# (Olympiad Champs Notes)

## **Measurement Temperature**

## **Real-Life Example**

We use thermometers at our home to check the temperature of our bodies during fever. We place the thermometer either in the mouth or under the arm-pits to measure the body temperature.

## **Amazing Facts**

- An interesting temperature related fact is that Fahrenheit and Celsius are equal at -40 degress.
- The hottest temperature ever recorded on Earth is  $57.8^{\circ}C$  ( $136^{\circ}F$ ), recorded in Al 'Azizyah, Libya on September 13, 1922.
- The coldest temperature ever recorded on Earth is -89.2  ${}^{\circ}C$  (-128.6  ${}^{\circ}F$  ), recorded at Vostro Station, Antarctica on July 21, 1983.

## **LEARNING OBJECTIVES**

## This lesson will help you to:—

- Understand the concept of temperature.
- Learn and study about various measuring scales of temperature.
- Study and learn about the conversion from one scale to another.

## QUICK CONCEPT REVIEW

#### TEMPERATURE

- It is the degree of hotness or coldness of a body or, environment.
- Temperature is measured in units called degrees. There are a few different temperature scales, including degrees Fahrenheit and degrees Celsius represented as  ${}^{o}F$  and  ${}^{o}C$  respectively.
- Temperature is measured using a thermometer.
- When you boil water, it measures  $100^{\circ}$  in Celsius, but  $212^{\circ}$  in Fahrenheit.
- When you freeze water, it measures  $0^0$  in Celsius, but  $32^0$  in Fahrenheit.
- So the difference between freezing and boiling is  $100^{\circ}$  in Celsius, but  $180^{\circ}$  in Fahrenheit:
- The temperature of our bodies is about  $37^{\circ}C$  or  $98.6^{\circ}F$ .

#### **Historical preview**

- One of the early scientists to start developing a way of measuring temperature was Galileo Galilei. These devices were called "thermoscopes" because they did not actually have a scale which measured temperature. However, records from this time period do allow scientists to records from this time period do allow scientists to reconstruct world temperatures much more accurately. Galileo invented the first documented thermometer in about 1592.
- By the early 18th century, as many as 35 different temperature scales had been devised.

Misconcept / concept

- Misconnect: All liquids boil at  $100^{\circ}C(212^{\circ}F)$  and freeze at  $0^{\circ}C(32^{\circ}F)$ .
- Concept: Not all liquids boil at  $100^{\circ}C$  and freeze at  $0^{\circ}C$ . This is the melting and freezing point of water only. Each and every liquid has different properties and thus melt and freeze at different temperatures.



**Temperature Conversion** 

By looking at the diagram, it can be seen that:

- The scales start at a different number (0 v/s 32), so we will need to add or subtract 32.
- The scales rise at a different rate (100 v/s 180), so we will also need to multiply.

#### And this is how it works out:

To convert from Celsius to Fahrenheit, first multiply by 180/100, then add 32

✤ To convert from Fahrenheit to Celsius, first subtract 32, then multiply by 100/180

Note: 180/100 can be simplified to 9/5, and likewise 100/180=5/9, so this is the easiest way:  ${}^{0}C$  to  ${}^{0}F$  multiply by 9, then divide by 5, then add 32

<sup>o</sup> *F* to <sup>o</sup> *C* Deduct 32, then multiply by 5, then divide by 9 Celsius to Fahrenheit  $({}^{0}C \times 9/5) + 32 = {}^{0}F$  Fahrenheit to Celsius  $({}^{0}F-32) \times 5/9 = {}^{0}C$ 

#### THERMOMETER

 We can use a thermometer to measure the temperature. Today, thermometers no longer contain mercury due to potential health risks; they are filled

Shortcut to Problem Solving

To remember 9/5 for  ${}^{0}C$  to  ${}^{0}F$  think "F is greater than C, so there are more  ${}^{0}F$  than  ${}^{0}C$  "with a combination of mineral spirits or alcohol mixed with red dye. In these thermometers, the red liquid rises and falls as it gets hotter or cooler. The hotter the temperature, the higher the liquid climbs up the thermometer. The lower the temperature, the lower it goes down 'the thermometer.

- Certain thermometers are made of glass, so they should handle them carefully to avoid breaking.
  On some thermometers, the numbers go up by ten, while on others they go up by five.
- To find the temperature, look at where the special liquid stops along the number line. On some thermometers the marks need to be skip-counted by twos, while on others they are simply counted by ones.

#### SCOPE OF MEASURING TEMPERATURE

- We use thermometers to measure the temperature outside and inside, and to check the temperatures of our bodies.
- We set the temperature on ovens and measure the temperature of food.