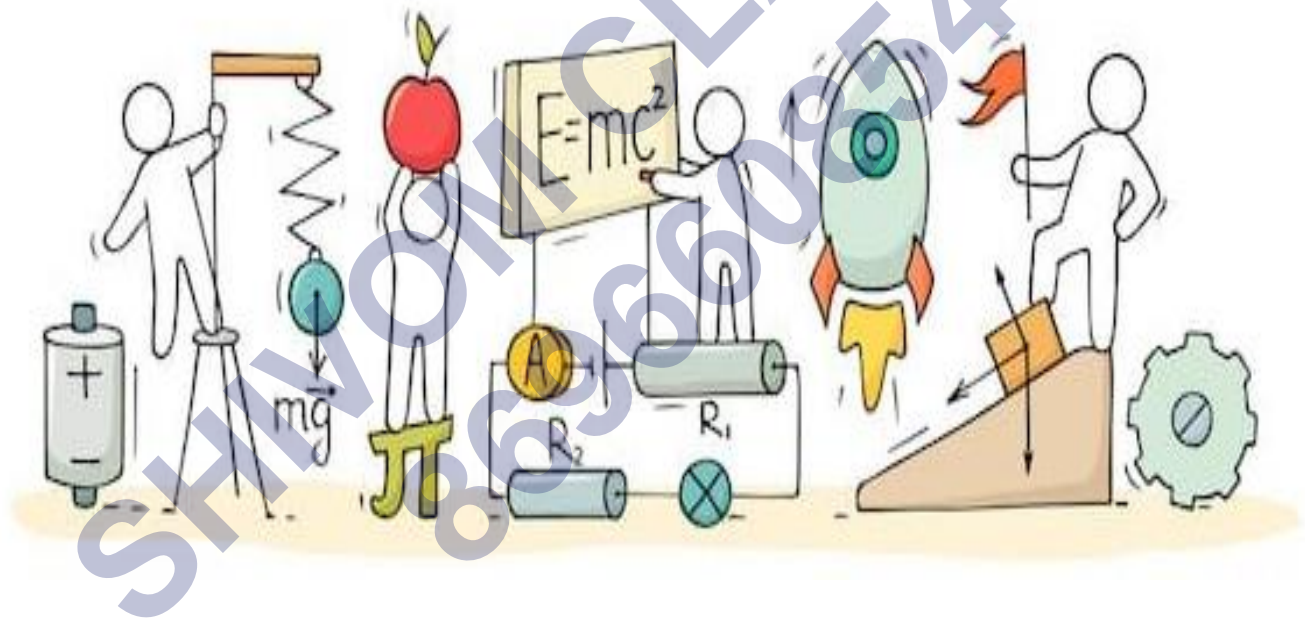


SCIENCE

Chapter-4: Heat



Heat

Concept of Heat

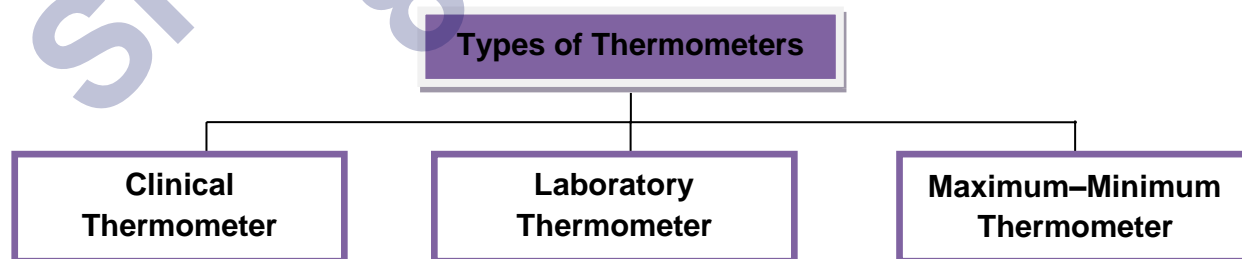
- Heat is a form of energy.
- We can feel heat by the sense of touch.
- This form of energy can be transferred between two objects with varying temperatures.
- The S.I. unit of heat is Joule (J).

Temperature

- Heat cannot be measured with any instrument directly, but its effect on a substance can be detected. This measurement is the temperature of the body.
- Temperature is defined as the degree of hotness or coldness of a body.

Thermometer

- A thermometer is a device which measures the temperature in a reliable manner.
- It is made of a long, narrow, uniform glass tube with a bulb at one end.
- It is filled with mercury as it is in liquid state at room temperature. It expands or contracts with an increase or decrease in the temperature.
- There are different types of thermometers:



Clinical Thermometer

- A clinical thermometer is used to measure the temperature of the human body.
- It is very accurate because of its narrow tube in which the liquid rises fast.



- The scale on the clinical thermometer is called the Celsius Scale, indicated by °C.
- It reads the temperature from 35°C to 42°C.
- It is used in clinics by doctors.

Laboratory Thermometer

- A laboratory thermometer is used to measure temperatures or the temperature changes of other objects.



- These thermometers are usually filled with red spirit rather than mercury.
- The range of a laboratory thermometer is generally from -10°C to 110°C.

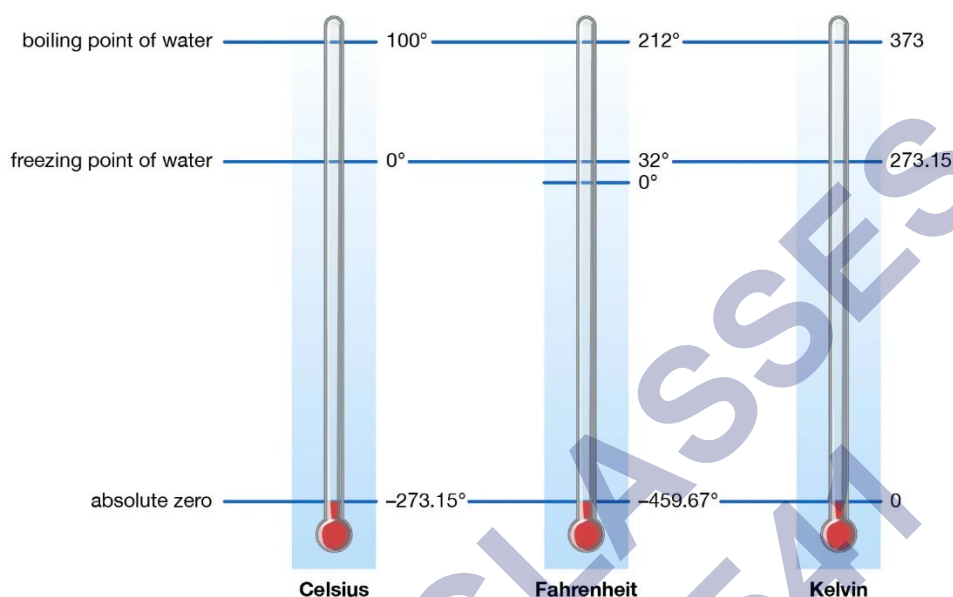
Maximum-Minimum Thermometer

- A maximum-minimum thermometer is used to measure the daily temperature in order to prepare weather reports.

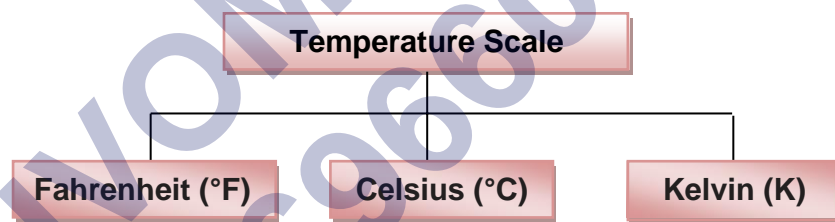


Scales of Temperature

- A reference scale with respect to which the temperatures can be measured is known as the scale of temperature.

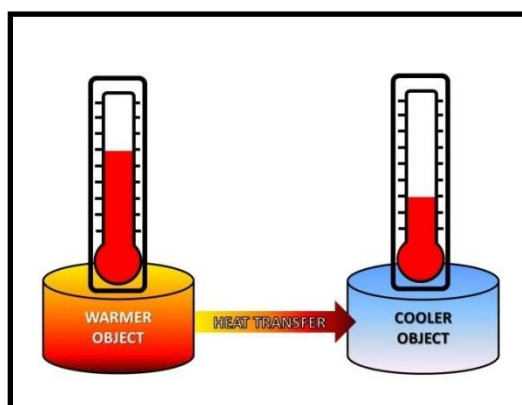


- There are different scales of temperature.

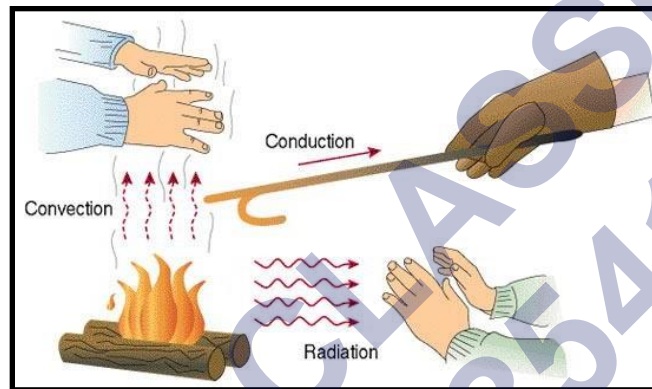
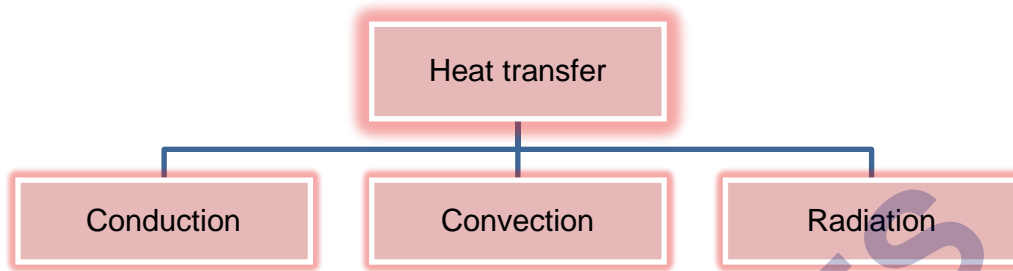


Transfer of Heat

- Heat is transferred from a body at a higher temperature to a body at a lower temperature, i.e. heat flows from a hot object to a cold object.

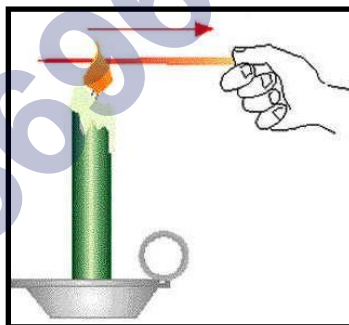


- The fundamental modes of heat transfer are conduction, convection and radiation.



Conduction

- Conduction is the process by which heat is transferred from the hotter end of an object to the colder end of the object.



- Conductors of heat:

- Materials which allow heat to pass through them easily are called conductors.
- Metals are good conductors of heat.
- Examples: Aluminium, iron, copper, silver etc.

- Insulators or bad conductors of heat:

- Materials which do not allow heat to pass through them easily are called insulators.

- They are also known as poor or bad conductors of heat.
- Examples: Plastic, wood, glass, rubber etc.

➤ Applications of good and bad conductors of heat in our day-to-day activities:

- Boilers in industries and cooking utensils are usually made of metals which allow heat to flow quickly through the vessel for faster boiling and cooking.
- Mercury is used as a thermometric liquid as it is a good conductor of heat.
- Wood and plastic are bad conductors of heat; so, they are used as handles of cookware.

Convection

- Convection is the transfer of heat by the movement of particles of a medium from one place to another.
- It occurs only in liquids and gases.
- Examples: Wind currents, the lower floor of a building is cooler than the upper floor, and the atmosphere at the seashore is always pleasant because of convection.

Radiation

- Radiation is the transfer of heat which does not require a medium.
- All hot bodies emit heat by the process of radiation.
- We get heat from the Sun because of radiation as there is no medium present between the atmosphere of the Earth and the Sun.

Examples:

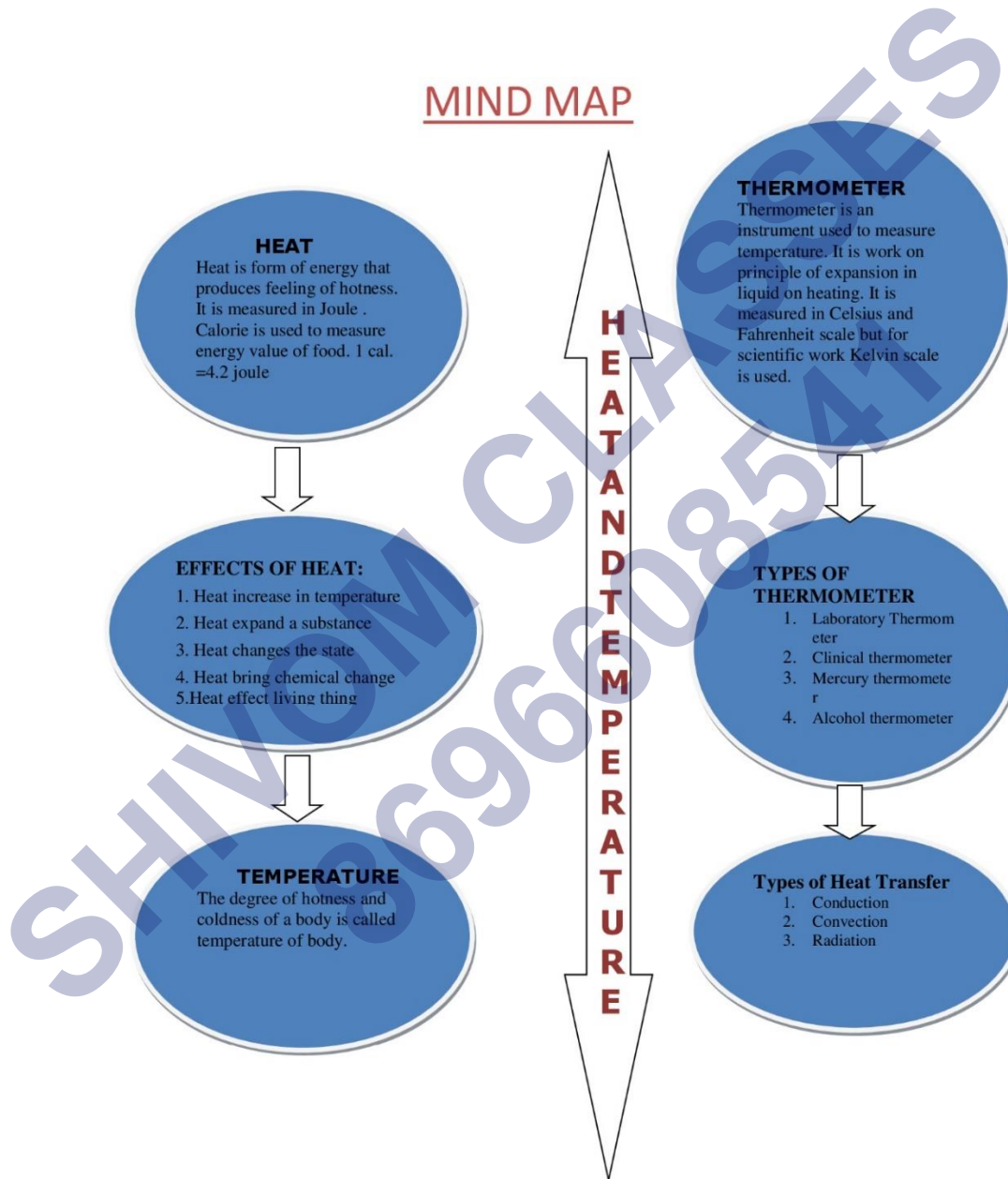
- When we sit near a room heater, we get warmth by the process of radiation.
- A hot utensil kept away from the flame cools down as it transfers heat to the surroundings by radiation.
- Our body produces heat and receives heat from the surroundings by radiation.

SUMMER AND WINTER CLOTHING:

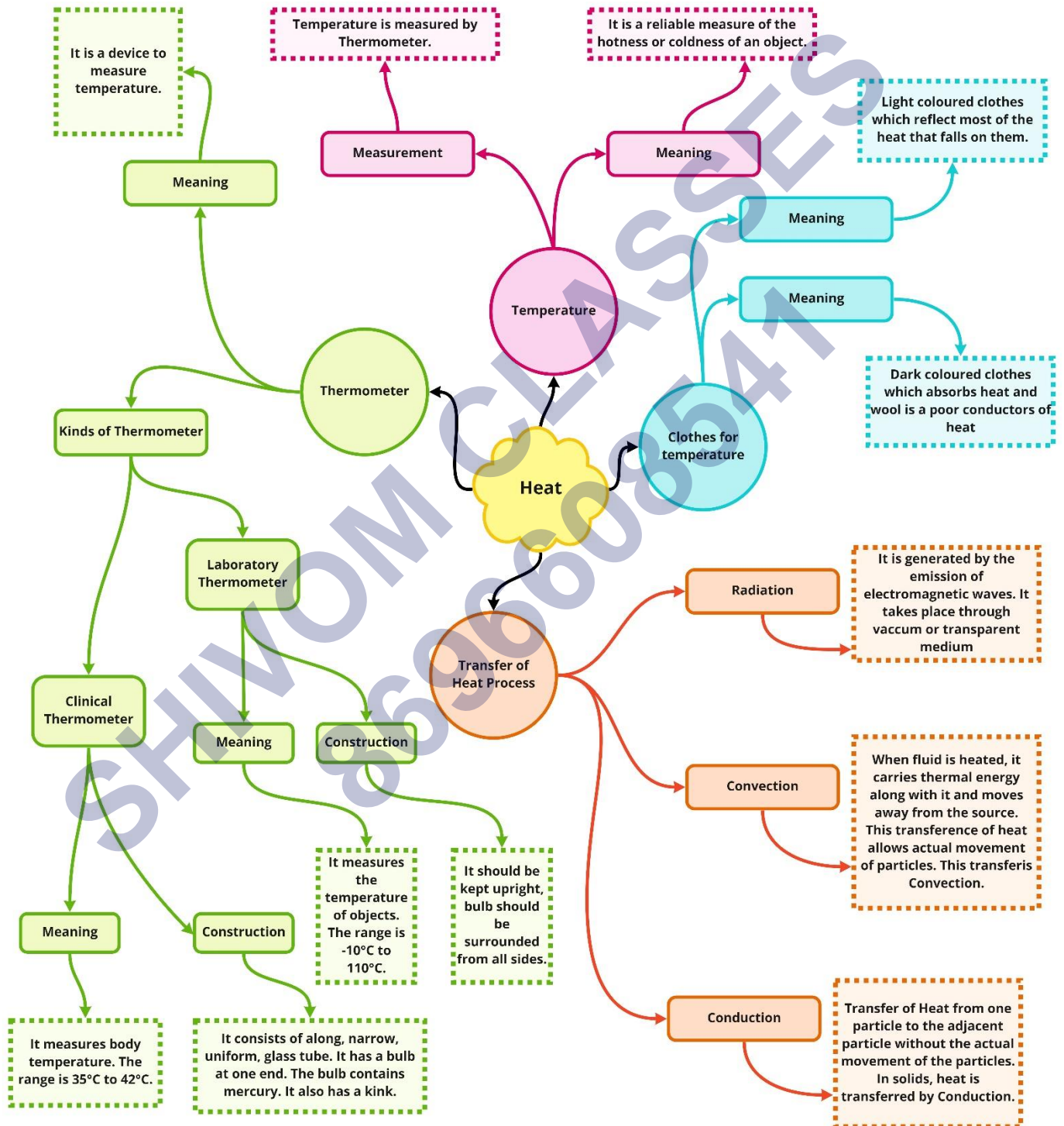
- Light colors reflect most of the heat falling on it, hence it is advised to wear light colors in summer
- On the other hand, darker colors absorb most heat and helps us keep warm in the winter

season.

- In recent times, hollow bricks are used for construction as they trap layers of air to keep the houses cool.



Class : 7th Science
Chapter-4: Heat



Important Questions

➤ Multiple Choice Questions:

Question 1. Which of the following is a good conductor of heat?

- (a) Iron
- (b) Steel
- (c) Aluminium
- (d) All of these

Question 2. A device used to measure the temperature is

- (a) transistor
- (b) thermometer
- (c) mercury
- (d) none of these

Question 3. Which of the following thermometers has a kink?

- (a) Laboratory thermometer
- (b) Clinical thermometer
- (c) Both (a) and (b)
- (d) Digital thermometer

Question 4. What is the range of the temperature reading of a clinical thermometer?

- (a) $35^{\circ}\text{C} - 42^{\circ}\text{C}$
- (b) $-10^{\circ}\text{C} - 110^{\circ}\text{C}$
- (c) $0^{\circ}\text{C} - 100^{\circ}\text{C}$
- (d) $32^{\circ}\text{C} - 42^{\circ}\text{C}$

Question 5. Which of the following thermometer contains mercury?

- (a) Clinical thermometer
- (b) Laboratory thermometer
- (c) Both (a) and (b)
- (d) None of these

Question 6. What is the range of the temperature reading of a laboratory thermometer?

- (a) $-10^{\circ}\text{C} - 110^{\circ}\text{C}$
- (b) $35^{\circ}\text{C} - 42^{\circ}\text{C}$
- (c) $0^{\circ}\text{C} - 100^{\circ}\text{C}$

(d) $-10^{\circ}\text{C} - 100^{\circ}\text{C}$

Question 7. The transfer of heat from hotter body to colder body is called

- (a) conduction
- (b) induction
- (c) convection
- (d) radiation

Question 8. The process of transferring of heat without any contact between the source of heat and the heated object is called

- (a) conduction
- (b) convection
- (c) radiation
- (d) induction

Question 9. The normal temperature of human body is

- (a) 35°C
- (b) 37°C
- (c) 40°C
- (d) 42°C

Question 10. The materials which allow the heat to pass through them easily are called

- (a) insulators
- (b) conductors
- (c) semiconductors
- (d) poor conductors

Question 11. Which of the following is an insulator?

- (a) Wood
- (b) Iron
- (c) Copper
- (d) Zinc

Question 12.

The air from the sea is called

- (a) sea breeze
- (b) land breeze

- (c) wind
- (d) none of these

Question 13. Which colour absorbs more heat?

- (a) Black
- (b) White
- (c) Blue
- (d) Red

Question 14. What is the SI unit of temperature?

- (a) Kelvin
- (b) Celsius
- (e) Fahrenheit
- (d) None of these

Question 15. Which one is filled in the bulb of a thermometer?

- (a) Mercury
- (b) Lead
- (c) Copper
- (d) Silver

➤ **Fill In the Blanks:**

1. A reliable measure of the hotness of an object is known as
2. is used to measure the hotness or coldness of our body.
3. Boiling and melting point of water is and respectively.
4. The transfer of heat from hotter body to colder body is called
5. The normal temperature of human body is °C.
6. is a good conductor of heat.

➤ **True or False:**

1. We wear white clothes in summer to radiate heat from the body.
2. Sea breeze and land breeze occur due to convection currents set up in the air.
3. The heat from sun reaches us through convection.
4. Conduction is a process of heat transfer in which vibrating particles give energy to the neighbouring ones.
5. A reliable measure for the hotness of an object is called Kelvin.

6. The thermometer used to measure the temperature of our body is called a clinical thermometer.

➤ **Very Short Question:**

1. Define temperature.
2. Name the device used to measure temperature.
3. Name the two types of thermometer.
4. What do you mean by clinical thermometer?
5. What is the unit of temperature as adopted by India?
6. What is the average body temperature of a healthy person?
7. What is the range of laboratory thermometer?
8. What is the use of kink in a clinical thermometer?
9. Give an example to show the transfer from heat from one body to another.
10. Give examples of conductors.

➤ **Short Questions:**

1. Define heat.
2. Define temperature. What is its unit?
3. What is the use of the maximum – minimum thermometer?
4. Why does the mercury not fall or rise in a clinical thermometer when taken out of the mouth?
5. Why clinical thermometer ranges from 35°C to 42°C ?
6. What is conduction?
7. Why conduction is only possible in solids?
8. How does the heat from the sun reach us?

➤ **Long Questions:**

1. Explain how water heated by convection?
2. What is the Relation between Celsius, Fahrenheit and Kelvin scales?
3. State similarities between the laboratory thermometer and the clinical thermometer.
4. State differences between laboratory thermometer and clinical thermometer.

✓ Answer Key-

➤ Multiple Choice Answers:

1. (d) All of these
2. (b) thermometer
3. (b) Clinical thermometer
4. (a) $35^{\circ}\text{C} - 42^{\circ}\text{C}$
5. (c) Both (a) and (b)
6. (a) $-10^{\circ}\text{C} - 110^{\circ}\text{C}$
7. (a) conduction
8. (c) radiation
9. (b) 37°C
10. (b) conductors
11. (a) Wood
12. (a) sea breeze
13. (a) Black
14. (a) Kelvin
15. (a) Mercury

➤ Fill In the Blanks:

1. temperature
2. Thermometer
3. 100°C , 0°C
4. conduction
5. 37
6. Iron

➤ True or False:

1. False
2. True
3. False
4. True
5. False

6. True

➤ Very Short Answers:

1. Answer: A reliable measure of hotness of the hotness of an object is its temperature
2. Answer: Thermometer.
3. Answer: Clinical thermometer and laboratory thermometer.
4. Answer: Thermometer means to measure our body temperature is called clinical thermometer.
5. Answer: Degree Celsius ($^{\circ}\text{C}$)
6. Answer: 37°C
7. Answer: -10°C to 110°C
8. Answer: Kink prevents mercury level from falling on its own.
9. Answer: Any utensil kept on flame, becomes hot because heat transfers from flame to the utensil.
10. Answer: Aluminium, copper, iron etc.

➤ Short Answer:

1. Answer: Heat is a form of energy, entry or exit of which correspondingly increases or decreases internal energy of a body when no work is done on the body or by the body. It is measured in joule or calories.
2. Answer: A reliable measure of the hotness of an object is its temperature. Temperature is measured by a device called thermometer. Unit of temperature is degree Celsius ($^{\circ}\text{C}$), Fahrenheit and Kelvin (SI unit).
3. Answer: Different types of thermometers are used for different purposes. The maximum and minimum temperatures of the previous day, reported in weather reports, are measured by a thermometer called the maximum – minimum thermometer.
4. Answer: Kink prevents mercury level from falling on its own.
5. Answer: The normal temperature of human body is 37°C . The temperature of human body normally does not go below 35°C or above 42°C . That is the reason that a clinical thermometer has the range 35°C to 42°C .
6. Answer: Heat flows from a hotter object to a colder object. The process by which heat is transferred from the hotter end to the colder end of an object is known as conduction.
7. Answer: In solids, generally, the heat is transferred by the process of conduction because particles of solids are closely packed and heat is transferred from the hotter end to the colder end of an object.
8. Answer: It cannot reach us by conduction or convection as there is no medium such as air in

most part of the space between the earth and the sun. From the sun the heat comes to us by a different process known as radiation which does not require any medium for heat transfer.

➤ Long Answer:

1. Answer: The water is poor conductor of heat so do not heated by conduction. When water is heated, the water became lighter. Hot water rises up. The cold water from the sides moves down towards the source of heat. This water also gets hot and rises upward and water from the sides moves down. This process continues till the whole water gets heated. This mode of heat transfer is known as convection.
2. Answer: Since the range of temperature from ice-point to steam-point is equal in all the three scales, 100 centigrade degrees = (212 – 32) or 180 Fahrenheit degrees = (373 – 273) or 100 absolute degrees. We consider three thermometers in the above three scales are dipped simultaneously in a liquid of certain temperature. Let the temperatures recorded in the Celsius, Fahrenheit and Kelvin thermometers respectively be C, F and K. Now it can be proved that $C / 5 = F - 32 / 9 = K - 273 / 5$.
3. Answer:
 - i. Laboratory thermometer and the clinical thermometer consist of a long, narrow, uniform glass tube.
 - ii. Laboratory thermometer and the clinical thermometer have a bulb containing mercury at the end of the tube.
 - iii. Laboratory thermometer and the clinical thermometer are marked with Celsius scale on the glass tube.
4. Answer:

Clinical thermometer	Laboratory thermometer
It is used to measure the temperature of human body only	It is used to measure the temperature of different objects in laboratory and factories
It has temperature range from 35°C. to 42°C.	It has temperature range from -10°C to 110°C.
It has a small constriction near the mercury bulb	Usually, it does not have any constriction
It can be tilted while taking reading	It has to be kept upright while taking the reading