

UNIQUE STUDY POINT

By Sumeet Sahu

www.uniquestudyonline.com

Unique Study Point, Amitesh Nagar, Indore, MP | Contact: 8103405051

Class: VI	Subject: Science	Session: 2025-26
Chapter: 07 - Temperature and its Measurement	Time: 1½ Hours	Max. Marks: 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

1. Which of the following statements about temperature is INCORRECT?
 - (a) Temperature is a measure of hotness or coldness
 - (b) Temperature can be reliably measured by sense of touch
 - (c) Temperature is measured using a thermometer
 - (d) A hotter body has higher temperature than a colder body
2. The range of a clinical thermometer is usually:
 - (a) 0 °C to 100 °C
 - (b) -10 °C to 110 °C
 - (c) 35 °C to 42 °C
 - (d) 20 °C to 50 °C
3. 0 kelvin is equal to:
 - (a) 0 °C
 - (b) -173.15 °C
 - (c) -273.15 °C
 - (d) -373.15 °C
4. Which of the following is commonly used as the liquid in laboratory thermometers?
 - (a) Water
 - (b) Alcohol (colored red)
 - (c) Kerosene
 - (d) Petrol
5. The main advantage of digital clinical thermometers over mercury thermometers is:
 - (a) They are cheaper
 - (b) They are non-toxic and easy to read

- (c) They can measure higher temperatures
(d) They never break
6. Which temperature scale is named after a Swedish astronomer?
(a) Kelvin scale
(b) Fahrenheit scale
(c) Celsius scale
(d) Reaumur scale
7. The normal human body temperature 98.6 °F is equivalent to:
(a) 35.0 °C
(b) 36.0 °C
(c) 37.0 °C
(d) 38.0 °C
8. While measuring temperature with a laboratory thermometer, if the thermometer is tilted:
(a) The reading will be accurate
(b) The reading may be incorrect
(c) The thermometer will break
(d) The liquid will come out
9. At higher altitudes, water boils at:
(a) Exactly 100 °C
(b) Higher than 100 °C
(c) Lower than 100 °C
(d) The same temperature as at sea level
10. A space should be left between the number and unit when writing temperature. Which is correct?
(a) 37°C
(b) 37 °C
(c) 37° C
(d) 37C

SECTION B - Short Answer Questions (2 marks each)

11. Define temperature. What device is used to measure it?
12. Explain why a clinical thermometer cannot be used to measure the temperature of boiling water.
13. What is meant by "normal body temperature"? Why does it vary slightly from person to person?
14. Convert 310 K to Celsius scale. (Formula: Temperature in °C = Temperature in K - 273.15)

SECTION C - Short Answer Questions (3 marks each)

15. List three important precautions that must be taken while using a laboratory thermometer. Explain why each precaution is necessary.
16. Draw a labeled diagram of a laboratory thermometer and mark the following parts: (i) Bulb (ii) Glass tube (iii) Celsius scale (iv) Liquid column
17. A patient's body temperature was recorded as follows over 6 hours:
10:00 AM - 39.2 °C

12:00 PM - 38.8 °C
2:00 PM - 38.2 °C
4:00 PM - 37.5 °C

- (a) Did the patient have fever at 10:00 AM?
(b) By how many degrees did the temperature decrease from 10:00 AM to 4:00 PM?
(c) At what time did the temperature return to nearly normal?

SECTION D - Long Answer Question (5 marks)

18. What is a thermometer? Explain the difference between a clinical thermometer and a laboratory thermometer in detail. Include differences in their structure, range, purpose, and method of use. Also explain why one type cannot replace the other.

SECTION E - Case Study Based Questions (4 marks each)

19. Case Study 1:

A group of students conducted an experiment where they measured their body temperatures at different times during the day. Here are the observations for one student:

6:00 AM (just after waking up): 36.2 °C
2:00 PM (after lunch): 37.0 °C
6:00 PM (after sports): 37.4 °C
10:00 PM (before sleep): 36.8 °C

Based on the above case study, answer the following questions:

- (a) At what time was the student's body temperature highest and lowest? (1 mark)
(b) Did the student have fever at any time during the day? Justify your answer. (1 mark)
(c) Why was the body temperature higher after sports compared to early morning? (1 mark)
(d) What does this experiment tell us about human body temperature throughout the day? (1 mark)

20. Case Study 2:

In a laboratory, three thermometers A, B, and C were available:

Thermometer A: Range -10 °C to 110 °C, 10 divisions between consecutive 10 °C marks

Thermometer B: Range 35 °C to 42 °C, 14 divisions between 35 °C and 42 °C

Thermometer C: Range 0 °C to 50 °C, 25 divisions between 0 °C and 50 °C

Students were asked to choose the appropriate thermometer for different tasks.

Based on the above case study, answer the following questions:

- (a) Which thermometer should be used to measure human body temperature? Why? (1 mark)
(b) What is the smallest value that thermometer A can read? (Show calculation) (1 mark)
(c) A student wants to measure the temperature of ice-cold water (around 5 °C). Which thermometer should they use? (1 mark)
(d) What is the smallest value that thermometer C can read? Which two tasks from the following would be most suitable for this thermometer: (i) Measuring body temperature (ii) Measuring room temperature (iii) Measuring boiling water (1 mark)

SECTION A - Answers to MCQs**1. (b) Temperature can be reliably measured by sense of touch**

This statement is INCORRECT. Temperature cannot be reliably measured by our sense of touch as it can be misleading depending on previous conditions. We need a thermometer for reliable measurement.

2. (c) 35 °C to 42 °C

The range of a clinical thermometer is usually from 35 °C to 42 °C as human body temperature normally falls within this range.

3. (c) -273.15 °C

0 kelvin (absolute zero) is equal to -273.15 °C. This is the lowest possible temperature according to scientific understanding.

4. (b) Alcohol (colored red)

Alcohol colored red is commonly used in laboratory thermometers. Mercury was used previously but is being phased out due to toxicity.

5. (b) They are non-toxic and easy to read

The main advantages of digital clinical thermometers over mercury thermometers are that they are non-toxic (no mercury hazard) and their digital display is easy to read.

6. (c) Celsius scale

The Celsius temperature scale is named after Swedish astronomer Anders Celsius who developed it in 1742.

7. (c) 37.0 °C

The normal human body temperature of 98.6 °F is equivalent to 37.0 °C on the Celsius scale.

8. (b) The reading may be incorrect

If the thermometer is tilted while measuring temperature, the reading may be incorrect because the liquid column level becomes difficult to read accurately.

9. (c) Lower than 100 °C

At higher altitudes, atmospheric pressure is lower, so water boils at a temperature lower than 100 °C. For example, in Shillong, water boils around 97-98 °C.

10. (b) 37 °C

The correct way is "37 °C" with a space between the number and the unit. This is the standard convention for writing temperature.

SECTION B - Answers to Short Answer Questions**11. Definition of temperature and measuring device:**

Temperature: Temperature is a reliable measure of the hotness or coldness of a body. It indicates how hot or cold an object is compared to another object. A hotter body has a higher temperature than a colder

body.

Measuring device: Temperature is measured using a device called a thermometer. Different types of thermometers include clinical thermometers (for measuring body temperature), laboratory thermometers (for measuring temperature in experiments), and room thermometers (for measuring air temperature).

12. Why clinical thermometer cannot measure boiling water temperature:

A clinical thermometer cannot be used to measure the temperature of boiling water due to the following reasons:

1. **Limited range:** A clinical thermometer has a narrow temperature range of 35 °C to 42 °C, which is designed specifically for measuring human body temperature. Boiling water has a temperature of 100 °C, which is far beyond the range of a clinical thermometer.
2. **Damage risk:** If a clinical thermometer is placed in boiling water, the liquid (or sensor) inside will expand beyond its limit, causing the thermometer to break or get damaged permanently. It is simply not designed to withstand such high temperatures.

13. Normal body temperature and its variation:

Normal body temperature: The normal temperature of a healthy human body is taken to be 37.0 °C (or 98.6 °F). However, this is actually the average body temperature calculated from a large number of healthy people.

Why it varies: Normal body temperature varies slightly from person to person because:

1. The 37.0 °C value is an average, and a perfectly healthy person may have a temperature slightly different from this average.
2. Body temperature is influenced by several factors such as age, time of the day, activity level, and individual metabolism.
3. Children generally have slightly higher body temperatures than adults, and older people may have slightly lower temperatures.

14. Convert 310 K to Celsius:

Given: Temperature = 310 K

Formula: Temperature in °C = Temperature in K - 273.15

Calculation:

Temperature in °C = 310 - 273.15

Temperature in °C = 36.85 °C

Answer: 310 K is equal to 36.85 °C (which is close to normal body temperature).

SECTION C - Answers to Short Answer Questions

15. Three precautions while using laboratory thermometer:

Three important precautions with explanations:

1. The bulb should not touch the bottom or sides of the container:

This precaution is necessary because the bottom and sides of the container may be hotter or colder than the liquid being measured (especially if the container is being heated). If the bulb touches these surfaces, the thermometer will measure their temperature instead of the liquid's temperature, giving an incorrect reading.

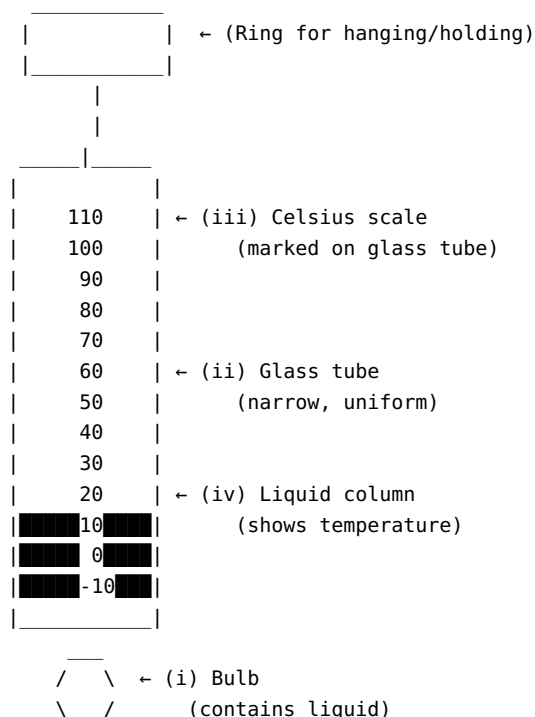
2. The thermometer should be held vertically and not tilted:

This precaution is necessary to ensure accurate reading of the liquid column level. When the thermometer is tilted, it becomes difficult to read the exact level of the liquid column against the scale markings, leading to errors in temperature measurement. A vertical position ensures clear and accurate reading.

3. The temperature must be read while the thermometer is still immersed in the liquid:

This precaution is necessary because as soon as the thermometer is taken out of the liquid, the liquid column inside starts falling immediately due to contact with cooler air. If we take the thermometer out before reading, we will get a lower reading than the actual temperature of the liquid. Reading while immersed ensures we capture the actual temperature.

16. Labeled diagram of laboratory thermometer:



Labels:

- (i) Bulb - Contains the liquid (alcohol or mercury)
- (ii) Glass tube - Long, narrow, uniform tube sealed at top
- (iii) Celsius scale - Temperature markings on the tube
- (iv) Liquid column - Visible liquid that rises/falls with temperature

Additional notes:

- The bulb is the enlarged portion at the bottom containing the thermometric liquid
- The glass tube is sealed and evacuated above the liquid
- The liquid expands and rises in the tube when heated
- Temperature is read where the top of liquid column meets the scale

17. Analysis of patient's temperature data:

Given data:

10:00 AM - 39.2 °C
12:00 PM - 38.8 °C
2:00 PM - 38.2 °C
4:00 PM - 37.5 °C

(a) Did the patient have fever at 10:00 AM?

Yes, the patient had fever at 10:00 AM. The temperature was 39.2 °C, which is significantly higher than the normal body temperature of 37.0 °C. Any temperature above 37.5 °C is generally considered fever.

(b) Temperature decrease from 10:00 AM to 4:00 PM:

Temperature at 10:00 AM = 39.2 °C

Temperature at 4:00 PM = 37.5 °C

Decrease in temperature = 39.2 °C - 37.5 °C = 1.7 °C

Therefore, the temperature decreased by 1.7 degrees Celsius from 10:00 AM to 4:00 PM.

(c) When did temperature return to nearly normal?

The temperature returned to nearly normal by 4:00 PM when it was 37.5 °C. This is very close to the normal temperature of 37.0 °C (within 0.5 °C), indicating that the patient had largely recovered from the fever by this time. The consistent downward trend shows the patient was responding well to treatment.

SECTION D - Answer to Long Answer Question

18. Thermometer and difference between clinical and laboratory types:

What is a Thermometer?

A thermometer is a device used to measure temperature. It provides an accurate and reliable measurement of how hot or cold a body or substance is. Thermometers work on the principle that liquids (or electronic sensors) change with temperature - expanding when heated and contracting when cooled.

DETAILED COMPARISON:

1. STRUCTURE:

Clinical Thermometer:

- Modern digital clinical thermometers have a digital display screen
- Contains electronic heat sensors (thermistors)
- Has a tip that comes in contact with the body
- Battery-powered with reset button
- Compact and portable design

Laboratory Thermometer:

- Consists of a long, narrow, uniform glass tube
- Contains liquid (mercury or colored alcohol) in a bulb at one end
- Has clear scale markings along the glass tube
- The liquid column is visible and moves up/down
- Usually longer than clinical thermometers

2. RANGE:

Clinical Thermometer:

- Narrow range: 35 °C to 42 °C (or 95 °F to 108 °F)
- This range is specifically designed for human body temperature
- Covers normal body temperature (37 °C) and fever range

Laboratory Thermometer:

- Wide range: typically -10 °C to 110 °C
- Can measure temperatures much below and above body temperature
- Suitable for variety of laboratory experiments

3. PURPOSE:

Clinical Thermometer:

- Exclusively designed to measure human body temperature
- Used in homes, hospitals, clinics
- Helps detect fever and monitor patient health
- Designed for safe and hygienic use on humans

Laboratory Thermometer:

- Used to measure temperature of various substances
- Used in laboratories for experiments
- Can measure temperature of liquids, water baths, chemical reactions
- Not intended for medical use

4. METHOD OF USE:**Clinical Thermometer:**

- Placed under tongue, in armpit, or in ear
- Requires washing with soap and water before and after use
- Digital portion must be kept away from water
- Makes a beep sound when measurement is complete
- Can be removed for reading (reading stays on display)

Laboratory Thermometer:

- Immersed in the substance whose temperature is to be measured
- Bulb should not touch bottom or sides of container
- Must be held vertically
- Reading must be taken while thermometer is still immersed
- Eye must be at same level as liquid column for accurate reading

WHY ONE TYPE CANNOT REPLACE THE OTHER:**Clinical thermometer cannot replace laboratory thermometer because:**

1. Its narrow range (35-42 °C) cannot measure the wide variety of temperatures needed in laboratory work
2. It would get damaged if exposed to high temperatures like boiling water (100 °C)
3. It is not designed to be immersed in chemical substances
4. Its precision is optimized for body temperature range, not for general use

Laboratory thermometer cannot replace clinical thermometer because:

1. Its wide range makes it less precise for the narrow body temperature range
2. It is not designed for hygienic medical use
3. Reading while immersed is impractical for measuring body temperature
4. Glass and liquid-based thermometers are breakable and may contain mercury (toxic)
5. It lacks the safety features and ease of use needed for home medical use

CONCLUSION:

Each type of thermometer is specifically designed for its intended purpose. Clinical thermometers are optimized for safe, accurate body temperature measurement, while laboratory thermometers are designed for versatile scientific measurements. Using the wrong type could lead to inaccurate results or damage to the instrument.

SECTION E - Answers to Case Study Based Questions**19. Case Study 1 - Answers:**

(a) Highest and lowest body temperature times:

The student's body temperature was highest at 6:00 PM (37.4 °C) after sports activities.

The student's body temperature was lowest at 6:00 AM (36.2 °C) just after waking up. (1 mark)

(b) Did the student have fever?

No, the student did not have fever at any time during the day. All temperature readings were within or close to the normal range. The highest temperature recorded was 37.4 °C, which is only slightly above normal (37.0 °C) and can be attributed to physical activity. Fever is generally considered to be 38 °C or above, so these variations represent normal fluctuations in body temperature throughout the day. (1 mark)

(c) Why temperature was higher after sports:

The body temperature was higher after sports (37.4 °C) compared to early morning (36.2 °C) because during physical activity (sports), the body's muscles work hard and generate heat energy. The increased metabolism and muscle activity raise the body's temperature. Additionally, after waking up in the morning, the body is in a resting state with lower metabolic activity, resulting in a slightly lower temperature. This temperature increase after exercise is normal and temporary. (1 mark)

(d) What this experiment tells us about body temperature:

This experiment demonstrates that human body temperature is not constant throughout the day - it fluctuates naturally based on various factors. Body temperature is influenced by: (i) Time of day - lower in early morning, higher in afternoon/evening, (ii) Activity level - increases after physical exercise, (iii) Metabolic state - varies with eating, digestion, rest, etc. These variations (about 1-1.5 °C) are normal and do not indicate illness. This is why the "normal" temperature of 37.0 °C is actually an average value. (1 mark)

20. Case Study 2 - Answers:

Given information:

Thermometer A: -10 °C to 110 °C, 10 divisions between consecutive 10 °C marks

Thermometer B: 35 °C to 42 °C, 14 divisions between 35 °C and 42 °C

Thermometer C: 0 °C to 50 °C, 25 divisions between 0 °C and 50 °C

(a) Which thermometer for body temperature and why:

Thermometer B should be used to measure human body temperature. This is because its range (35 °C to 42 °C) perfectly matches the range of human body temperature, which typically stays between these values. Normal body temperature is 37 °C, and even with fever, it rarely goes beyond 42 °C. The narrow range also means better precision for body temperature measurement. (1 mark)

(b) Smallest value thermometer A can read:

For Thermometer A:

Between consecutive 10 °C marks, there are 10 divisions

Temperature difference = 10 °C

Number of divisions = 10

Value of one division = $10\text{ °C} \div 10 = 1\text{ °C}$

Therefore, the smallest value that thermometer A can read is 1 °C. (1 mark)

(c) Which thermometer for ice-cold water:

For measuring the temperature of ice-cold water (around 5 °C), students should use either Thermometer A or Thermometer C. Thermometer A can measure from -10 °C to 110 °C (includes 5 °C), and Thermometer C can measure from 0 °C to 50 °C (includes 5 °C). Thermometer B cannot be used as its range starts from 35 °C, which is much higher than ice-cold water temperature. Between A and C, Thermometer C would be more suitable as it has better precision in the lower temperature range. (1 mark)

(d) Smallest value of thermometer C and suitable tasks:

For Thermometer C:

Temperature range = 0 °C to 50 °C = 50 °C difference

Number of divisions = 25

Value of one division = $50\text{ °C} \div 25 = 2\text{ °C}$

Therefore, the smallest value that thermometer C can read is 2 °C.

Suitable tasks for Thermometer C from the given options:

(i) Measuring body temperature - NOT SUITABLE (body temperature around 37 °C requires precision of less than 1 °C, but this thermometer only reads to 2 °C accuracy)

(ii) Measuring room temperature - SUITABLE (room temperature is typically 20-30 °C, well within range, and 2 °C precision is acceptable)

(iii) Measuring boiling water - NOT SUITABLE (boiling water is 100 °C, which is beyond the 50 °C maximum range)

Therefore, measuring room temperature would be most suitable for this thermometer. (1 mark)

Made with ♥ by Sumeet Sahu

Unique Study Point, Amitesh Nagar, Indore, MP

Website: uniquestudyonline.com