

Board – ICSE

Class – 9th

Topic – Heat

1. Express 350 °C into Fahrenheit scale.

Ans. $\therefore F = \frac{9}{5} C + 32.$
 $= \frac{9}{5} \times 350 + 32 = 662 \text{ }^\circ\text{F}.$

2. Express -250 °C into Fahrenheit scale.

Ans. $\frac{F - 32}{9} = \frac{C}{5}$
 $\therefore F = \frac{9}{5} C + 32 = \frac{9}{5}(-250) + 32 = -450 + 32 = -418 \text{ }^\circ\text{F}.$

3. Express 112 °F into Celsius scale

Ans. Temperature in Fahrenheit scale = 112° F.

$$\therefore \frac{C}{5} = \frac{F - 32}{9}$$
$$\therefore C = \frac{5}{9}(F - 32) = \frac{5}{9}(112 - 32) = \frac{5}{9} \times 80 = 44.44^\circ\text{C}.$$

4. Express - 58 °F into Celsius scale.

Ans. Temperature in Fahrenheit scale = - 58 °F

$$\therefore \text{Temp. in Celsius, } C = \frac{5}{9}(F - 32) = \frac{5}{9}(-58 - 32) = \frac{5}{9} \times (-90) = -50 \text{ }^\circ\text{C}.$$

5. The temperature of human body rises by 1 °C. Calculate the corresponding rise in temperature on Fahrenheit scale.

Ans. Degrees between standard points on Celsius scale = (100 - 0) = 100

Degrees between standard points on Fahrenheit scale = 212 - 32 = 180.

Now, 100 °C = 180 °F

$$\therefore 1 \text{ }^\circ\text{C} = \frac{180}{100} = 1.8 \text{ }^\circ\text{F}.$$

6. The average temperature of human body is 98.6 °F, Calculate the equivalent temperature in Celsius scale.

Ans. Temperature in Celsius scale $C = \frac{5}{9}(F - 32)$

$$\frac{5}{9}(98.6 - 32) = \frac{5}{9} \times 66.6 = 37 \text{ }^\circ\text{C}.$$

7. The mercury thread rises by $\frac{3}{5}$ parts between the standard points on Celsius scale when the bulb of thermometer is placed in hot water. Calculate the temperature
 (a) in Celsius scale
 (b) Fahrenheit scale.

Ans. (a) Number of divisions between standard points on Celsius scale

$$= 100 \cdot \frac{3}{5} \text{ of Celsius scale}$$

$$= \frac{3}{5} \times 100 \text{ }^\circ\text{C} = 60 \text{ }^\circ\text{C}$$

(b) \therefore Temp. on Fahrenheit scale,

$$F = \frac{9}{5} C + 32 = \frac{9}{5} \times 60 + 32 = 108 + 32 = 140 \text{ }^\circ\text{F.}$$

8. Mercury thread falls by $\frac{9}{16}$ parts between two standard points on Celsius scale when boiling water at $100 \text{ }^\circ\text{C}$ is allowed to cool.

Calculate the temperature in (a) Celsius scale (b) Fahrenheit scale.

Ans. (a) Number of divisions between standard points on Celsius scale = 100.

$$\therefore \frac{9}{16} \text{ of Celsius scale} = \frac{9}{16} = 56.25 \text{ }^\circ\text{C}$$

$$\therefore \text{Fall in temperature} = 56.25 \text{ }^\circ\text{C}$$

$$\therefore \text{Temperature on Celsius scale} = 100 - 56.25 = 43.75 \text{ }^\circ\text{C.}$$

(b) Temperature on Fahrenheit scale,

$$F = \frac{9}{5} C + 32 = \frac{9}{5} \times 43.75 + 32 = 78.75 + 32 = 110.75 \text{ }^\circ\text{F.}$$

8. State three differences between heat and temperature.

Ans. Heat is the sum total of potential and kinetic energies of all the molecules of a substance, whereas temperature is the average kinetic energy of all the molecules of a substance.

Heat is energy and is measured in joules, whereas temperature is degree of hotness and is measured in degrees on a suitable scale.

The amount of heat in a body depends upon the number of molecules, whereas temperature of a body depends upon its average kinetic energy of molecules.

9. State two advantages of alcohol thermometer over mercury thermometer.

Ans. (i) Expansion of alcohol is fairly large for one degree Celsius rise in temperature as compared to mercury. Thus, fractional divisions of a degree are possible.

(ii) It does not freeze up to $-100 \text{ }^\circ\text{C}$. Thus, it can be used to record very low temperature.

10. Answer the following:

(a) Draw a neat labelled diagram for clinical thermometer.

(b) Answer the following questions regarding clinical thermometer.

(i) Why is its stem thin and short?

(ii) Why its stem is made triangular?

Head Office: 106-107-108 Lake Homes Shopping Complex, Chandivali IRB Road, Mumbai 400076

T.: 022 4120 3067 | E.: info@speedlabs.in

- (iii) Why is the scale on it marked from 95°F to 110°F?
- (iv) Why is its capillary tube provided with constriction?
- (v) Why its bulb is made fairly large?
- (vi) Why this thermometer is washed with water and jerked before use?
- (vii) What does it indicate when temperature recorded by it

- (a) Below 98.4°F
- (b) Above 98.4 °F.

Ans.- (a) Diagram is given below.

(b)

(i) The stem is made short as it is a specialised thermometer which records temperature between 95 °F to 110 °F or 35°C to 43 °C. The stem is made thin so that it can easily fit in mouth cavity.

(ii) Total internal reflection takes place in triangular stem, Thus, a thin thread of mercury in the capillary tube appears as a broad band and hence the temperature can be easily read.

(iii) It is because temperature of human body does not fall below 95 °F or rise above 110°F as in either case death occurs. Thus, in order to keep thermometer sensitive, its stem is marked between 95 °F to 110 °F.

(iv) The constriction in capillary tube does not allow the mercury to flow back into bulb, when thermometer is taken out from the mouth of patient. Thus, it helps in recording accurate temperature of the patient.

(v) Larger the bulb, more is the amount of mercury in it and hence more is the expansion of mercury for 1°C rise in temperature. As the expansion of mercury increases per degree rise in temperature, therefore divisions on the stem can be marked far apart. This helps in making thermometer sensitive.

(vi) It is washed with water to remove any germs or bacteria sticking to it. It is jerked so that mercury flows back to bulb and thermometer is ready for use.

(vii) If the temperature recorded is below 98.4 °F then person is considered to be suffering from some kind of weakness. If the temperature is above 98.4 °F then person is suffering from fever.

11. The mercury thread rises by $\frac{3}{5}$ parts between the standard points on Celsius scale when the bulb of thermometer is placed in hot water. Calculate the temperature

- (a) In Celsius scale
- (b) Fahrenheit scale.

Ans.- (a) Number of divisions between standard points on Celsius scale
 $= 100 \cdot \frac{3}{5}$ of Celsius scale $= \frac{3}{5} \times 100^\circ\text{C} = 60^\circ\text{C}$.

(b) ∴ Temp. on Fahrenheit scale, $F = \frac{9}{5} C + 32 = \frac{9}{5} \times 60 + 32 = 108 + 32 = 140^\circ\text{F}$.

12. Describe an experiment to prove that solids expand on heating ?

Ans.- Take Gravesend's ring and ball apparatus. Check that ball passes through ring at room temperature. Heat the ball strongly on a flame for five minutes and try to pass the ball through ring. It is observed that ball does not pass through ring. Thus, experiment proves that solids expand on heating.

13. The diagram shows a bimetallic strip as used in a simple fire alarm.

(a) Name suitable materials for A and B.

(b) What adjustments would you make to the arrangement shown, to make the alarm operate at lower temperature?

Give reasons for your answer.

Ans.- (a) A is invar and B is brass.

(b) The contact points are brought closer to one another.

This makes the bimetallic strip to make contact at lower temperature and hence, bell starts ringing.