06 TEMPERATURE AND ITS MEASUREMENT

In this chapter, we will learn about:

- Temperature
- Common scales of temperature
- Measurement of temperature
- Safety measures in using thermometers

When your mother is cooking bread for you and you touch the bread, how does it feel? It feels hot. Again when you are eating an ice cream, how do you feel the ice cream? It feels cold. To describe how much hot or cold a thing is, scientists use the term "Temperature". A hot body is at high temperature and a cold body is at low temperature.

Temperature of a body indicates how hot or cold the body is.

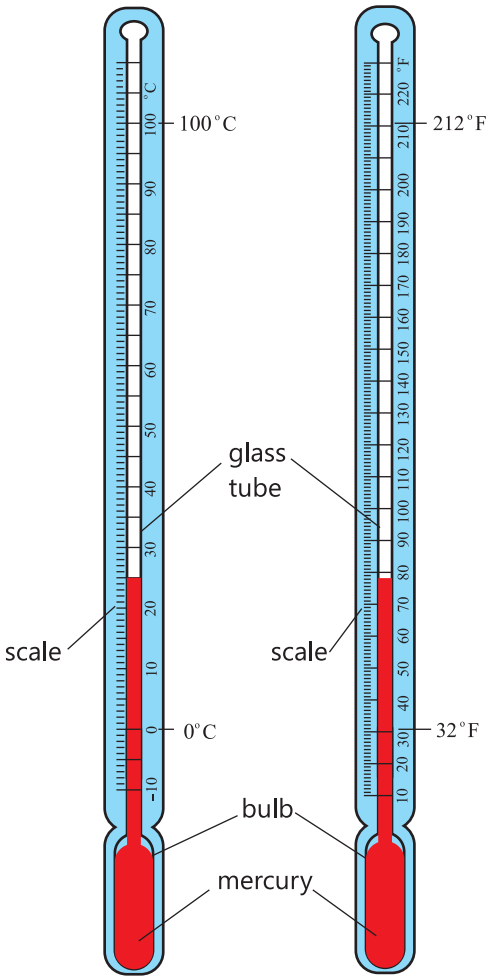
We can guess the temperature of a body by touching it. But this is not an accurate and safe method for measuring temperature. In order to measure temperature accurately and safely at home or at school laboratory, we use an instrument called **Thermometer.**

Thermometer is an instrument which measures the temperature accurately and safely.

LABORATORY THERMOMETER

Figure 6.1 shows a laboratory thermometer. A laboratory thermometer consists of a thick-walled glass tube having a narrow bore in it. There is a glass bulb at lower end of the tube and its upper end is closed. The bulb is filled with a liquid metal called **mercury**.

When bulb of the thermometer touches a hot body, the mercury in the bulb expands and rises up in the tube. In this way the thermometer shows a high temperature. But when the bulb of the thermometer touches a cold body, the mercury contracts and comes down in the tube and the thermometer shows a low temperature.



Centigrade or Celsius thermometer | Fahrenheit thermometer

Figure 6.1

TEMPERATURE SCALES

The numbers written on the thermometer show the degree of hotness or coldness of a body. These numbers are called **Temperature Scale**. Now-a-days, two types of temperature scales are used. The most commonly used scale is the **Celsius or Centigrade** scale. The other scale is the **Fahrenheit** scale. We shall learn about these scales from the following activity.

? Do you know?

A Celsius degree is larger than a Fahrenheit degree.

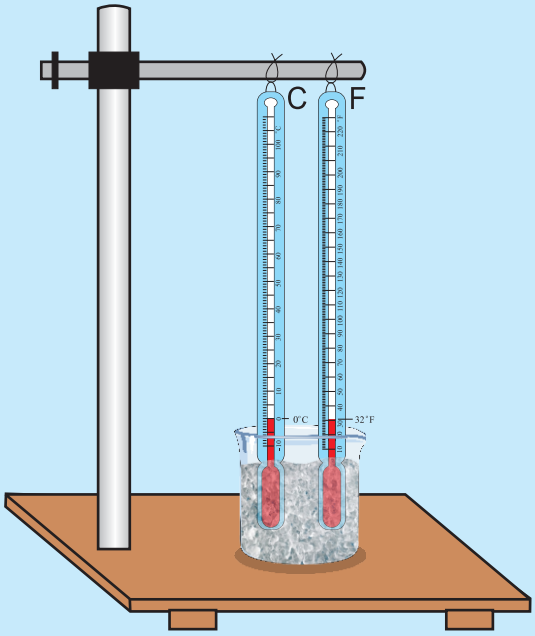
Activity 6.1

Material and Apparatus

A Celsius scale thermometer marked C, a Fahrenheit scale thermometer marked F, crushed ice, beaker, iron stand, thread

Procedure

- Put the crushed ice into the beaker.
- Suspend both thermometers in the beaker as shown in the figure.
- Carefully observe the mercury in the two thermometers. In which direction is the mercury moving?
- Note the point on both the thermometers where mercury stops falling.



On thermometer C _____

On thermometer F _____

From activity 6.1, we have seen that on one thermometer, temperature of melting ice is 0 °C. This scale is called Celsius or Centigrade scale. The other thermometer shows melting point of ice as 32 °F. This scale is called Fahrenheit scale.

For Your Information

- °C stands for degree centigrade.
- °F stands for degree Fahrenheit.

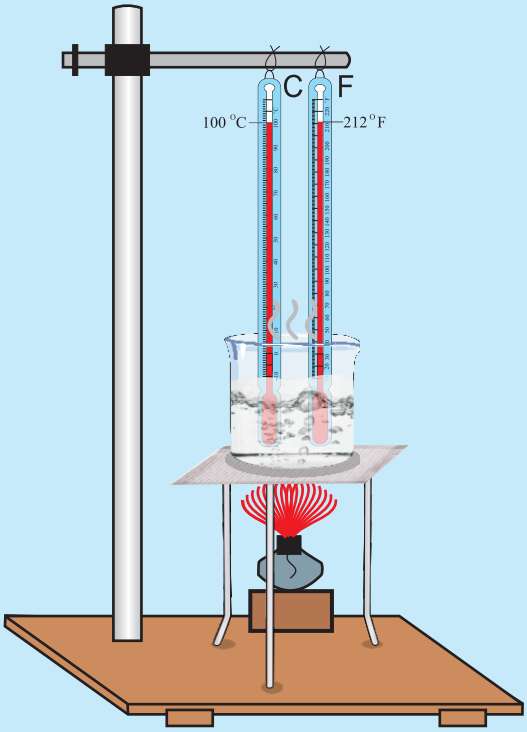
DEMONSTRATION (to be performed by the teacher)

Material and Apparatus

Beaker, water, Celsius scale thermometer, Fahrenheit scale thermometer, tripod stand, wire gauze, spirit lamp

Procedure

- Fill the beaker half with water and place it on the tripod stand.
- Suspend both the thermometers into the beaker as shown in the figure.
- Heat the water in the beaker with the help of spirit lamp.
- Ask the students to note the temperature on both thermometers when water is boiling.



Brain Teaser

A person puts a thermometer into a pot of water to see how hot it is. The thermometer reads 132, but the water is not boiling yet. Which temperature scale is the thermometer measuring?

(a) Celsius (b) Fahrenheit

For Your Information

Temperature in Celsius (°C)	Temperature in Fahrenheit (°F)	Comments
100	212	Water boils
0	32	Water freezes
-40	-40	Fahrenheit equals Celsius
25	80	Room temperature

CLINICAL THERMOMETER

A clinical thermometer is used for measuring the temperature of the human body. Its glass tube is marked in centigrade scale from 35 to 42 °C and in Fahrenheit scale from 95 to 110 °F (Figure 6.2). A clinical

Do you know?

The normal temperature of a healthy human body is 37 °C or 98.6 °F.

thermometer has a small range. This is because the human body temperature cannot be below or above this range.

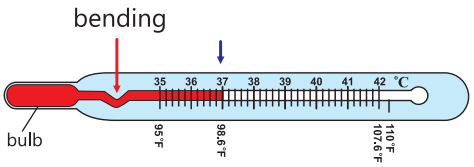


Figure 6.2: Clinical thermometer

A clinical thermometer has a small bending in the narrow bore just above the mercury bulb. When we put the thermometer in the armpit of the patient, mercury rises up in the bore due to high temperature (Figure 6.3). When we remove the thermometer from the armpit of the patient, mercury contracts on cooling. The small bending in the bore prevents the fall of mercury into the bulb. Therefore the mercury level does not change and we can get correct reading of body temperature. However, to use the thermometer again, we give it jerks to bring down the mercury back into the bulb.

Figure 6.3: Measuring body temperature

i For Your Information

Mercury is poisonous, and there is a danger of breakage of the thermometer, therefore, never put the thermometer into the mouth of a patient.

SAFETY MEASURES IN USING THERMOMETERS

Take the following safety measures while using thermometers:

1. keep the thermometer upright while measuring the temperature.
2. mercury is harmful to health, therefore, in case of breakage of a thermometer, do not touch it with hands.
3. do not touch the bulb of a clinical thermometer with fingers. It should be cleaned with spirit and water before use on another patient.
4. after using a clinical thermometer, it should be cleaned, disinfected and placed in an appropriate container for storage.
5. do not keep a clinical thermometer below 0 °C and above 50 °C.
6. do not put the clinical thermometer into hot water. It may burst and injure the user or the person nearby.

Things to do

1. Suspend a Centigrade thermometer and a Fahrenheit thermometer first in the sunshine and then in the shade and note the temperature of air.
2. Measure the temperature of tap water using Centigrade and Fahrenheit thermometers.
3. Measure your temperature and the temperature of five of your friends, with a clinical thermometer.

KEY POINTS

- The degree of hotness or coldness of the body is called its temperature.
- An instrument used to measure the temperature of an object is called a thermometer.
- On Celsius scale, water freezes at 0 °C and boils at 100 °C.
- On Fahrenheit scale, water freezes at 32 °F and boils at 212 °F.
- A clinical thermometer is used to measure the temperature of a human body.
- A clinical thermometer has a bend just above the bulb which prevents the fall of mercury back to the bulb.

GLOSSARY

Temperature: Degree of hotness or coldness

Thermometer: An instrument used for measuring temperature

Celsius scale: A scale on which temperature between melting point of ice and boiling point of water is divided into 100 equal parts

Fahrenheit scale: A scale on which temperature between melting point of ice and boiling point of water is divided into 180 equal parts

EXERCISE

6.1 Encircle the correct option.

(i) Temperature means:

(a) how high or low something is

(b) how hot or cold something is

(c) how fast or slow something is

(d) how the weather changes

(ii) With increase in temperature, mercury in thermometer will:

(a) increase (b) decrease

(c) fall (d) rise

(iii) The temperature at which a solid changes into a liquid is called:

(a) melting point (b) ice point

(c) boiling point (d) fixed point

(iv) Celsius scale is also called :

(a) Fahrenheit scale (b) Centigrade scale

(c) Absolute scale (d) Kelvin scale

(v) The difference in temperature between melting point of ice and boiling point of water on Centigrade scale is:

(a) 180 (b) 100 (c) 37 (d) 98.6

(vi) On Fahrenheit scale, water boils at:

(a) 32 degree (b) 100 degree

(c) 180 degree (d) 212 degree

(vii) Normal human body temperature on Fahrenheit scale is:

(a) 37 degree (b) 42 degree

(c) 95 degree (d) 98.6 degree

6.2 Choose the correct word from the word bank for each of the following:

clinical thermometer **temperature** **melting point of ice**
bending **ice** **boiling point of water** **mercury**

(i) Solid form of water _____

(ii) 0 °C of ice _____

(iii) 212 °F for water _____

(iv) Stops mercury to fall in clinical thermometer _____

(v) Degree of hotness or coldness _____

(vi) Thermometer measures human body temperature _____

(vii) Liquid metal filled in thermometer _____

6.3 Answer these questions.

(i) What is temperature? State the scales used to measure temperature.

(ii) Sketch a laboratory thermometer and label its important parts.

(iii) Sketch a clinical thermometer.

(iv) State at least three features of a clinical thermometer.

(v) Write three differences between laboratory thermometer and clinical thermometer.

(vi) What are the precautions needed while using a clinical thermometer?