



# Heat



## B. Short/Long Answer Questions

### Question 1.

What is heat? State its S.I. unit.

**Answer:**

**Heat** is a form of energy which flows. It is the energy of motion of molecules constituting the body. The unit of heat is same as that of energy. The S.I. unit of heat is joule (abbreviated as J) and other common units of heat are calorie and kilo calorie, where  $1 \text{ kcal} = 1000 \text{ cal}$ .

### Question 2.

What is meant by the term temperature.

**Answer:**

**Temperature** is a quantity which tells the thermal state of a body (i.e. the degree of hotness or coldness). It determines the direction of flow of heat when the two bodies at different temperatures are placed in contact.

### Question 3.

State the three units of temperature.

**Answer:**

The S.I. unit of temperature is kelvin or K. The other most common unit of temperature is degree Celsius ( $^{\circ}\text{C}$ ) and degree Fahrenheit ( $^{\circ}\text{F}$ ).

### Question 4.

Name the instrument used to measure the temperature of a body.

**Answer:**

To measure the temperature of a body with the help of a thermometer.

### Question 5.

Name two scales of temperature. How are they inter-related?

**Answer:**

Two scales of temperature are

(i) Celsius (ii) Fahrenheit

**Relation:**

Water freezes at  $0^{\circ}\text{C}$  or  $32^{\circ}\text{F}$  and boils at  $100^{\circ}\text{C}$  or  $212^{\circ}\text{F}$

$\therefore (212 - 32)^{\circ}\text{F} = (100 - 0)^{\circ}\text{C}$

$180^{\circ}\text{F} = 100^{\circ}\text{C}$

$1^{\circ}\text{F} = \left(\frac{5}{9}\right)^{\circ}\text{C}$

or  $1^{\circ}\text{C} = \left(\frac{9}{5}\right)^{\circ}\text{F}$

or  $\frac{C}{100} = \frac{F - 32}{180}$

or  $\frac{C}{5} = \frac{F - 32}{9}$

### Question 6.

How is the size of a degree defined on a Celsius scale?

**Answer:**

The interval between the ice point and steam point divided by 100 (hundred) equal parts is called a degree on the Celsius scale.

### Question 7.

How is the size of a degree defined on a Fahrenheit scale?

**Answer:**

The interval between the ice point and steam point divided into 180 equal parts is called a degree on the Fahrenheit scale.

### Question 8.



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## Question 8.

State the temperature of (i) ice point and (ii) steam point, on the Celsius scale.

### Answer:

(i) **Ice point.** Is the the mark on Celsius scale at which ice melts. Ice point on the Celsius scale is  $0^{\circ}\text{C}$ .

(ii) **Steam point.** On the Celsius scale is the mark at which water changes into steam at normal atmospheric pressure. On Celsius scale it is  $100^{\circ}\text{C}$ .

## Question 9.

Write down the temperature of (i) lower fixed point, and (ii) upper fixed point, on the Fahrenheit scale.

### Answer:

**Lower fixed point:** On the Fahrenheit scale is the mark at which pure ice melts. It is  $32^{\circ}\text{F}$  on Fahrenheit scale.

**Upper fixed point:** On the Fahrenheit scale is the mark at which water starts changing into steam at normal atmospheric pressure. It is  $212^{\circ}\text{F}$ .

## Question 10.

What is the Celsius scale of temperature ?

### Answer:

Celsius scale is that which has ice point as  $0^{\circ}\text{C}$  and steam point marked as  $100^{\circ}\text{C}$ .

## Question 11.

What is the Fahrenheit scale of temperature ?

### Answer:

Fahrenheit scale is that which has ice point as  $32^{\circ}\text{F}$  and the steam point marked as  $212^{\circ}\text{F}$ .

## Question 12.

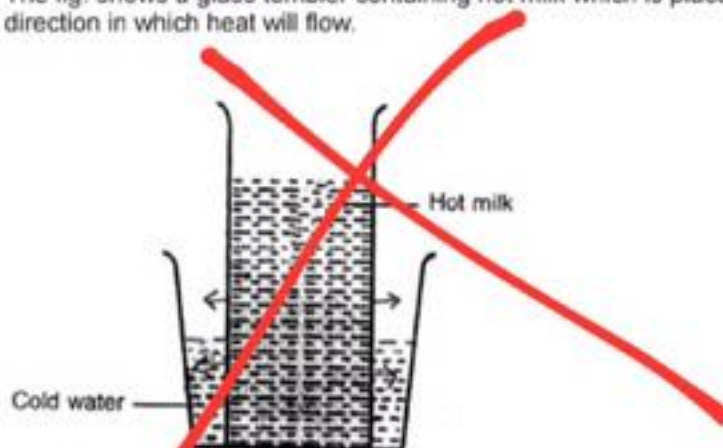
What is the Kelvin scale of temperature ?

### Answer:

On Kelvin scale of temperature zero mark is when no molecular motion occurs. Ice point is at  $273\text{ K}$  and steam point is at  $373\text{ K}$ . Thus  $0\text{ K} = -273^{\circ}\text{C}$  and one degree on Kelvin scale is same as one degree on Celsius scale.

## Question 13.

The fig. shows a glass tumbler containing hot milk which is placed in a tub of cold water. State the direction in which heat will flow.



### Answer:

When we bring two objects of different temperature together, energy will always be transferred from hotter to the cooler object.

Here, also heat will flow from hot milk tumbler to tub of cold water.

## Question 14.

Draw a neat labelled diagram of a laboratory thermometer.

### Answer:



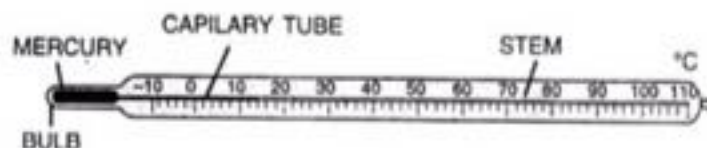
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## Question 14.

Draw a neat labelled diagram of a laboratory thermometer.

**Answer:**



## Question 15.

Write down the body temperature of a healthy person.

**Answer:**

The temperature of a healthy persons is 98.6 degrees fahrenheit or 37.0 degree Celsius or 310 k.

## Question 16.

What do you understand by thermal expansion of a substance ?

**Answer:**

The expansion of a substance when, heated, is called thermal expansion.

Or

Thermal expansion is the tendency of matter to change .in shape, area and volume in response to a change in temperature.

## Question 17.

Name two substances which expand on heating.

**Answer:**

Mercury and Aluminium wire.

## Question 18.

Why do telephone wires sag in summer ?

**Answer:**

The telephone wires will sag in summer due to expansions and will break in winter due to contraction.

Therefore, while putting up the wires between the poles, care is taken that in summer they are kept slightly loose so that they may not break in winter due to contraction.

While in winter they are kept tight so that they may not sag too much in summer due to expansion.

## Question 19.

Iron rims are heated before they are fixed on the wooden wheels. Explain the reason.

**Answer:**

The wooden wheels of a bullock-cart are fitted with iron tyres. To ensure a tight fit, the tyre is made slightly smaller in diameter than the wheel. The tyre is first heated due to which it expands. The heated tyre is then fitted on the wheel. When the tyre cools, it contracts and makes a tight fit on the wheel.

## Question 20.

Why are gaps left between successive rails on a railway track ?

**Answer:**

The rails of railway track are made of steel. While laying the railway track, a small gap is left between the two successive length of rails. The reason is that the rails expand in summer. The gap is provided to allow for this expansion. If no gap is left, the expansion in summer will cause the rails to bend sideways. This may result in a train accidents.

## Question 21.

A glass stopper stuck in the neck of a bottle can be removed by pouring hot water on the neck of the bottle. Explain why ?

**Answer:**

When hot water is poured over the neck of the bottle, it expands. As a result the stopper gets loosened and can be removed easily.





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## Question 21.

A glass stopper stuck in the neck of a bottle can be removed by pouring hot water on the neck of the bottle. Explain why?

### Answer:

When hot water is poured over the neck of the bottle, it expands. As a result the stopper gets loosened and can be removed easily.

## Question 22.

Why is a cement floor laid in small pieces with gaps in between?

### Answer:

The floor is laid in small pieces with gaps in between to allow for the expansion during summer. However glass strips can be placed in the gaps.

## Question 23.

One end of a steel girder in a bridge is not fixed, but is kept on rollers. Give the reason.

### Answer:

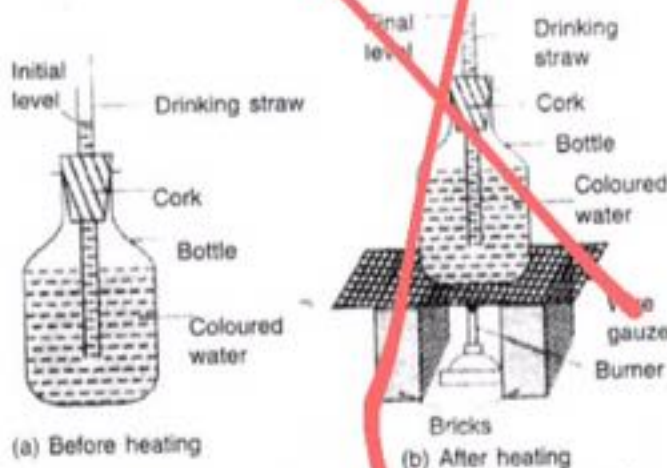
In the construction of a bridge, steel girders are used. One end of the girder is fixed into the concrete or brick pillars and its other end is not fixed, but it is placed on rollers. The reason is that if there is any rise (or fall) in temperature of atmosphere, the girder can freely expand (or contract) without affecting the pillars.

## Question 24.

Describe one experiment to show that liquids expand on heating.

### Answer:

- Take an empty bottle with a tight fitting cork having a hole drilled in its middle, a drinking straw, two bricks, a wire gauze and a burner.
- Fill the bottle completely with water and add few drops of ink in it to make it coloured.
- Fix the cork in the mouth of the bottle and pass the drinking straw through the cork. Put some molten wax around the hole so as to avoid the leakage of water.
- Pour some more water into the drinking straw so that water level in the straw can be seen. Mark the water level in the straw as shown in Figure.



*Thermal expansion of a liquid*

- Place the bottle on the wire gauze kept over the two bricks as shown in Figure. Then heat the bottle by means of a burner.

- Look at the level of water in the straw.

You will notice that as the water is heated more and more, the level of water in the drinking straw rises. This shows that water expands on heating.

## Question 25.

State one application of thermal expansion of liquids.

### Answer:

Mercury is a metal found in liquid state. It expands more and uniformly over a wide range of temperature. So mercury is used as thermometric liquid.

**Question 28.**

State which expands more, when heated to the same temperature : solid, liquid or gas ?

**Answer:**

Gases expand much more than the liquids and the solids. Like liquids, the gases do not have a definite shape, so they also have only the cubical expansion.

**Question 29.**

Name the three modes of transfer of heat.

**Answer:**

There are three modes of transfer of heat (i) Conduction (ii) Convection (iii) Radiation.

(i) **Conduction** "is that mode of transfer of heat, when heat travels from hot end to cold end from particle to particle of the medium, without actual movement of particles."

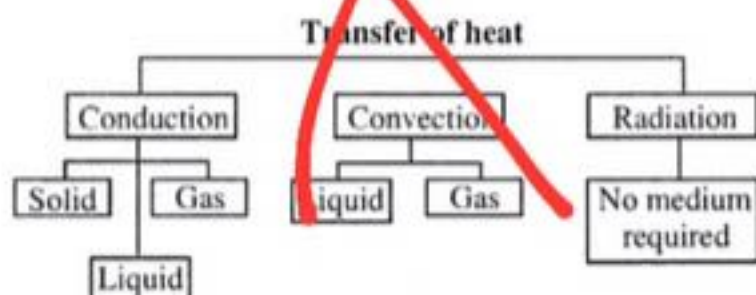
(ii) **Convection**. "is a process of transfer of heat by actual movement of the medium particles."

(iii) **Radiation**. "is that mode of transfer of heat in which heat directly passes from one body to the other body without heating the medium."

**Question 30.**

Name the mode of transfer of heat in the following :

- (a) solid,
- (b) liquid,
- (c) gas
- (d) vacuum

**Answer:****Question 31.**

What are the good and bad conductors of heat ? Give two examples of each.

**Answer:**

**Good conductors.** "The substances through which heat is easily conducted are called good conductors of heat."

**Example :** Copper, iron.

**Bad conductors.** "The substances through which heat is not conducted easily are called bad conductors of heat or poor conductors of heat."

**Example :** Wood, cloth.

**Question 32.**

Name a liquid which is a good conductor of heat.

**Answer:**

Mercury is good conductor of heat.

**Question 33.**

Name a solid which is a good conductor of heat.

**Answer:**

Aluminium is a good conductor of heat.

**Question 34.**

Select good and bad conductors of heat from the following :

copper, mercury, wood, iron, air, saw-dust, cardboard, silver, plastic, wool.

**Answer:**

Good conductors — Mercury, copper, silver, iron.

Bad conductors — Wood, air, saw dust, plastic, wool, cardboard.



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## Question 35.

Why is an oven made of double walls with the space in between filled with cork ?

### Answer:

An oven is made of double walls and the space between them is filled with wool, cork etc. because the wool and cork are the insulator of heat. They prevent the heat of the oven to escape.

## Question 36.

Why do we use cooking utensils made up of copper.

### Answer:

Cooking utensils are made of metals such as copper, aluminium, brass, steel etc., so that heat is easily conducted through the base to their contents. But they are provided with handles of bad conductors (such as ebonite or wood) to hold them easily as handles will not conduct heat from the utensil to our hand.

## Question 37.

Why is a tea kettle provided with an ebonite handle ?

### Answer:

Tea kettles are provided with wooden or ebonite handles. The wood or the ebonite being the insulators of heat, does not pass heat from the utensils to our hand. Thus, we can hold the hot utensils or pans comfortably by their handles.

## Question 38.

In summer, ice is kept wrapped in a gunny bag. Explain the reason.

### Answer:

In summer, the ice is kept wrapped in a gunny bag or it is covered with saw dust. The air filled in the fine pores of the gunny bag or saw dust, is the insulator of heat. The air does not allow heat from outside to pass through it to the ice. Thus, the ice is prevented from melting rapidly.

## Question 39.

Explain why

- (a) we wear woolen clothes in winter.
- (b) the water pipes are covered with cotton during very cold weather.

### Answer:

- (a) Woolen clothes have fine pores filled with air. Wool and air both are bad conductors of heat. Therefore in winter, we wear woolen clothes as they check the conduction of heat from the body to the surroundings and thus keeps the body warm.
- (b) During very cold weather, the water pipes are covered with cotton. The cotton has air trapped in its fine pores. The cotton and air are the insulators of heat. They do not pass heat from water inside the pipes to the outside atmosphere. Thus, cotton prevents the water in the pipes from freezing.

## Question 40.

Why are quilts filled with fluffy cotton ?

### Answer:

Quilts are filled with fluffy cotton. Air is trapped in the fine pores of cotton. Cotton and air are the insulators of heat. They check heat from our body to escape and thus keep us warm. The newly made quilts are warmer than the old ones because in the old quilts, there is no air trapped in the cotton.

## Question 41.

State the direction of heat transfer by way of convection.

### Answer:

By the process of convection, heat is always transferred vertically upwards. The reason is that the medium particles near the source of heat absorb heat from the source and they start moving faster. As a result, the medium at this place becomes less dense so it rises up and the medium from above being denser, moves down to take its place. Thus, current is set up in the medium which is called a convection current. The current continues till the entire medium acquires the same temperature.





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## Question 45.

Why is the freezing chest in a refrigerator fitted near its top?

### Answer:

Freezing chest in a refrigerator is fitted near the top, because it cools the remaining space of the refrigerator by convection current. Air near the top comes in contact with the freezing chest gets cooled, becomes denser and therefore descends while the hot air from the lower part rises and hence convection currents produced cool the whole space inside.

## Question 46.

Explain briefly the process of heat transfer by radiation.

### Answer:

RADIATION. "The transfer of heat energy from a hot body to cold body directly, without heating the medium between two bodies is called RADIATION."

The radiant heat or thermal radiation is of the form of ELECTROMAGNETIC WAVES. These waves can travel even in vacuum in all directions in straight line with the speed of light. They do not heat the medium through which they pass. Heat radiations are also called INFRA-RED RADIATIONS because the wavelength of heat radiations is longer than that of visible light. These radiations can cause heating effect only if they are absorbed by some material.

## Question 47.

Give one example of heat transfer by radiation.

### Answer:

When we sit in the sun, we feel warm. We cannot get heat from the sun by the process of conduction or convection because most of the space between the sun and the earth is a vacuum and both of these modes of heat transfer require medium. Hence, one must be getting heat from the sun by the mode of radiation.

## Question 48.

Why do we prefer to wear white or light coloured clothes in summer and black or dark coloured clothes in winter ?

### Answer:

We prefer to wear white clothes in summer. The reason is that the white clothes reflects most of the sun's heat and absorb very little of the sun's heat, thus they keep our body cool.

We prefer to wear black and dark coloured clothes in winter. The reason is that the black or dark colour clothes absorb most of the sun's heat and keep our body warm.

## Question 49.

The bottom of a cooking utensil is painted black. Give the reason.

### Answer:

The bottom part of the cooking utensil or pan is painted black. The reason is that the black surface absorbs more heat and so the contents of utensil or pan get cooked rapidly if its bottom part is painted black.