Chapter 7: Temperature and its Measurement

Exercises — Let Us Enhance Our Learning

Q1 The normal temperature of a healthy human being is close to ___.
(i) 98.6 °C
(ii) 37.0 °C
(iii) 32.0 °C
(iv) 27.0 °C

SOLUTION

The chapter states: 'The normal temperature of a healthy human adult is taken to be 37.0 °C or 98.6 °F.'
98.6 °C would be far above boiling water — clearly impossible for a living body.
37.0 °C is the standard accepted normal human body temperature on the Celsius scale.

Answer: (ii) 37.0 °C

Q2 37 °C is the same temperature as ___.
(i) 97.4 °F
(ii) 97.6 °F
(iii) 98.4 °F
(iv) 98.6 °F

SOLUTION

The chapter explicitly states: 'A temperature measured as 37.0 °C on Celsius scale is equivalent to 98.6 °F on Fahrenheit scale.'
Therefore, 37 °C = 98.6 °F.

Answer: (iv) 98.6 °F

Q3 Fill in the blanks:
(i) The hotness or coldness of a system is determined by its ___.
(ii) The temperature of ice-cold water cannot be measured by a ___ thermometer.
(iii) The unit of temperature is degree ___.

SOLUTION

(i) Temperature tells us how hot or cold a body is — as stated in Section 7.2: 'A reliable measure of hotness (or coldness) of a body is its temperature.'
(ii) The chapter notes that boiling water and ice temperatures are outside the range of a clinical thermometer. Ice-cold water is below the lower limit of a clinical thermometer (which measures body temperature, typically 35–42 °C).
(iii) The Celsius scale uses degree Celsius (°C) as its unit; this is the scale used in most of the chapter's examples.

Answer: (i) temperature; (ii) clinical; (iii) Celsius

Q4 The range of a laboratory thermometer is usually ___.
(i) 10 °C to 100 °C
(ii) –10 °C to 110 °C
(iii) 32 °C to 45 °C
(iv) 35 °C to 42 °C

SOLUTION

The chapter states in Activity 7.3: 'Its range is from –10 °C to 110 °C.'
The Summary also confirms: 'Laboratory thermometers typically have a temperature range from –10 °C to 110 °C.'

Answer: (ii) –10 °C to 110 °C

Q5 Four students used a laboratory thermometer to measure the temperature of water as shown in Fig. 7.6. Who do you think followed the correct way for measuring temperature?
(i) Student 1
(ii) Student 2
(iii) Student 3
(iv) Student 4

SOLUTION

Correct method: hold the thermometer vertically, keep the bulb fully immersed in

the water without touching the bottom or sides of the beaker.
Student 1 holds it tilted with the bulb on the bottom — wrong.
Student 2 holds it vertical but the bulb rests on the bottom of the beaker — wrong.
Student 3 holds it vertical with the bulb immersed in the water and clear of the bottom — correct.
Student 4 holds it vertical but the bulb touches the bottom of the beaker — wrong.

Answer: (iii) Student 3 — the thermometer is held vertically with the bulb fully immersed in the water and not touching the bottom or sides of the beaker.

Q6 Colour to show the red column on the drawings of thermometers (Fig. 7.7) as per the temperatures written below: 14 °C, 17 °C, 7.5 °C.

SOLUTION

Each thermometer in Fig. 7.7 has the same scale: marked from -10 °C to above 30 °C, with a small division every 2.5 °C (marks at 0, 2.5, 5, 7.5, 10, 12.5, ...).
First thermometer (14 °C): shade the red column up to a little below the 15 °C mark — one small division above 12.5 °C, just short of 15.
Second thermometer (17 °C): shade the red column up to between the 15 °C and 17.5 °C marks, a little below 17.5.
Third thermometer (7.5 °C): shade the red column exactly up to the 7.5 °C mark (the mark halfway between 5 °C and 10 °C).

Answer: Shade the red column to 14 °C, 17 °C, and 7.5 °C. The scale has a mark every 2.5 °C, so 7.5 °C falls exactly on a mark, while 14 °C and 17 °C are read just below the 15 °C and 17.5 °C marks.

Q7 Observe the part of thermometer shown in Fig. 7.8 and answer the following questions:
(i) What type of thermometer is it?
(ii) What is the reading of the thermometer?
(iii) What is the smallest value that this thermometer can measure?

SOLUTION

(i) The scale runs from -10 °C up to 40 °C in a straight tube with graduated markings — this is a laboratory thermometer.
(ii) The red liquid column ends at the 27th mark past 0, a little past the mid-mark between 20 and 30. The reading is 27 °C.

(iii) Between two numbered marks 10 °C apart (e.g. 20 °C and 30 °C) there are 10 equal small divisions, so each division = 10 ÷ 10 = 1 °C. The smallest value the thermometer can measure is 1 °C.

Answer: (i) Laboratory thermometer. (ii) 27 °C. (iii) 1 °C.

Q8 A laboratory thermometer is not used to measure our body temperature. Give a reason.

SOLUTION

A laboratory thermometer's range is –10 °C to 110 °C, designed for general scientific use.

It does not have a kink (constriction) near the bulb like older clinical thermometers. When removed from the body, the liquid column immediately falls back — making it impossible to read the temperature after removal.

Additionally, it is not designed to be placed under the tongue or in the armpit safely.

Clinical (digital) thermometers are designed specifically for safe and accurate body temperature measurement.

Answer: A laboratory thermometer cannot be safely placed under the tongue, and its liquid column falls immediately on removal — making it impossible to get an accurate body temperature reading outside the body.

Q9 Vaishnavi has not gone to school as she is ill. Her mother has kept a record of her body temperature for three days as shown in Table 7.4.

Table 7.4: Body temperature record of Vaishnavi

DAY	7am	10am	1pm	4pm	7pm	10pm
One	38.0 °C	37.8 °C	38.0 °C	38.0 °C	40.0 °C	39.0 °C
Two	38.6 °C	38.8 °C	39.0 °C	39.0 °C	39.0 °C	38.0 °C
Three	37.6 °C	37.4 °C	37.2 °C	37.0 °C	36.8 °C	36.6 °C

(i) What was Vaishnavi's highest recorded temperature?
(ii) On which day and at what time was Vaishnavi's highest temperature recorded?
(iii) On which day did Vaishnavi's temperature return to normal?

SOLUTION

Scanning all values in the table:
Day One: 38.0, 37.8, 38.0, 38.0, 40.0, 39.0 → maximum = 40.0 °C
Day Two: 38.6, 38.8, 39.0, 39.0, 39.0, 38.0 → maximum = 39.0 °C
Day Three: 37.6, 37.4, 37.2, 37.0, 36.8, 36.6 → maximum = 37.6 °C
Overall highest = 40.0 °C (Day One, 7 pm).

(i) Highest recorded temperature = 40.0 °C.
(ii) Day One at 7 pm.
(iii) Normal temperature is 37.0 °C. On Day Three, the temperature was 37.0 °C at 4 pm and continued to fall. Day Three is when her temperature returned to normal.

Answer: (i) 40.0 °C. (ii) Day One at 7 pm. (iii) Day Three.

Q10 If you have to measure the temperature 22.5 °C, which of the following three thermometers will you use (Fig. 7.9)? Explain.

SOLUTION

To read 22.5 °C, the thermometer must include 22.5 °C in its range and have a smallest division of 0.5 °C or smaller, so the half-degree can be read.
All three thermometers cover a range from about -10 °C to above 30 °C, so 22.5 °C is within each range.
Thermometer (a): 10 divisions between two numbered marks 10 °C apart, so each division = 1 °C — it can show 22 or 23, not 22.5.
Thermometer (c): only 5 divisions per 10 °C, so each division = 2 °C — even coarser.
Thermometer (b): 20 divisions between two marks 10 °C apart, so each division = 0.5 °C — this one can show 22.5 °C exactly.
So thermometer (b) is the right choice.

Answer: Thermometer (b). Its smallest division is 0.5 °C, so it can read 22.5 °C. Thermometer (a) has 1 °C divisions and (c) has 2 °C divisions, so neither can show the half-degree value.

Q11 The temperature shown by the thermometer in Fig. 7.10 is
(i) 28.0 °C
(ii) 27.5 °C
(iii) 26.5 °C
(iv) 25.3 °C

SOLUTION

The scale is marked in steps of 5 (0, 5, 10, ... 40), with 10 small divisions between each numbered pair, so each small division = 0.5 °C.
The red column ends 5 divisions past the 25 °C mark, which is 5 × 0.5 = 2.5 °C, giving 25 + 2.5 = 27.5 °C.
So the temperature shown is 27.5 °C.

Answer: (ii) 27.5 °C

Q12 A laboratory thermometer has 50 divisions between 0 °C and 100 °C. What does each division of this thermometer measure?

SOLUTION

Temperature range between 0 °C and 100 °C = 100 – 0 = 100 °C.
Number of divisions = 50.
Value per division = 100 °C ÷ 50 = 2 °C.
Each division measures 2 °C.

Answer: Each division measures 2 °C.

Q13 Draw the scale of a thermometer in which the smallest division reads 0.5 °C. You may draw only the portion between 10 °C and 20 °C.

SOLUTION

Range to draw: 10 °C to 20 °C (a span of 10 °C).
Smallest division = 0.5 °C, so the number of small divisions = 10 ÷ 0.5 = 20 divisions.
Mark major (larger) lines at every 5 °C: 10, 15, 20.
Mark medium lines at every 1 °C: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.
Mark small lines at every 0.5 °C: 10.0, 10.5, 11.0, 11.5, … 19.5, 20.0.
Each small division represents 0.5 °C — so between any two consecutive degree marks, place one small tick in the middle.

Answer: Draw a vertical scale from 10 °C to 20 °C with 20 equal small divisions (one every 0.5 °C). Place a longer tick at every whole degree (10, 11, …, 20) and the longest ticks at 10, 15, and 20. Each small gap = 0.5 °C.

Q14 Komal tells you that she has a fever of 101 degrees. Does she mean it on the Celsius scale or Fahrenheit scale?

SOLUTION

Normal human body temperature = 37.0 °C or 98.6 °F.

If 101 °C: that is well above 100 °C (the boiling point of water). No living person could survive at 101 °C — this is physically impossible.

If 101 °F: that is slightly above 98.6 °F (normal). A fever of 101 °F is a common, mild fever — medically realistic.

Therefore, Komal means 101 °F (Fahrenheit scale).

Answer: Fahrenheit scale. A fever of 101 °C is impossible (above boiling point); 101 °F is a realistic mild fever just above the normal 98.6 °F.