Temperature and Its Measurement

Introduction to Temperature

Temperature is a measure of the hotness or coldness of a body.

It is a fundamental physical quantity used in science and daily life.

The SI unit of temperature is Kelvin (K).

Other commonly used units include:

- Degree Celsius (°C)
- Degree Fahrenheit (°F)

Thermometers and Their Functioning

A thermometer is an instrument used to measure temperature.

It works based on the principle that liquids expand when heated and contract when cooled.

Different substances are used in thermometers, such as:

- **Mercury**
- **Alcohol (in older designs)**

Mercury is commonly used because it has a wide temperature range and does not stick to glass.

Due to the toxicity of mercury, digital thermometers are now preferred as they do not contain mercury.

Structure of a Thermometer

A thermometer generally consists of:

i. **Capillary Tube**: A thin, narrow tube inside the thermometer.

ii. **Bulb**: A small reservoir at the bottom filled with mercury or other liquids.

iii. **Glass Stem**: A protective outer casing with a temperature scale.

iv. **Temperature Scale**: Marked in Celsius, Fahrenheit, or both.

When the bulb is exposed to heat, the liquid expands and rises in the capillary tube.

The reading is taken at the level of the liquid column.

Types of Thermometers

Laboratory Thermometer

Used for measuring the temperature of substances in experiments.

Commonly ranges from 10°C to 110°C.

Features:

- Uniform bore for accurate readings.
- A glass stem with an etched temperature scale.

Precautions:

- Wash before and after use.
- Handle carefully to prevent breakage.
- Keep upright while taking readings.
- Ensure the bulb is fully surrounded by the substance being measured.
- Read at eye level to avoid errors.

Clinical Thermometer (Doctor's Thermometer)

Used to measure human body temperature.

Ranges from 35°C to 42°C.

Contains a **kink** (or constriction) in the capillary tube, preventing mercury from falling back after removal.

Used by placing under the tongue or in the armpit.

Features:

- Mercury thread visible inside the thermometer tube.
- Glass bulb containing mercury at one end.
- A narrow bore in the tube for precise readings.

Precautions:

- Clean with antiseptic before and after use.
- Ensure the mercury level is below 35°C before use.
- Read the thermometer at eye level.
- Do not sterilize in boiling water (may cause breakage).

Digital Thermometers

- Work using electronic sensors instead of mercury.
- Provide faster and safer readings.
- Can be used orally, rectally, or under the arm.
- Display results on a digital screen.

Comparison of Thermometer Types

Type	Usage	Temperature Range	Special Feature
Laboratory Thermometer	Experiments	10°C - 110°C	Requires upright position
Clinical Thermometer	Human body	35°C - 42°C	Kink prevents quick mercury drop
Digital Thermometer	General use	Varies	Mercury-free, instant reading

Conclusion

Thermometers play a crucial role in science, medicine, and daily life.

Traditional mercury thermometers are being replaced by safer digital versions.

Understanding how they work and proper handling ensures accurate temperature measurement.