HEAT Class 7

TRANSFER OF HEAT

Heat flows from a hotter object to a colder one through conduction, convection, or radiation.

- Conduction
  - Heat transfer from the hotter end to the colder end in solids.
  - Conductors (e.g., aluminum, iron) allow heat to pass easily, while insulators (e.g., plastic, wood) do not.
- Convection
  - Heat transfer in liquids and gases.
  - Hotter parts rise, and colder parts move in to replace them, creating a cycle.
- Radiation
  - Heat transfer without a medium.
  - Hot bodies radiate heat, which is absorbed, reflected, or transmitted by objects. Ex Sun's heat reaches Earth through radiation.
- Examples
  - Sea breeze: Hot air rises from land, and cooler air moves in from the sea during the day.
  - Land breeze: Cool air moves from land to sea at night.
  - Dark-colored clothes absorb more heat, while light-colored clothes reflect heat.

KINDS OF CLOTHES WE WEAR IN SUMMER AND WINTER

- Summer
  - Light-colored clothes are preferred as they reflect heat, keeping the wearer cool.
- Winter
  - Dark-colored clothes absorb more heat, keeping the wearer warm.
  - Woolen clothes trap air between fibers, preventing body heat from escaping.

HOT AND COLD

Some objects are hot, while others are cold. Touching them helps us feel the difference, but our sense of touch isn't always reliable.

In winter, it feels cold indoors but warm in the sun. In summer, it feels hot even inside.

- Testing the Reliability of Touch
  - Our sense of touch can detect hot and cold, but it is not always reliable for measuring temperature accurately.
  - Label three containers A, B, and C.
  - Put cold water in A, hot water in B, and mixed water in C.
  - Dip the left hand in A and the right hand in B for 2-3 minutes.
  - Then, put both hands into container C. Both hands will feel differently, showing touch can be misleading.

MEASURING TEMPERATURE

Temperature is a reliable measure of how hot an object is, measured using a thermometer.

Clinical Thermometer: Measures body temperature (35°C to 42°C).

Laboratory Thermometer: Measures other objects' temperature (-10°C to 110°C).

- Precautions for Using Thermometers
  - Wash before and after use, preferably with antiseptic solution.
  - Ensure mercury level is below 35°C before use.
  - Read at eye level and handle with care to prevent breakage.
  - Do not hold the thermometer by the bulb while reading.
- Reading a Thermometer
  - Note the temperature difference between two bigger marks and the number of divisions between them.
  - If there are five divisions between marks reading one degree, each small division equals 0.2°C.
- Human Body Temperature
  - Normal human body temperature is 37°C, though individual temperatures may vary slightly.
  - Maximum and minimum thermometers are used to measure daily temperature ranges in weather reports.

Presented with xmind

TOPIC: HEAT

I. OBJECTIVE-TYPE QUESTIONS

1. Name the device which is used to measure the hotness or coldness of an object:

(a) Thermometer
(b) Barometer
(c) Manometer
(d) Picometer

2. What is a normal temperature of a healthy person?

(a) 37^0F
(b) 37 K
(c) 37^0 C
(d) None of these

3. Heat always flows from -

(a) From a colder object to a hotter object.
(b) From a hotter object to a colder object.
(c) In both directions.
(d) Heat never flows from one object to another.

4. Conduction is the method of transfer of heat in -

(a) Gases
(b) Vacuum
(c) Liquid
(d) Solid

5. Heat from the sun reaches us by -

(a) Radiation
(b) Conduction
(c) Convection
(d) All of these

6. At the campsite there are tents of three shades. One is made of black fabric and the other is white fabric and one is a black-and-white combination. Which will you prefer for resting on a hot summer afternoon -

(a) Black fabric
(b) White fabric
(c) Combination of both
(d) None of the above

For the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii), and (iv) as given below
i) Both A and R are true and R is the correct explanation of the assertion.
ii) Both A and R are true but R is not the correct explanation of the assertion.
iii) A is true but R is false.
iv) A is false but R is true

7. **Assertion (A):** Woollen clothes keep the body warm in winter.
Reason (R): There is air trapped in between woollen fibres and air is a bad conductor of heat.
i) Both A and R are true and R is the correct explanation of the assertion.

8. **Assertion (A):** The temperature of boiling water can be measured by a clinical thermometer.
Reason (R): The range of a clinical thermometer is from 35˚C to 42˚C.
iv) A is false but R is true.

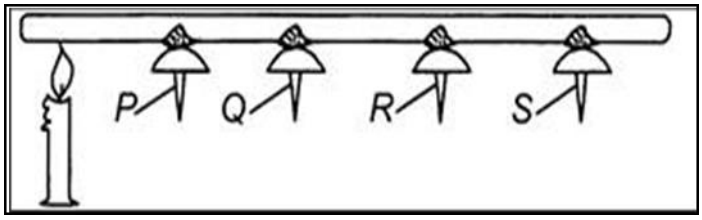
9. **Assertion (A):** All hot bodies radiate heat.
Reason (R): When heat falls on an object, a part of it is reflected, a part is absorbed and a part may be transmitted.
ii) Both A and R are true but R is not the correct explanation of the assertion.

10. **Assertion (A):** The materials which allow heat to pass through them easily are conductors of heat.
Reason (R): Aluminum is a poor conductor of heat.
iii) A is true but R is false.

II. VERY SHORT QUESTIONS (2M):

1. Using two thin blankets rather than one thick blanket is preferred. Explain**. [Hint: The two thin blankets joined together will have a layer of air trapped in between them. Air doesn't allow our body heat to escape to the cold surroundings and hence keep us warm.]**

2. Some pins are stuck to a metal rod with wax and a lighted candle is kept below the rod as shown in the diagram below:



Which one of the pins will fall off the metal rod first? Give reason.
[Hint: The pin 'P' nearest to the flame falls first because heat is transferred from the hot end of the metal rod to its colder end by the process of conduction.]

3. A few sharp jerks are given to a clinical thermometer before using it. Why is it done so?
[Hint: Jerks are given to a clinical thermometer before using it to settle down the mercury level below normal temperature so that the measurement taken is accurate.]

4. The handle of a pressure cooker is covered with thick plastic. Explain why.
[Hint: Plastic is a bad conductor of heat due to which the heat from the cooker does not flow to its handle and we can hold it easily].

5. What are the conditions necessary for heat to be conducted?
[Hint: Two bodies should be in solid state, they should be in direct contact with each other and their temperatures should be different.]

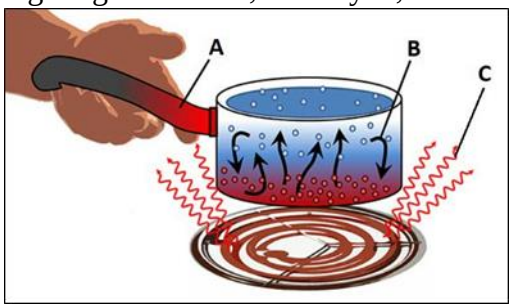
6. How does the heat travel in the air?
[Hint: Heat travels in the air by convection. The air molecules near the heat source get heated, become lighter, and rise. The air from the sides comes in to take its place. In this way the air gets heated.]

7. In a mercury thermometer, the level of mercury rises when its bulb comes in contact with a hot object. Give reason.
[Hint: As the temperature increases, expansion in mercury takes place which leads to a rise in the level of mercury in the thermometer.]

8. Mention any two examples of insulators as well as conductors. **[Hint: Copper and Aluminium are the examples of conductors which allow heat to pass through them. While wood and plastic are examples of insulators which do not allow heat to pass through them.]**

III. SHORT ANSWER TYPE QUESTIONS (3M):

1. Observe the figure given below, identify A, B and C and explain each of them.



[Hint: A – CONDUCTION – The process by which heat is transferred from the hotter end to the colder end of an object without actual movement of particles.
B – CONVECTION – The method in which heat is transferred by the actual movement of the particles of a substance.
C – RADIATION – It is a process of heat transfer which does not require any material medium.]

2. Write any two applications of convection and radiation in daily life.
[Hint: Convection – i) Room heater warms the air near the floor. When the warm air rises up, the cool air sinks to the floor which results in effective heating of the room. ii) Exhaust fans are fitted near the ceiling for hot air to escape.
Radiation – i) In cold and hilly areas, the outer walls and roofs are usually painted dark to keep the houses warm, ii) In factories, the roofs are painted shiny silver to reduce the loss of heat in winter and increase the radiation of heat in summers.]

3. What is meant by heat transfer? Explain.
[Hint: The flow of heat from one object to another with or without a medium is called the transfer of heat. Heat always flows from a body at a higher temperature to another body at a lower temperature. The flow of heat stops when the temperature of both bodies becomes equal. Transfer of heat takes place through the methods of conduction, convection and radiation.]

IV. LONG ANSWER TYPE QUESTIONS (5M):

1. What are the precautions to be taken while using a clinical thermometer and a laboratory thermometer?
[Hint: Clinical thermometer –
i) Thermometer should be washed before and after use, preferably with an antiseptic solution.
ii) Ensure that the mercury level is below 35˚C.
iii) Our eyes should be at the level of mercury while reading the temperature.
iv) Handle the thermometer with care. If it hits some hard object, it can break.
v) Do not hold the thermometer by the bulb while reading it.

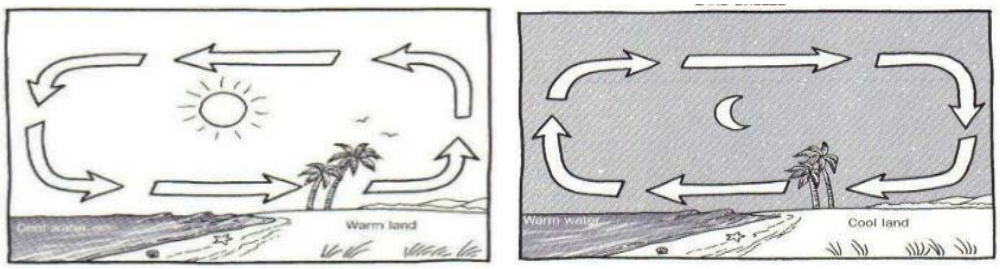
Laboratory thermometer-

i) Handle the thermometer with care. If it hits some hard object, it can break.

ii) Should be kept upright not tilted.

iii) Bulb should be surrounded from all sides by the substance of which the temperature is to be measured. The bulb should not touch the surface of the container.]

2. Explain the differences between sea breeze and land -breeze with the help of labelled diagrams.

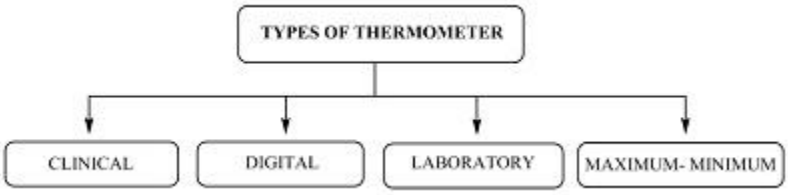


SEA BREEZE **LAND BREEZE**

[Hint: SEA BREEZE - During the day, the land heats up much faster than seawater. So, the air above the land becomes hotter and rises up. The cool air above the sea surface moves towards land to fill the space. This flow of air from the sea towards the land is called sea breeze.

LAND BREEZE – The land cools much faster at night than the seawater. So, the air above the land surface is cooler than the air over the sea. The warm air above the sea surface rises up. The cool air from the land moves towards the sea. This flow of air from land towards the sea is called land breeze.]

3. Describe different types of thermometers.



[Hint: i) Clinical thermometer

The thermometer that measures our body temperature is called a clinical thermometer. It consists of a long, narrow, uniform glass tube. It has a bulb at one end which contains mercury. A clinical thermometer reads the temperature from 35˚C to 42˚C.

ii) Digital thermometer

Digital thermometers are preferred over clinical thermometers nowadays due to the high toxicity of the mercury present in clinical thermometers and difficulty in its disposal in cases when the thermometer breaks, digital

thermometers are manufactured that can measure the accurate temperature without the use of mercury.

iii) Laboratory thermometer

A laboratory thermometer is used to measure the temperature of things other than the human body. The range of a laboratory thermometer is generally from -10˚C to 110˚C.

iv) Maximum-minimum thermometer

The daily maximum and minimum temperatures reported in weather reports, are all measured by a thermometer known as the Maximum-minimum thermometer.]

V. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

Read the passage and answer the following questions:

Some things feel hot when touched while others feel cold. So, our sense of touch tells us whether a thing is hot or cold. But does it always give us accurate results? A reliable measure of the hotness of an object is its temperature. Temperature is measured by a device called a thermometer. The thermometer used to measure human body temperature is known as clinical thermometer. A clinical thermometer is made up of a long and narrow glass tube. It has a special feature called a kink just above the mercury bulb. This kink prevents immediate backflow of the mercury from the tube to the bulb, thus allowing us to read the temperature conveniently. The normal body temperature of a healthy person is 37^0C or 98.6^0 F.

i) Define temperature? [Hint- **A reliable measure of the hotness of an object is its temperature.]**

ii) What is a clinical thermometer? **[Hint- The thermometer used to measure human body temperature is known as a clinical thermometer.]**

iii) What is the normal temperature of the human body? **[Hint: The normal temperature of the human body is 37 ˚C.]**

iv) What is the use of kink in a clinical thermometer? **[Hint: Kink prevents immediate backflow of mercury from the tube to the bulb, thus it allows us to read the temperature conveniently.]**
