INDEX

1 HEAT

WISE UP

- Heat is a form of energy.
- Heat flows from hot objects to cold objects.
- Heat flows from one object to other due to its temperature difference.
- The cold object obsorbs the heat energy become warm.
- The hot object release the heat energy and become cold.

- All the objects are made of molecules, and these molecules always are in motion.
- When the objects heated, the molecules in object move faster. Due to this temperature rises.
- The degree of hotness or coldness of a body is called temperature.
- We can increase the temperature in the following examples.
  - Drilling holes on a metal tube using a driller.
  - Rubbing palms one against each other.
  - Dissolving limestone in water.
- We can decrease the temperature in the following examples.
  - Adding glucose to the water.
  - When a spray or perfume or spirit is taken in a palm.
  - When a mint (or) camphor add to water.
- The effects of heat energy are
  - Rise in temperature
  - Fire
  - Change of state
  - Expansion
  - Chemical and biological change.

NCERT TEXTUAL QUESTIONS

1. State similarities and differences between the laboratory thermometer and the clinical thermometer.

A. **Similarities :**

i) Both are used to note the temperature.

ii) Both are made up of long narrow uniform glass tube with a bulb at one end.

iii) Mercury is used in both thermometers

iv) Both are marked in celsius scale.

Differences :

i) Laboratory thermometer is larger and broader in size as compared to clinical thermometer

ii) Laboratory thermometers are marked from – 10°C to 110°C while clinical thermometers are marked from 35°C to 42°C only.

iii) Laboratory thermometers are used to note the temperature of different objects in different states while clinical thermometer is used only to note temperature of human beings.

iv) There is no kink in laboratory thermometer but there is kink in clinical thermometer to prevent mercury level from falling on its own

v) While noting the readings of laboratory thermometer, it has to be in touch with the object whose temperature is to be noted but in clinical thermometer, temperature is seen when it is outside the body.

2. Give two examples each of conductors and insulators of heat.

A. **Examples of conductors :** Aluminium, iron, copper, etc.

Examples of Insulators : Water, Air, etc.

3. Assess the following :

a) How hot an object is determined by its hotness or coldness.

b) Temperature of boiling water cannot be measured by clinical thermometer.

c) Temperature is measured in degree of hotness (or) coldness.

d) No medium is required for transfer of heat by the process of radiation.

e) A cold steel spoon is dipped in a cup of hot milk. It transfer heat to its other end by the process of conduction.

f) Clothes of dark colours absorb heat better than clothes of light colour.

4. Match the following :

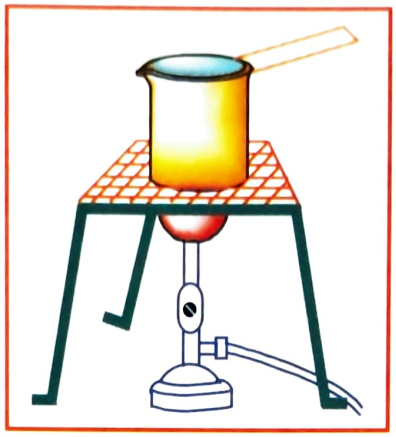
i)	Land breeze blows during	a)	Summer
ii)	Sea breeze blows during	b)	Winter
iii)	Dark coloured clothes are prefered during.	c)	Day
iv)	Light coloured clothes are prefered during.	d)	Night

A. i) d ii) c iii) b iv) a

5. **Discuss why wearing more layers of clothing during winter keeps us warm than wearing just one thick piece of clothing.**

A. Different layers of clothing traps air inside them. Air is a poor conductor of heat so it prevents the flow of heat from body to the cold surrounding and makes a body feel warm.

6. **Look at figure. Mark where the heat is being transfered by conduction, by convection and by radiation.**



A. **By conduction :** From lower surface to upper surface of the pan.
By convection : From lower box to the upper region of pan water.
By radiation : From flame to the bottom of pan.

7. **In places of hot climate, it is advised that the outer walls of houses be painted white. Explain.**

A. Light coloured surface reflects most of heat that falls on them which results the surface remains cool. So, it is advised to paint outer walls of houses white in places of hot climate.

8. **One litre of water at 30°C is mixed with one litre of water at 50°C. The temperature of the mixture will be:**

a) 80°C **b) More than 50°C but less than 80°C**
c) 20°C **d) Between 30°C and 50°C**

A. d) Between 30°C and 50°C.

9. **An iron ball at 40°C is dropped in a mug containing water at 40°C. The heat will**

a) Flows from iron ball to water
b) Not flow from iron ball to water or from water to iron ball
c) Flows from water to iron ball
d) Increase the temperature of both

A. b) Not flow from iron ball to water or from water to iron ball.

10. **A wooden spoon is dipped in a cup of ice cream. Its other end.**

a) Becomes cold by the process of conduction
b) Becomes cold by the process of convection
c) Becomes cold by the process of radiation
d) Does not become cold

A. d) Does not become cold.

11. **Stainless steel pans are usually provided with copper bottoms. The reasons for this could be that.**

a) Copper bottom makes the pan more durable

b) Such pans appear colourful

c) Copper is a better conductor of heat than the stainless steel

d) Copper is easier to clean than the stainless steel

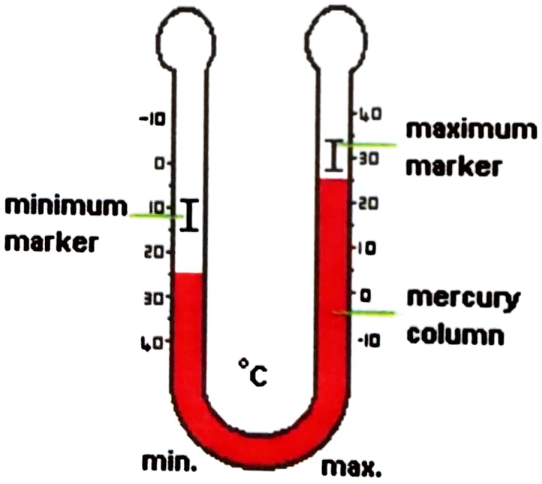
A. c) Copper is a better conductor of heat than the stainless steel.

ADDITIONAL QUESTIONS

VERY SHORT ANSWER QUESTIONS

1. **Name of the thermometer used for noting weather temperature ?**

A. Maximum - minimum thermometer



2. **Why is a thermometer jerked before taking temperature of a person ?**

A. To bring the mercury level below 35°C

3. **Which solution is used to wash thermometer before and after use ?**

A. Antiseptic Solution.

4. **Is it advisable to touch the bulb of thermometer while reading the scale ?**

A. No.

5. Why plastic handles are fixed to metallic pans ?

A. To prevent hand from burning.

6. What kind of clothes keep us warm in winter ?

A. Dark coloured clothes keep us warm in winter.

7. What is the use of the kink in clinical thermometer ?

A. It prevents mercury level from falling on its own.

8. What is the space above a mercury column in a thermometer filled with ?

A. It is originally a vacuum which may later contain some amount of mercury vapour in it.

9. Why is convection not possible in solids ?

A. The molecules of a solid are held strongly due to intermolecular forces. As these molecules cannot travel to the source of heat energy hence convection is not possible in case of solids.

SHORT ANSWER QUESTIONS

1. What are the main conditions necessary for the flow of heat ?

A. Conditions for the flow of heat are

i) The two substances should be in contact with each other.

ii) The temperature of both the substances should be different.

iii) The heat flows from hot bodies to cold bodies

2. Distinguish between heat and temperature.

A.

Heat	Temperature
i) It is a form of energy.	i) It gives the degree of hotness or coldness of a body.
ii) It is cause to raising the temperature of a body.	ii) It is the effect of heat given to a body.
iii) Its SI unit is joule (J).	iii) Its SI unit is kelvin (K).
iv) It is measured with calorimeter.	iv) It is measured with thermometer.

3. How woollen clothes keep us warm in the winter ?

A. In the winter, we use woolen clothes because wool is a poor conductor of heat. Moreover, there is air trapped in between the wool fibres. This air prevents the flow of heat from our body to the cold surroundings so, we feel warm.

4. How does the heat travel in air ? In which direction does the smoke go ?

A. The air near the hot source gets heated up and becomes less dens. Then this hot air rises up and cool air from sides occupies its space.

Smoke is always goes upward, along with hot air.

5. Can a mercury thermometer be used to measure temperature in the Arctic and Antarctic regions?

A. No, Mercury thermometer cannot be used in such regions that have extremely low temperature. Instead of that alcohol thermometers are used in such areas since the freezing point of mercury is – 39°C and that of alcohol is – 112°C.

LONG ANSWER QUESTIONS

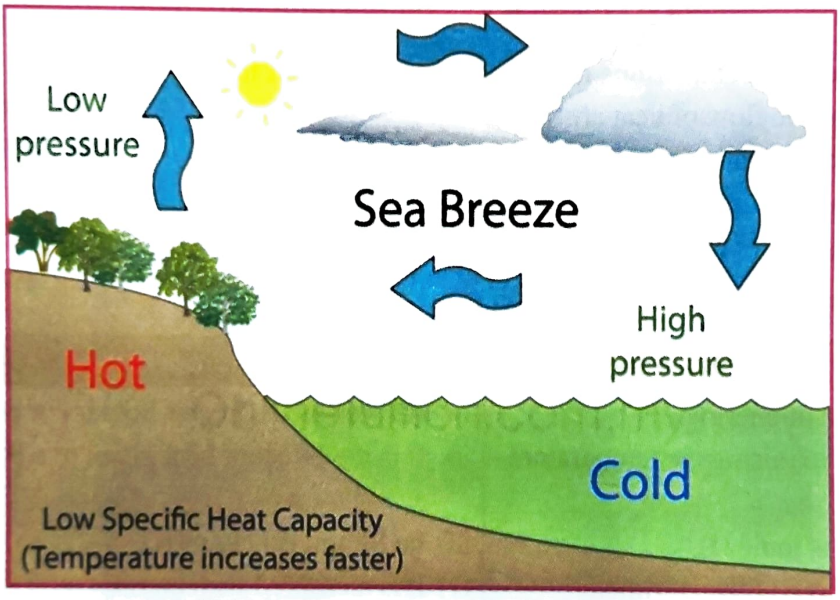
1. Differences between radiation, conduction and convection.

A.

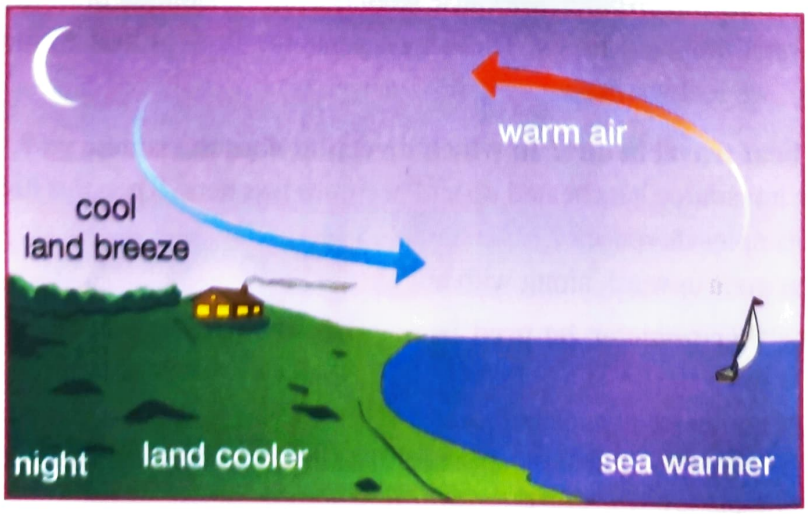
Radiation	Conduction & Convection
i) No medium is needed.	i) A medium is needed.
ii) Heat energy is transfered in the form of electromagnetic waves.	ii) In conduction, heat energy is transfered from particle to particle but in convection heat energy is transfered by the transfer of matter.
iii) It is a fast mode of heat transfer.	iii) It is a slow mode of heat transfer.

2. Define sea breeze and land breeze.

A. **Sea breeze :** In the coastal areas, during the day time, the land air becomes hot and rises up. The cool air from the sea rushes towards the land. The hot air move from land to sea to complete the cycle such phenomenon is called sea breeze.



Land breeze : At night, the water cools down more slowly than the land. So the cool air, from the land moves towards the sea. This process is called land breeze.



3. **Explain the term 'Heat'**

A. **Heat :**

i) It is a form of energy that flows from one object to another when there is a difference in temperature between the objects.

ii) It is total amount of internal energy of the molecules of a body.

iii) As a result of heat exchange between two bodies, total amount of heat of two bodies remains unchanged.

iv) SI unit is (J) joule.

4. **What are conductors and insulators ? Give examples ?**

A. **Conductors :** The materials which allow heat to pass through them easily are called conductors of heat.

Ex : All metal objects (aluminium, iron and copper) etc.

Insulator : The materials which donot allow heat to pass through them easily are called poor conductors (or) insulators

Ex : Plastic and wood etc.

5. **Give an experiment to show that black bodies are good absorbers and good radiators ?**

A. **Experiment :** Take two tin cans of the same size.

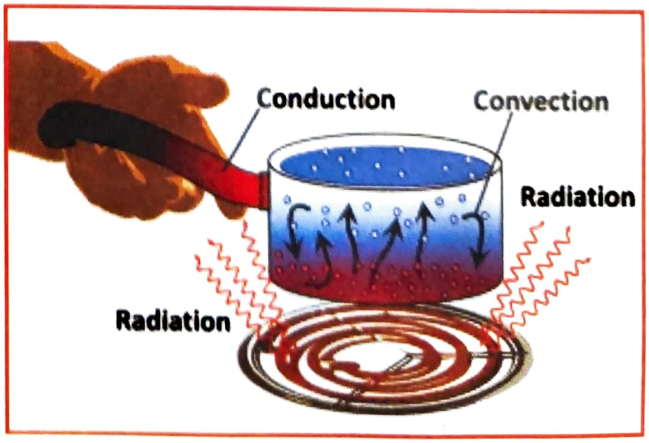
Paint one of them with black and put equal amount of water in each can. Now place them in the sun for about an hour. When we touch the water in the tin cans we find that the water in the black tin has becomes warmer than that in the other tin. Since size of the tins are same, this shows that black body has absorbed more heat radiations than the other one.

You can also do the reverse experiment by taking equal amounts of water in the dark had cooled down more. Thus, we conclude that black bodies are good absorbers and also good radiators of heat.

6. **What are different modes of transfer of heat ?**

A. **Conduction :** The process by which heat transferred from the hotter end to the colder end of an object is known as conduction

Convection : The phenomenon due to which particles of a medium actually move to the source of heat energy and on absorbing the heat energy move away from it, there by making a space for the other particles to move to the source of heat, is called convection.



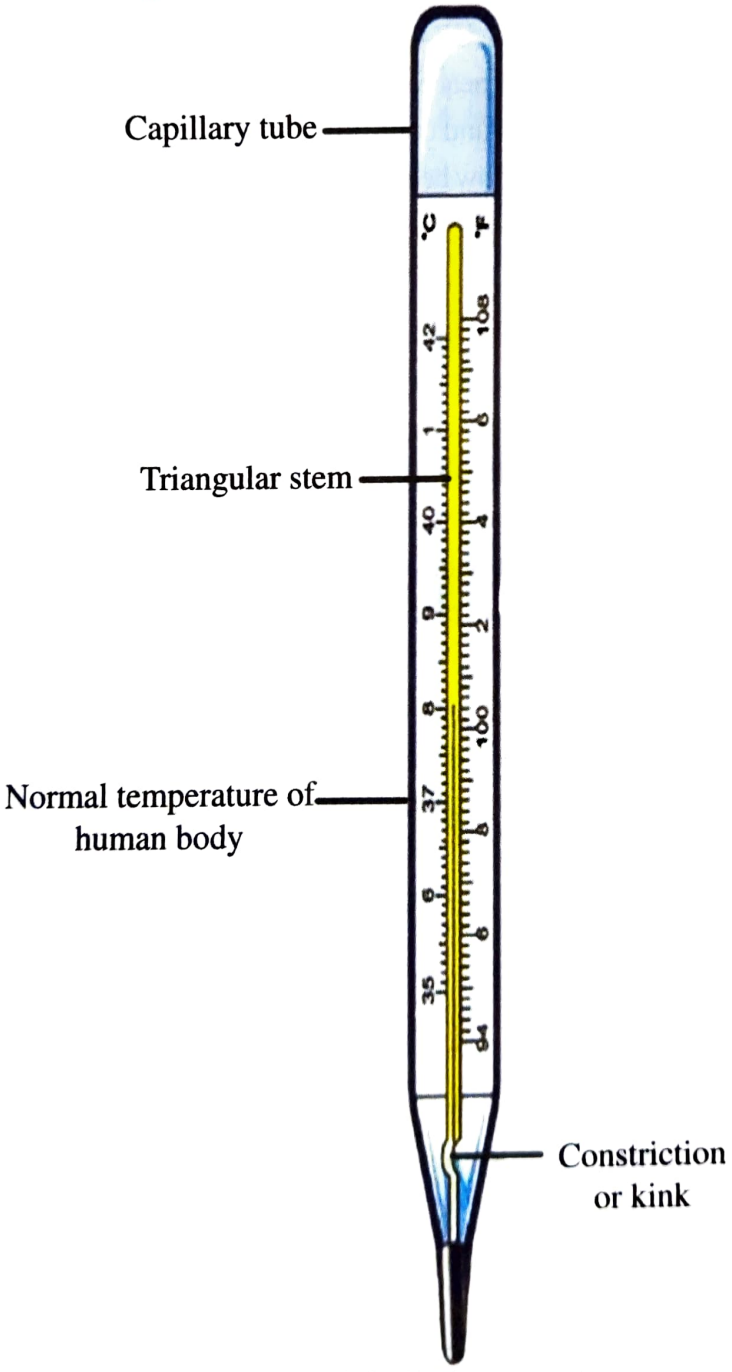
Radiation : The transfer of heat energy from a hot body to a cold body directly, without heating the space in between the two bodies, is called radiation.

7. What precautions to be observed while reading a clinical thermometer ?

A. i) Thermometer should be washed before and after use, preferably with an antiseptic solution.
ii) Ensure that before use the mercury level is below 35°C.
iii) Read the thermometer keeping the level of mercury along the line of sight.
iv) Handle the thermometer with care. If it hits against some hard object, it can break.
v) Don't hold the thermometer by the bulb while reading it.

8. Draw a neat labelled diagram of clinical thermometer ?

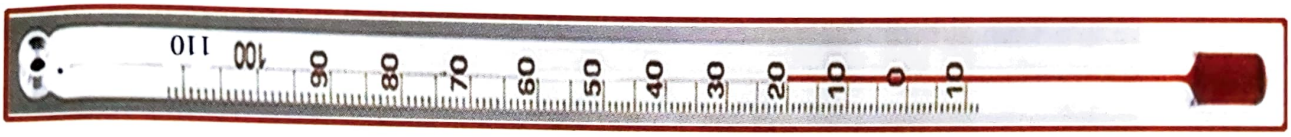
A.



A clinical Thermometer

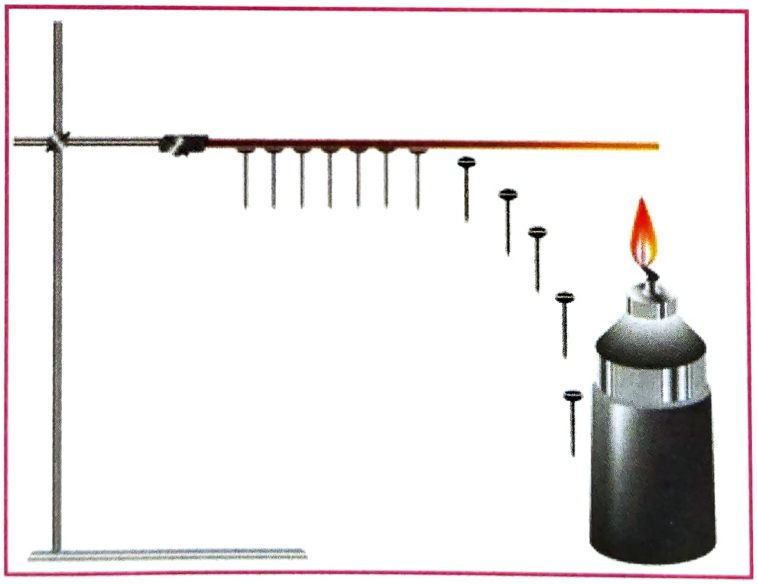
9. What are the precautions to be observed while reading a laboratory thermometer.

A. i) Thermometer should be kept upright not tilted.
ii) Thermometer bulb should be surrounded from all sides by the substance of which the temperature is to be measured.
iii) The bulb should not touch the surface of the container.
iv) Read the thermometer keeping the level of mercury along the line of sight.
v) Handle the thermometer with care. If it hits against some hard object, it can break.
vi) Don't hold the thermometer by the bulb while reading it.



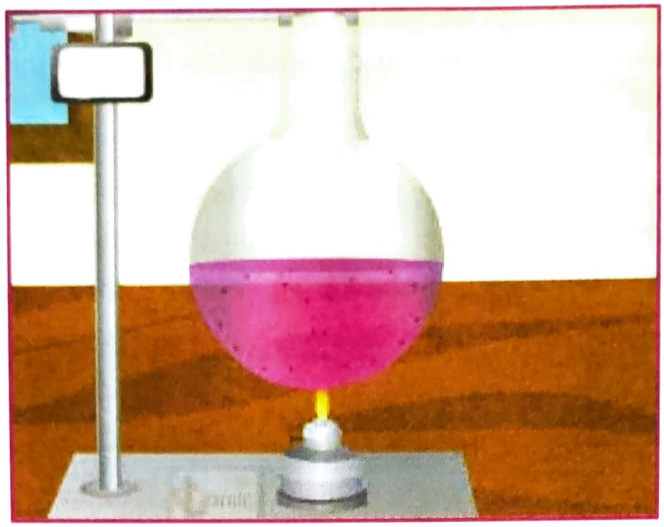
10. Explain the conduction phenomenon in solids with help of an activity

A. i) Take a rod or flat strip of a metal, say of aluminium or iron.
ii) Fix a few small wax pieces on the rod. These pieces should be at nearly equal distances
iii) Clamp the rod to a stand.
iv) Heat the other end of the rod and observe.
v) We find that the wax piece which is nearer to the flame is falls first.
vi) The process by which heat is transferred from the hotter end to the colder end of an object is known as conduction.



11. Explain the convenction phenomenon in liquids with help of an activity

A. i) Take a round bottom flask. Fill it two-third part with water.
ii) Place it on a tripod stand.
iii) Place a crystal of potassium permanganate at the bottom of the flask gently using a straw.
iv) Now, heat the water just below the crystal.
v) We find that the purple coloured water is moving up.
vi) When water is heated hot water rises up.The cold water from the sides moves down.
vii) This process continues till the whole water gets heated. This mode of heat transfer is known as convection.



QUICK REVIEW

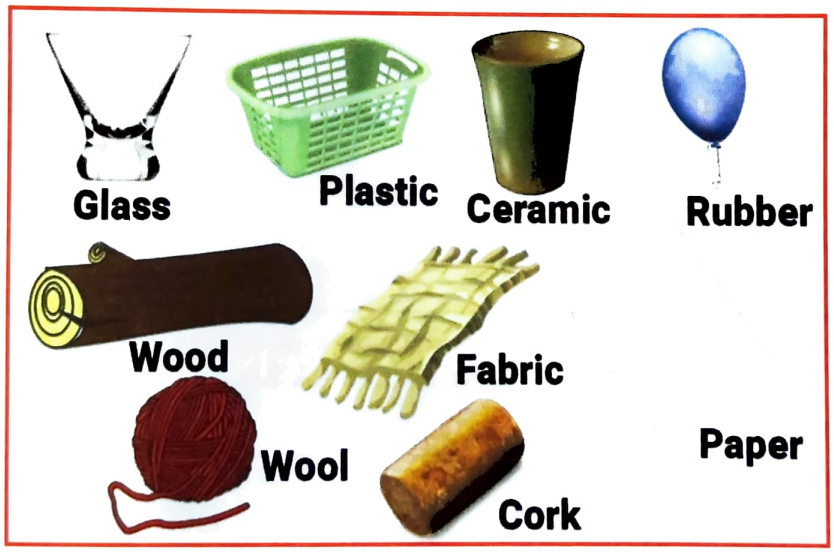
- **Heat :** Heat is a form of energy which causes the sensation of hotness or coldness.
- Heat flow from hotter object to a colder object.
- Heat is the sum of potential and kinetic energy of all the molecules of matter.
- **Temperature :** The degree of hotness or coldness of substance is called temperature.
- **Thermometer :** Temperature is measured by a device called thermometer.
- Clinical thermometer measures the temperature of our body marked on it is in celsius scale.
- Mercury is filled in clinical thermometer and the scale marked on it is in celsius scale.
- Mercury has low specific heat capacity.
- **Clinical thermometer :** The thermometer that measure our body temperature is called a clinical thermometer.
- A clinical thermometer has scale range from 35° C to 42° C (or) 94°F to 108°F.
- The normal temperature of human body is 37°C (or) 98.4°F
- Laboratory thermometer is used to measure the temperature of objects.
- Laboratory thermometer has scale range from – 10°C to 110°C.
- Always read a thermometer when its mercury thread becomes steady.
- **Principle of thermometer :** It is based on the fact that liquid expands on heating and contracts on cooling.
- Three ways in which heat flow from one object to another object. They are conduction, convection and radiation.
- In solids, heat is transfered by conduction
- In liquids and gases heat is transfered by convection
- No medium is needed for transfer of heat by radiation
- Woollen clothes keep us warm during winter.
- Air is a poor conductor of heat.

- Dark coloured objects or black bodies absorb heat radiations better and rapidly than light coloured or bright coloured bodies.
- The kink prevents mercury level from falling on its own.
- **Good conductors :** The materials which allow heat to flow through them easily are called conductors or good conductors of heat.

  Ex : Silver, Copper, Iron etc.

- **Bad conductors :** The materials which do not allow heat to flow through them are called bad conductors or Insulators.

  Ex : Plastic, Wood, Paper, Cork .....



- During the day, the land gets heated faster than the water. The air over the land becomes hotter and rises up. The cool air from the sea is move towards land is called the **sea breeze.**
- During the night time, the water cools down more slowly than the land. So, the cool air from the land moves towards the sea is called the **land breeze**.

ANALYSE AND APPLY

1. Heat is the form of energy which causes the sensation of _____ or _____.
2. The degree of hotness (or) coldness is called _____.
3. _____ clothes keep us warm during winter.

4. Liquids expand on _____ and contracts on _____.
5. Heat flow from hotter body to colder body (T/F).
6. Air is poor conductor (T/F).
7. Mercury has low specific heat (T/F).
8. Laboratory thermometer is used to measure the temperature of human body (T/F).

9.

Column - I	Column - II
i) Laboratory thermometer	p) joule
ii) Clinical thermometer	q) kelvin
iii) Heat	r) 35°C to 42°C
iv) Temperature	s) -10°C to 110°C

10.

Mode of transfer of heat	Nature of medium required	Example in daily life
i) Conduction	_____	_____
ii) Convection	_____	_____
iii) Radiation	_____	_____

OBJECTIVE EXERCISE

Multiple choice questions :

1. The range of clinical thermometer [ ]
   a) 40°C to 42°C b) 35°C to 42°C c) – 10°C to 110°C d) 10°C to 110°C
2. The normal temperature of a human body in celsius scale [ ]
   a) 35°C b) 42°C c) 37°C d) 110°C
3. The bulb of clinical thermometer is filled with [ ]
   a) Water b) Air c) Ice d) Mercury
4. S.I unit of temperature [ ]
   a) K b) °F c) °C d) °R
5. Ventilation in room is due to [ ]
   a) Conduction b) Convection c) Radiation d) Both (a) & (b)
6. Examples of conductors [ ]
   a) Copper, wood b) Copper, plastic c) Copper, iron d) Water, wool

7. Convection occurs in [ ]
a) Liquids b) Solids c) Gases d) Both (a) & (c)

8. Sea breeze occurs during [ ]
a) Night time b) Day time c) Both (a) & (b) d) None of these

9. Solar energy reaches to us by a process [ ]
a) Conduction b) Convection c) Radiation d) Both (a) & (b)

10. Heat always flows. [ ]
a) Hot body to cold body
b) Cold body to hot body
c) High temperature of body to lower temperature of the body
d) Both (a) & (c)

11. Temperature is measured by a device called [ ]
a) Voltmeter b) Thermometer c) Ammeter d) Anemometer

12. The range of laboratory thermometer is [ ]
a) – 10°C to 110°C b) – 20°C to 120°C c) – 30°C to 130°C d) – 40°C to 140°C

13. Land breeze occurs during [ ]
a) Day time b) Night time c) Both (a) & (b) d) None of these

14. Woolen clothes keep us warm during [ ]
a) Summer b) Winter c) Both (a) & (b) d) None of these

15. When the temperature is raised, the molecular vibration [ ]
a) stops b) remain the same c) increases d) decreases

16. Which of these is the best conductor of heat? [ ]
a) water b) silver c) hydrogen gas d) wood

17. If two metals are in contact, heat can flow if and only if [ ]
a) they are of the same dimensions b) they are of different materials
c) they are at different temperature d) they are good insulators of heat

18. Mode of transfer of heat which requires no material medium is [ ]
a) conduction b) convection c) radiation d) condensation

19. When a substance is heated, its intermolecular space [ ]
a) increases b) decreases
c) remain the same d) first decreases and increases

20. Black bodies are [ ]
a) good absorbers and bad radiators of heat b) good absorbers and good radiators of heat
c) only good absorbers d) only good radiators

21. Mercury is used in liquid thermometers because it has [ ]
a) good conductor b) Low specific heat c) low melting point d) all the above

Assertion & Reason Tpye Questions :

22. **Assertion (A) :** The temperature of a body must rises whenever heat is supplied to the body.
Reason (R) : Temperature is a measure of the degree of hotness of a body. [ ]
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect
d) A is incorrect, R is correct

23. **Assertion (A) :** Mercury is used in clinical and laboratory thermometers [ ]
Reason (R) : Mercury does not wet the glass and has a high boiling point and low melting point.
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect
d) A is incorrect, R is correct

24. **Assertion (A) :** Handle of the pressure cooker is made of plastic [ ]
Reason (R) : Insulators are poor conductors of heat
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect
d) A is incorrect, R is correct

25. **Assertion (A) :** At night land breeze blows from water to land [ ]
Reason (R) : Land cools off faster than water and warm air rises up
a) Both A and R are correct and R is the correct explanation of A
b) Both A and R are correct but R is not the correct explanation of A
c) A is correct, R is incorrect
d) A is incorrect, R is correct

Olympiad Corner :

1. On one day, the science teacher noticed that two of the boys in a group of three have fever and one do not. Teacher asked them to check each other for fever with hand. Harshith felt that both Varshith and Sankar have fever. Varshith felt that one of them has fever. Then, the boy who is not suffering from fever is [ ]
a) Varshith b) Harshith c) Sankar d) can not say

2. Jyothi was prepared to measure the temperature of hot water with a clinical thermometer. It is wrong because [ ]
a) The clinical thermometer can read temperatures between 35 °C to 42 °C.
b) The temperature of hot water may be more than 42 °C.
c) If the clinical thermometer is put in hot water, mercury in it expands beyond the limit and thermometer may break.
d) All the above

3. We do jerk a clinical thermometer before we measure body temperature because [ ]
a) The kink in the capillary near the bulb of the clinical thermometer prevents mercury level from falling on its own.
b) We should bring the mercury level to the minimum.
c) The kink in the capillary near the bulb of the clinical thermometer do not prevent mercury level from falling on its own.
d) Both a & b

4. We do not use water in the thermometer because [ ]
a) Water is not opaque and shining.
b) water freezes below 0 °C it will produce uneven contraction up to 4 °C later it starts expanding
c) It will stick to walls of glass tube.
d) All the above

5. During winter mornings people do stand in the Sun because [ ]
a) People feel warm if they stand in the sun
b) In winter the temperature of the atmosphere in the mornings will be very greater than the body temperature of the people.
c) People feel quite hot.
d) All the above

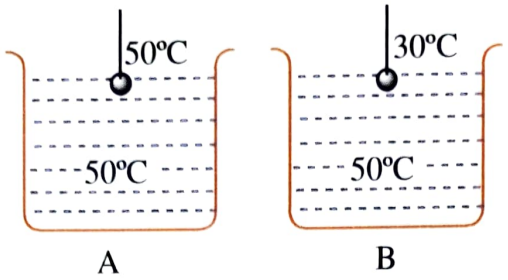
6. We avoid keeping thermometer near the flame because [ ]
a) Thermometers containing thermometric liquids like alcohol or mercury.
b) When we keep glass thermometers near the flame, glass break due to uneven expansion.
c) Uneven expansion of alcohol.
d) Uneven expansion of mercury

7. **Statement (I)** : Transfer of heat energy always takes place from a body at lower temperature to a body at higher temperature [ ]
Statement (II) : Woolen sweaters keep us warm by trapping layer of air.
Which of the statements is / are true?
a) Only I b) Only II c) Both I & II d) Neither I nor II

8. A wooden spoon is dipped in a cup of icecream.Its other end [ ]
a) becomes cold by the process of conduction
b) becomes cold by the process of convection
c) becomes cold by the process of radiation
d) does not become cold

9. Stainless steel pans are usually provided with copper bottoms. The reason for this could be that
a) copper bottom makes the pan more durable [ ]
b) such pans appear colourful
c) copper is better conductor of heat than the stainless steel
d) copper is easier to clean than the stainless steel

10. Two containers A and B contain liquid at 50 °C.Two metal balls one at 50 °C and other at 30 °C are dropped in the containers A and B respectively.The transfer of heat takes place in [ ]



a) only container A
b) only container B
c) Both the container A and B
d) Neither container A nor container B

11. Roti's and hot food items will be often packed with Aluminium foil because [ ]
a) Aluminium do rise its temperature quickly
b) Aluminium rise its temperature faster rate and maintain the temperature of food items for long time
c) Aluminium do not rise its temperature
d) Aluminium rise its temperature slowly and maintain the temperature of food items for long time.

12. A piece of ice at 0 °C is put into a vessel containing water at 0 °C. The ice will [ ]
a) melt b) not melt c) slightly melt d) vanish in no time

13. The temperature of an object is observed to rise in a period. In this period [ ]
i) heat is certainly supplied to it
ii) heat may have been supplied to it
iii) work may have been done on it
a) (i) and (ii) b) (ii) and (iii) c) (i) and (iii) d) only (i)

14. In a room containing air, heat is transferred from one place to another by [ ]
a) conduction b) convection c) radiation d) all the three methods

15. Temperature is a quantity [ ]
A) which determine direction of heat flow
B) which makes the hotness or coldness as relative
C) which is an indicator of average K.E of molecules in a body
D) denotes the degree of hotness or coldness of a body
a) A,B,C, are correct
b) B,C,D are correct
c) Only A, D are correct
d) All are correct

16. Choose the correct statements from the following : [ ]
a) Temperature is measured by a device called thermometer
b) Thermometer is based on the fact that liquid expands on heating and contracts on cooling.
c) In a thermometric scale there are two fixed points
d) All the above

17. Effects of heat energy are/ is [ ]
a) heat energy can bring about a change in state
b) heat energy bring about a chemical change
c) heat energy can bring about a change in temperature
d) all the above

18. Liquid thermometers are based upon the principle of heat transfer through : [ ]
a) conduction
b) radiation
c) expansion of liquid
d) all the above

19. Heat is the [ ]
a) form of energy
b) can flow from hot body to cold body
c) not form of energy
d) both a and b

KEY

Multiple choice questions :

1) b	2) c	3) d	4) a	5) b	6) c	7) d	8) b	9) c	10) d
11) b	12) a	13) b	14) b	15) c	16) b	17) c	18) c	19) a	20) b
21) d	22) d	23) a	24) a	25) d					

Olympiad corner :

1) b	2) d	3) d	4) d	5) a	6) b	7) b	8) d	9) c	10) b
11) d	12) b	13) b	14) d	15) d	16) d	17) d	18) c	19) d	