# 9 Heat and Temperature

Heat is very important in daily life. Some objects are hot, some object are cold in our surroundings. If following objects are placed open what happens to them ? Write your experience.

| | |
|---|---|
| Hot tea in a cup | |
| Ice cream | |
| Hot water | |
| Plate placed in sunshine | |

Hot body placed in open space lose heat and cold object placed in open space lose coldness. Hot body releases heat in atmosphere. Cold body absorbs heat from atmosphere.

**What is required?** Four bottles of same size, water, ink or colour, a card paper.

**Figure 9.1**

**Figure 9.2**

**What to do?**

- Take four similar bottles.
- Fill one with hot water and other with cold water.
- By adding two-three drops of ink or colour make water coloured.
- Fill plane cold water in remaining two bottles and place card paper on it.
- As shown in the figure, place this bottle on the coloured water bottle inverted.
- Slowly, remove the card paper and observe the water in bottle.

What is seen in inverted bottle when card paper is removed?

From which bottle which bottle does the diffusion of water particle take place? Why?

Water of which bottle is not coloured. Why?

Heat transformation takes place from hotter body to less hot body. When two objects, having different temperature, are in thermal contact, the heat will be transferred from higher temperature to lower temperature. This process will continue till temperature of both substances becomes equal. It is called thermal equilibrium.

**Do the following activity to understand thermal equilibrium**

**what is required ?** a cup of glass, hot water, a pan, cold water

**What to do?**

- Fill a cup of glass with hot water.
- Fill cold water in the pan.
- Place a cup of glass in the pan.

**Figure 9.3**

- After some time, touch the water in pan and note the observation.

Figure 9.4

There are two friends near by you.Touch the wrist of their hand and try to experience the heat of their body and note in following table.

| No. | Name of friend | Hot or cold with respect to your body? |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

**Why do we blow up while drinking tea?**

**What is required?** Two small similar pans, a spirit lamp, a tripode stand, water

**What to do?**

- Take two similar bouls.
- Fill one bowl half with water. Fill other bowl full with water.
- Give heat to both the bowls with spirit lamp for same time.
- Then touch the water of both the bowls and note your observations.

Figure 9.5

**Water in which bowl is hotter?**

**Figure 9.6**

Water in which bowl is less hot?

Why is water of both bowls not equally hot on supplying heat for same time?

On supplying same heat, the heat energy of objects may be different. Because heat energy depends on the mass of substance.

Total kinetic energy of the atoms of object is the thermal energy of object.

**A person is standing at the bank of pond with a cup of tea. Then heat of water of pond or hot tea, which has more heat?**

We experience heat. We can get idea about the heat of object by touching it. To understand this, let's do an activity.

**What is required?** Three similar large bowls, water

**What to do?**

- Take three similar bowls.
- Fill one with cold water and second with hot water.
- Fill third one with luke warm water.

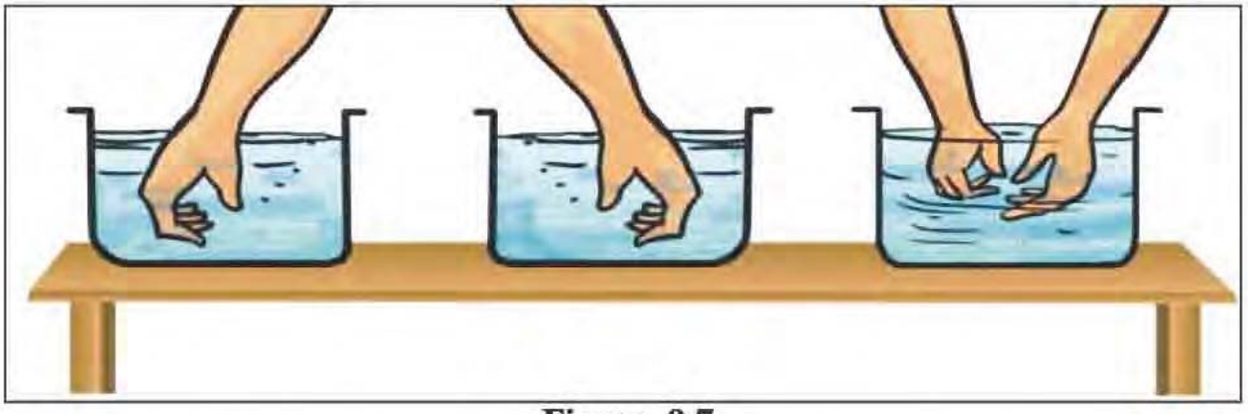

**Figure 9.7**

- Now insert your left hand in first boal and right hand in second pan for some time.
- After some time place both the hands in luke warm water of third pan.

What is experience of left hand in first boal?

What is experience of right hand in second bowl?

What is experience of left and right hand in the third bowl?

Can you say whether the water in the third bowl is hot or cold? why?

**The degree of hotness or coolness of any substances is called temperature.** Whether substances is how much hot or cold can be said from its temperaturei If heat is supplied to body, its temperature increases and if heat is absorbed from the body, its temperature decreases. We can't decide whether the body, is hot or cold by touching it. If object is very hot the skin will burn while touching it. There is the appratus to measure temperature.

**The appratus used to measure accurate temperature of any object is called thermometer.**

**What is required?** Simple thermo meter

**What to do ?**

- Observe normal thermometer

**What do you see while observing thermo meter?**

Thermometer is like cylindrical glass rod. In side it, there is thin tube at lower end of it. There is a capsule type shape. In that, alcohol or mercury is filled. In normal thermometer, the numbers are calibrated in degree Celsius.

**Figure 9.8**

**Figure 9.9**

**Why is mercury filled in thermometer?**

**Mercury is a metal in liquid state. It is expanded when heat is supplied to it. It never sticks with tube, so it can easily move in glass tube. Because of glittering of Mercury, the thermometer can be seen easily. So the temperature of the substances can be easily read.**

**Lets measure the temperature of water with thermometer.**

**What is required?** Domestic thermometer, two bowls, water

**What to do?**

- Take two bowls.
- Take cold water in one bowls.
- Take hot water in the bowls.
- Place the thermometer in cold water so that mercury part immerses in it.
- Now observe mercury in the thermometer and measure temperature. At which digit the mercury in the thermometer becomes steady?

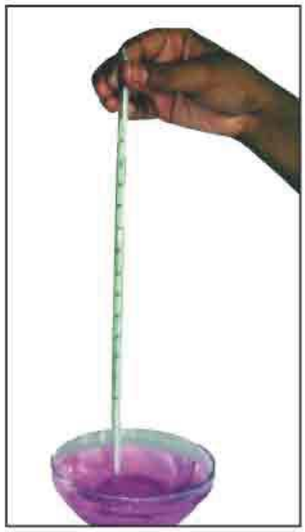

**Figure 9.10**

**Figure 9.11**

- Now place the thermometer in hot water so that mercury part immerses in water.
- Observe mercury in the thermometer and take measurement. At which digit mercury in thermometer becomes steady?

- How much maximum temperature can be measured with this thermometer.

**At which digit is the steady mercury column observed while observing thermometer ? why?**

Doctor uses the thermometer to measure fever of patient. It is different from a normal thermometer. Let's observe it.

**What is required?** Clinical thermometer

Domestic thermometer

**Figure 9.12**

**What to do?**

- Write the differences, by observing the clinical and the domestic thermometer in the table.

| Clinical thermometer | Domestic thermometer |
|---|---|
| 1. _____ | 1. _____ |
| 2. _____ | 2. _____ |
| 3. _____ | 3. _____ |


**Figure 9.13**

**Figure 9.14**

**°C = Celsius**

**°F = Fahrenheit**

**How to convert Celsius in Fahrenheit?**

$$^0F = \frac{9^0C + 160}{5} \quad \text{or} \quad ^0F = 1.8^0C + 32$$

**How to convert Fahrenheit to Celsius?**

$$^0C = \frac{5^0F - 160}{9} \quad \text{or} \quad ^0C = \frac{^0F - 32}{1.8}$$

**What is required?** Clinical Thermometer

**Figure 9.15**

**What to do?**

- Measure the temperature of bodies of your five friends in your class room.
- While measuring temperature of other friend, clean the mercury containing part with cotton and give slow thrust to the thermometer.

| No. | Name of friend | Temperature (Celsius) | Temperature (Fahrenheit) |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

**Which precautions should be taken while measuring body temperature with clinical thermometer?**

Why does mercury become steady after some time while measuring body temperature?

Why does mercury not move in downward direction after measuring body temperature by clinical a thermometer?

**Normally, the body temperature of healthy person is 37°C i.e. (98.6°F)**

1. **Why is light thrust given to clinical thermometer before using it?**
2. **Can we measure the temperature of boiling water with the help of clinical thermometer ? Why?**

**Different types of thermometer :**


**Figure 9.16 Digital Thermometer**

**Figure 9.17**
**Digital Clinical Thermometer**


**Figure 9.18**
**Thermometer which is placed on forehead**

We get information about temperature of different places from T.V., Radio, or news papers. Let's do activity to know the temperature in the surroundings of us.

**What is required ?** Domestic thermometer

**What to do?**

- Hang domestic thermometer in the class room and note temperature in the given table below :

| TIME TABLE | | | | |
|---|---|---|---|---|
| **Day** | **Morning 11.30** | **Noon 2.30** | **Noon 4.30** | **Average temperature of the day** |
| Monday | | | | |
| Tuesday | | | | |
| Wednesday | | | | |
| Thursday | | | | |
| Friday | | | | |
| Saturday | | | | |

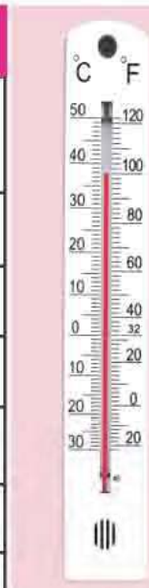


**Figure 9.19 Thermometer**

**Average temprature of which day is more?**

Temperature of which day at which time is more?

Average temperature of which day is less?

By studying above table, prepare the graph of average temperature

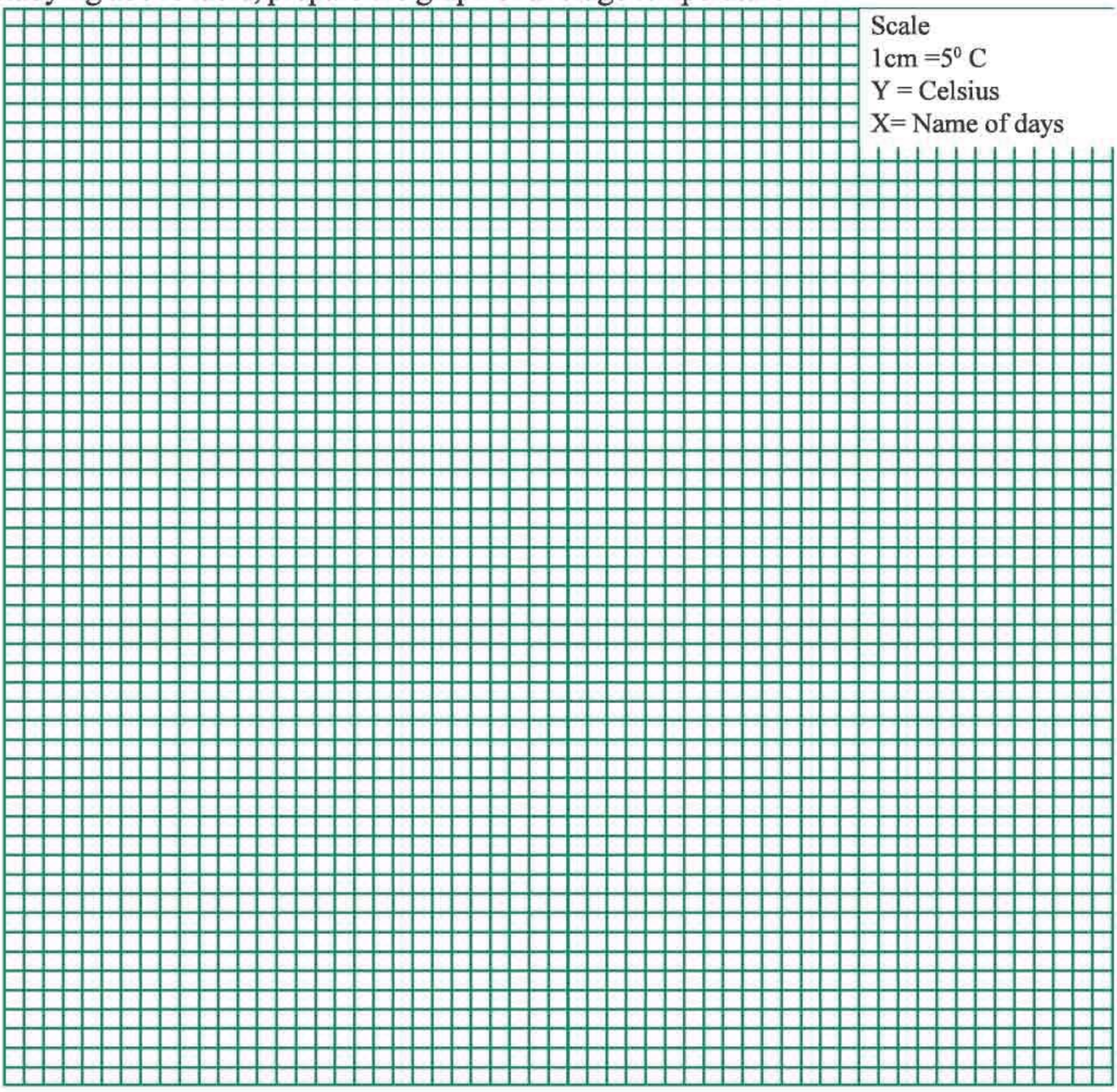


**Figure 9.20**

When liquid substances is heated, it converts into vapour. The chang in the form of substance takes place at definite temperature.

**What is required?** a domestic thermometer, a boal a pan, Ice cubes, stand, spirit lamp

**What to do?**

- Take a bowl place with ice cubes in it.
- Adjust thermometer so that the mercury part of it is in contact with ice.

- Arrange apperatus as shown in figure. Measure temperature using thermometer.....$^0$C
- Now, heat the bowl and continuously measure temperature. When ice is in bowl the temperature is .....$^0$C
- Till ice is present in bowl the temperature is not increasing on supplying heat. Means this that temperature remains constant. At 0 $^0$C temperature ice is converted in to water. That constant temperature is called melting point of ice.

**Figure 9.21**

***The constant temperature at which solid substance is converted in to liquid form is called melting point of that substance.***

- After conversion of ice in water on supplying heat to bowl, temperature of water increases. After sometime, water is converted in vapour. Then even you supply heat, temperature remains constant. .....$^0$C. This constant temperature is called boiling point of water.

***The constant temperature at which liquid is converted in to vapour is called boiling point of that substances.***

| Name of substance | Meting point | Boiling point |
|---|---|---|
| Ice | 0 $^0$C. | 100$^0$ C |
| Mercury | - 39$^0$ C | 357$^0$ C |
| Zinc | 419$^0$ C | 907$^0$ C |
| Copper | 184$^0$ C | 562$^0$ C |
| Aluminum | 660$^0$ C | 2467$^0$ C |
| Gold (Aurum) | 1065$^0$ C | 2807$^0$ C |
| Iron (Ferum) | 1535$^0$ C | 2750$^0$ C |

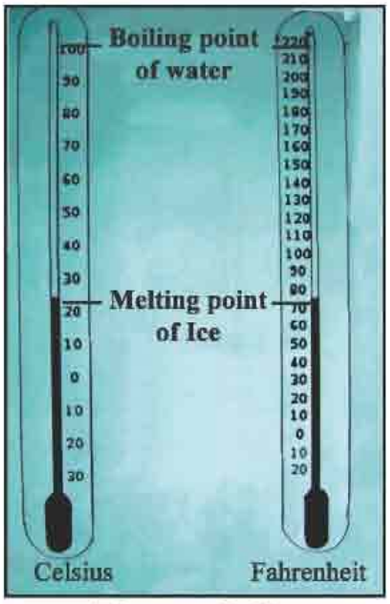


**Figure 9.22**

For different substances melting and boiling points are different. It is used to make silver ornaments, to get petroleum products, to make ice cream, to get distilled water etc. Discuss and note the other uses.

**Difference between evaporation and boiling :**

1. Evaporation takes place due to vapour formed at the surface of liquid. Boiling takes place due to vapour through out the liquid inside it.
2. Vaporization occurs at any temperature. Boiling occurs at specific temperature.

**Q.1** The hot water taken for bath becomes cold after some time. Why this happens?

**Q.2** Can temperature of ice cream be judged by touching it ? why ?

**Q.3** Measure temperature by clinical thermometer by placing it in ice cream cup. Can we get proper temperature? why?

**Q.4** If there is no wedge in clinical thermometer, what happens?

**Q.5 Do activity :**

Take a cup and a bowl. Fill water in it. Put both in a refrigerator. In which vessel does water become cold quickly ? why?

**Q.6 Visit the doctor and get following information :**

(1) Which device is used to measure fever of patient? why?

(2) Which type of thermometer does the doctor have?

(3) What is the body temperature of healthy person?

(4) When can be said that the patient has fever?

(5) Note the body temperature of a patient when you visit.

Name of patient :

Temperature : _____ $^0$C _____ $^0$F

**Q.7** Draw figure of Domestic thermometer.

# 10 Air Pollution

Raju and Riaz are fast friends. Raju lived in a village while Riaz lived in a city. Raju went to Riaz's house in the city during Vacation. Both friends went for a walk in the evening. Raju saw many vehicles running on the road. Smoke was coming out of industrial chimnies. Raju felt the heat. He felt irritation in his eyes and nose. When they moved further Raju started sneezing and suffocating suddenly. Do you know, why did it so happen to Raju?

There are different gases and microorganisms in the atmosphere. The harmful changes that are burnal to environment are known as pollution. The factors responsible to spread pollution are known as pollutants. Pollutant may be in solid, liquid or gaseous form. Out of these, the gaseous pollutants are more in proportion in the atmosphere. Do you know what are the reasons which spread air polluation? Let us see.

**Figure 10.1**

- **Write reasons for air pollution on basis of the above picture**