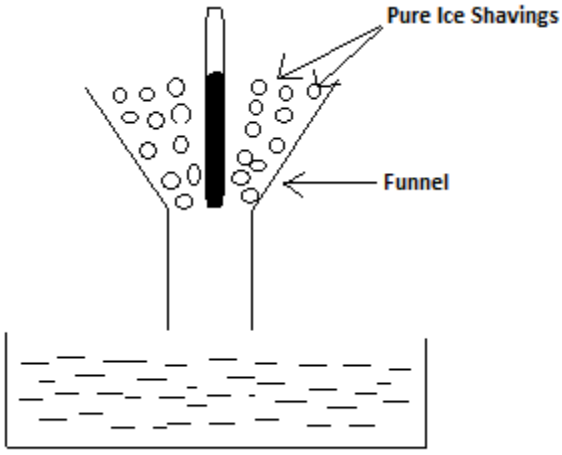
- This is a special type of liquid in glass thermometer, which is designed to measure the temperature of a human being.
- It therefore has a few range of degrees above and below the normal human body temperature.
- It is normally placed beneath the patient tongue or ampit, and left there for at least two minutes.
- When the thermometer is removed from the mouth, the sudden cooling and contraction of the mercury in the bulb causes the thread to break at the constriction.
- This causes the mercury thread to remain in the bore or stem, and the temperature can be read at leisure.
- Before it is used again, the mercury in the stem or bore must be returned to the bulb by shaking.
- The average body temperature of a healthy person is about 37^0C.

The calibration or graduation of a thermometer (liquid in glass):

- After the construction of a new thermometer, we have to calibrate or graduate it.
- To graduate or calibrate a thermometer, we must choose two fixed points and these are the upper and the lower fixed points.
- The upper fixed point is the temperature of steam from boiling water, when the pressure of the atmosphere is 760 mmHg.
- The lower fixed point is the temperature of pure melting ice. After the detection and the marking of these two fixed points, the distance between them called the fundamental interval is divided into a number of equal parts or degrees.



Determination of the lower fixed point (ice point):



- To determine the lower fixed point of an un-graduated thermometer, the thermometer is pushed into pure ice shavings.
- The alcohol or mercury thread in the bore or stem starts to fall.
- At a particular point, the thread stops falling and remains steady.
- This point is marked as the lower fixed point.