Chapter 5. Heat: Thermometry

PAGE NO: 209

Solution 1:
Temperature is the quantity that tells about the thermal state of a body i.e. the degree of hotness or coldness of a body.

Solution 2:
Thermometer is used for measuring the temperature of a body.

Solution 3:
Thermometer works on the principal that substances expand when heated and contract on cooling.

Solution 4:
Range of thermometer is the range of temperature which can be measured by thermometer.

Solution 5:
Mercury is the liquid used in a clinical thermometer

Solution 6:
The usual range of temperature marked on clinical thermometer is 95° F to 110°F.

Solution 7:
Fahrenheit designed the first thermometer.

Solution 8:
Before constructing a thermometer, we determine lower fixed point and upper fixed point and divide the whole range of thermometer into specific number of equal divisions to provide a scale for measuring the temperatures within a range.

Solution 9:
The clinical thermometer is specially designed thermometer used to measure the temperature of a human body easily and as accurately as possible.

Solution 10:
Three properties of a liquid which make it suitable to be used in a thermometer are:

- The substance should have high coefficient of expansion so that it is sensitive to the smallest change in temperature
- The substance should have uniform expansion all over its entire volume
- The substance should have minimum specific heat so that it absorbs minimum heat from the body under measurement.

Solution 11:
Two disadvantages of using mercury as a thermometric liquid:

- It does not have uniform expansion.

- Mercury is less sensitive than alcohol as its coefficient of expansion is less than alcohol.

Solution 12:
Three advantages of using mercury as a thermometric liquid:

- Mercury is good conductors of heat.
- Mercury have high coefficient of expansion thus is sensitive to the smallest change in temperature.
- Freezing points is very low and boiling point is high.

Solution 13:
Water is not used as a thermometric liquid because it has low coefficient of expansion so it is less sensitive to temperature changes. Moreover, it is transparent thus making it difficult to read the thermometer and water evaporates with time thus producing error and also the freezing and boiling points are also low.

Solution 14:
Temperature in Kelvin To K = Temperature in Celsius To C + 273.
To K = 0°C + 273
To K =273 K.

Solution 15:
Body temperature of a healthy person is 98.4oF.
We know C/100 = (F – 32)/180.
C =5/9(F- 32)
C = 5/9(98.4 – 32)
C = 5/9 x 66.4
C =36.88°C
Temperature of body of healthy man is 36.88°C.

Solution 16:
Absolute scale of temperature is Kelvin scale.
Conversion of temperature from Celsius to Kelvin scale is
Temperature in Kelvin To K = Temperature in Celsius To C + 273.
So a rise of temperature of 1°C in Celsius scale is equal to rise of 1°K in Kelvin scale.

Solution 17:
Kelvin temperature scale is used in SI system.

Solution 18:
In Celsius scale there are two fixed points namely lower fixed point and upper fixed point at 0°C and 100°C respectively. This range is divided into 100 equal divisions and each part gives 1°C.

Solution 19:
We know C/100 = (F – 32)/180.
C =5/9(F- 32)
9/5 C + 32 =F
F = 9/5 C + 32.
Temperature given in Celsius = -15°C.
F = 9/5 x (-15) +32

F = -27 +32
F = 5°F.

Solution 20:
Absolute zero of temperature is 0°K.
Temperature in Kelvin To K = Temperature in Celsius To C + 273.
0°K = To C +273.
To C = -273°C.
Absolute zero of temperature on Celsius scale is -273°C.

Solution 21:
Difference of temperature of two bodies in Celsius scale = 1°C.
We know C/100 = (F – 32)/180.
C =5/9(F- 32)
9/5 C + 32 =F
F = 9/5 C + 32.
So, difference of 1° in Celsius scale is equal to the difference of 9/5° in Fahrenheit scale.
Thus, Difference of 1°C of temperature of two bodies in Celsius scale is equal to difference of 1.8° in Fahrenheit scale.

Solution 22:
Celsius invented the Celsius scale of temperature.

Solution 23:
Fahrenheit invented the Fahrenheit scale of temperature.

Solution 24:
Mercury, alcohol are commonly used in thermometers.

PAGE NO : 210

Solution 25:
Camel and are two animals which are able to increase their body temperature in summers and decrease their body temperature in winters.

Solution 26:
CGS unit of heat is Joule denoted by J.
1 J is amount of heat required to raise the temperature of a body by 1/4.12°C of temperature.

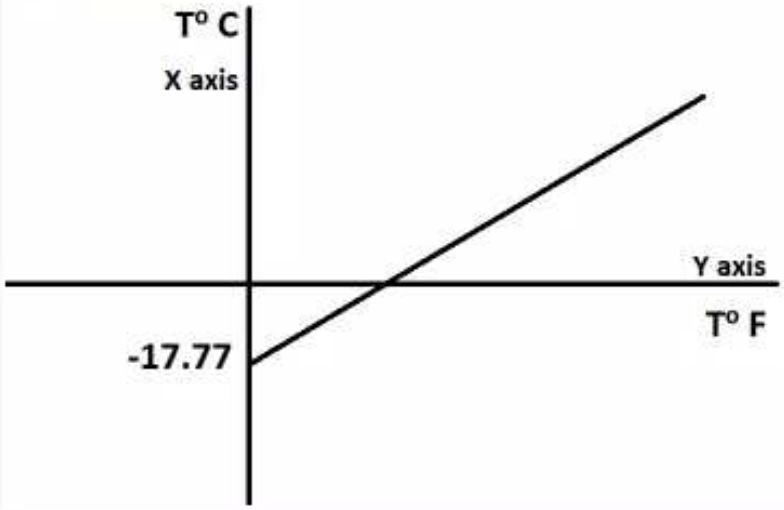
Solution 27:

We know C/100 = (F – 32)/180.

C =5/9(F- 32)

C = 5/9F – 17.77.

Graph between T° C and T° F is straight line having slope of 5/9 and intercept on Y axis is -17.77.



Solution 28:

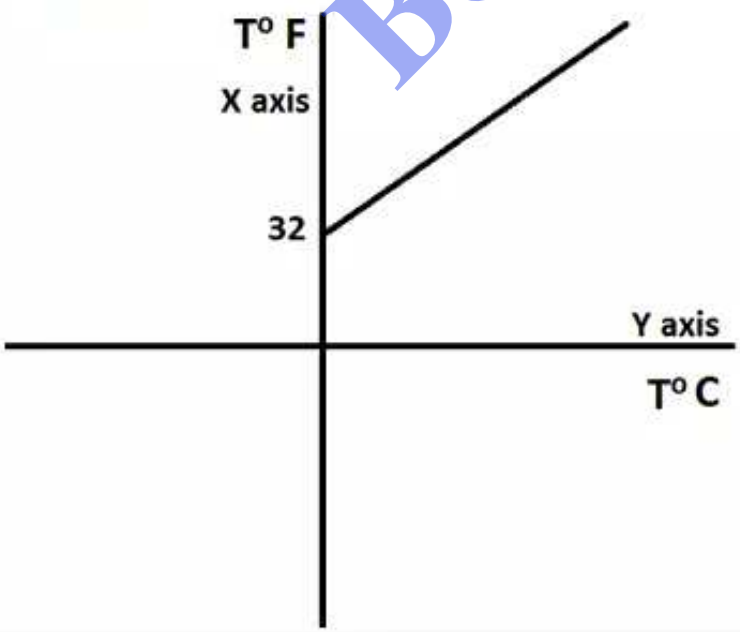
We know C/100 = (F – 32)/180.

C =5/9(F- 32)

9/5C + 32 =F

F = 9/5C + 32.

Graph between T° F and T° C is straight line having slope of 9/5 and intercept on Y axis is 32.



Solution 29:
Relation between Celsius and Fahrenheit scales of temperature is
C/100 = (F – 32)/180.

Solution 30:
Temperature of ice point on Fahrenheit scale =32°F.
Temperature of steam point on Fahrenheit scale =212°