



Class - VII Science August Month Notes

## 7. Temperature and Heat

### I. Technical Words:

1. Temperature - the degree of hotness or coldness of an object
2. Thermometer - the instrument to measure temperature
3. conduction - the flow of heat from a hot object to a cooler object in contact With each other or from the hotter part of a body to a colder part, without the movement of the particles
4. convection - the process by which heat is transferred by the movement of molecules in Fluids
5. radiation - the process by which heat is transferred from a hot object to a cold object without the help of a medium

### II. Short answer question

1. Name two liquids that are commonly used in a thermometer.

[Answer] Mercury and alcohol.

2. Convert the following temperatures from °C to °F.

- a. 40
- b. 100
- c. 36

a. 40 °C

$$\begin{aligned} F &= [(9/5) \times C] + 32 \\ &= [(9/5) \times 40] + 32 \\ &= 104 ^\circ\text{F} \end{aligned}$$

b. 100 °C

$$\begin{aligned} F &= [(9/5) \times C] + 32 \\ &= [(9/5) \times 100] + 32 \\ &= 212 ^\circ\text{F} \end{aligned}$$

c. 36 °C

$$\begin{aligned} F &= [(9/5) \times C] + 32 \\ &= [(9/5) \times 36] + 32 \\ &= 96.8 ^\circ\text{F} \end{aligned}$$

3. Convert the following temperatures from °F to °C.

- a. 0
- b. 212
- c. 32

a. 0 °F

$$C = 5/9 (F - 32)$$

$$= 5/9 (0 - 32)$$

$$= -17.78 ^\circ\text{C}$$

b. 212 °F

$$C = 5/9 (F - 32)$$

$$= 5/9 (212 - 32)$$

$$= 90 ^\circ\text{C}$$

c. 32 °F

$$C = 5/9 (F - 32)$$

$$= 5/9 (32 - 32)$$

$$= 0 ^\circ\text{C}$$

4. Why are solar cookers painted black on the inside?

The black coating on the solar cooker absorbs the maximum heat when kept under the Sun. This helps to cook food faster.

5. Explain any three effects of heat with example.

The three effects of heat are: (i) When a body is heated, it undergoes a chemical change. For example, when paper is burnt, it changes to ash along with release of heat and gas. (ii) Most materials expand when they are heated and contract on cooling. For example, to fix an iron wheel on a wooden wheel, the iron ring is heated. This expands the ring and once cooled, it contracts and fixes itself on the wooden wheel. (iii) On heating an object, its temperature increases. For example, milk kept in a container when heated will have a higher temperature than milk at room temperature.

### III. Long answer question

1. Draw the labelled diagram of a clinical thermometer and explain the workings of each part.

A clinical thermometer has a case made of clear glass or plastic with markings on it in degree Celsius and Fahrenheit. One end of the case has a bulb that contains mercury which is used to measure the temperature. Inside the case is a capillary tube. The tube has a constriction or a kink. This stops the liquid from slipping back into the bulb before the temperature is read. (Diagram: Refer to the textbook.)

2. Describe the differences between Centigrade and Fahrenheit scale and explain how they are interchangeable.

Difference between Centigrade and Fahrenheit scale.

Centigrade scale	Fahrenheit scale
The °C symbol is used as the unit.	The °F symbol is used as the unit.
The upper and lower fixed point is 100 °C and 0 °C, respectively.	The upper and lower fixed point is 212 °F and 32 °F, respectively.
The scale is divided into 100 degrees, between the upper and the lower fixed points.	The scale is divided into 180 degrees, between the upper and the lower fixed points.

To convert temperature from Fahrenheit to Celsius, the equation used is:  $C = \frac{5}{9}(F - 32)$

To convert temperature from Celsius to Fahrenheit scale, the equation used is:  $F = \left[\left(\frac{9}{5}\right) \times C\right] + 32$

3. Compare conduction, convection and radiation with examples.

[Answer] Comparison between conduction, convection and radiation.

Conduction	Convection	Radiation
Heat is transferred without the movement of particles.	Heat is transferred by the movement of molecules in fluids.	Heat is transferred without the help of a medium in the form of waves.
Takes place in solids.	Takes place in all fluids except mercury.	All objects radiate heat.
Heat transfer is slow.	Heat transfer is faster than in conduction.	Heat transfer is the fastest.
For example, transfer of heat to our hand when we touch warm water.	For example, when we heat water kept in a container over a burner.	For example, sitting around a bonfire. We can feel the radiating heat on our face.

4. Describe the working of a thermos flask with regard to minimisation of heat transfer with a labelled diagram.

Conduction, convection and radiation help to minimise heat losses in a thermos flask. The outer case of a thermos flask is made up of an insulating material such as plastic. The mouth of the flask is closed with a stopper made of another insulator such as cork or plastic and the flask resting on cork. These features minimise loss of heat due to conduction. The flask contains a double walled glass or metal bottle. A special technique is used to remove all the air from the narrow space between the inner and outer walls. Since there is no medium through which heat can travel, there is no loss of heat by conduction or convection. The inner side of the outer wall and the outer side of the inner wall are silvered or polished. This helps to reflect the heat back into the flask, thus reducing loss of heat through radiation. (Diagram: Refer to the textbook.)

5. Describe the flow of heat in the following instances.
- A cooking vessel becomes hot when kept on a flame.
  - Chocolate melts in our mouth.
  - A hot cup of tea is left in the open.
  - You bite a hot pakora.

a. When a cooking vessel is kept on a flame, the heat flows from the fire to the part of the vessel closest to the heat source. Once heated, the heat expands the molecules of the vessel. The molecules begin to vibrate faster and collide with the neighbouring molecules. Vibrations (energy) are passed from one molecule to another in the vessel. This causes the heat to spread through the vessel and it becomes hot.

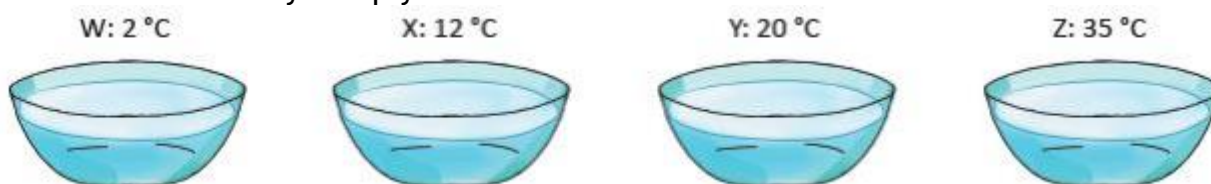
b. Chocolate melts in our mouth due to conduction. The heat from our body (mouth) flows to the chocolate, causing it to melt.

c. When a hot cup of tea is left in the open, the heat of the tea is transferred to its surrounding air, which is colder than the hot tea.

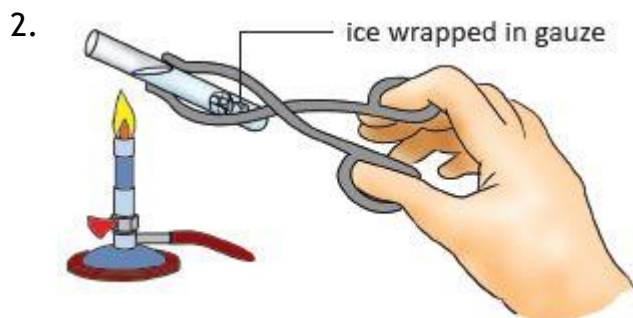
d. When we bite into the hot pakora, heat transfers from the pakora to our mouth through the process of conduction.

#### IV. Picture-based question.

1. Four basins contain water at different temperatures. You dipped your hand into one of the basins and then held it under running tap water at  $25^{\circ}\text{C}$ . Your hand felt cold. Into which container did you dip your hand?



[Answer] Hand was dipped in container Z ( $35^{\circ}\text{C}$ ).



Observe the figure. When does the ice melt faster, when the test tube is heated at the top or at the bottom? Explain your answer.

Ice will melt faster when the test tube is heated at the bottom. Heat will be transferred to the part of the test tube closest to the heat source through conduction. Once heated, the heat will transfer to the water molecules closer to the heated part of the test tube. The heat from the water in the tube has to be transferred to the ice for it to melt. Water gets heated by the process of convection. When the test tube is heated at the bottom, the water molecules there get heated and move up. The cooler water molecules move downwards. Then they too get heated and move up. In this way, all the water in the test tube gets heated and causes the ice to melt.

#### VI. Assertion and Reasoning Type Questions :

Assertion and reasoning type questions .

The question below consists of an assertion and a Reason. Use the following key to choose the appropriate answer.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true

1.Assertion (A): A clinical thermometer has a scale in the range of  $37^{\circ}\text{C}$  to  $45^{\circ}\text{C}$

Reason (R): The normal temperature of human body is  $37^{\circ}\text{C}$

Ans - (d) A is false but R is true

2.Assertion (A): Radiation is a method of transfer of heat.

Reason (R): The process of heat transfer that does not require any medium is called convection.

Ans - (c) A is true but R is false.