# Heat and Energy

## Exercise

**Question 1.**
Define heat energy **(a)** on conventional basis **(b)** on the basis of kinetic theory of matter.

**Answer:**

**(a) Heat energy :** It is a form of energy which causes in us the sensation of hotness or coldness.
**(b) Heat energy :** On the basis of kinetic theory of matter, heat energy is defined as the sum total of kinetic and potential energies of all the molecules of a given substance.

**Question 2.**
Define temperature **(a)** on conventional basis **(b)** on the basis of kinetic theory of matter.

**Answer:**

**(a) Temperature :** The degree of hotness coldness of a body is called temperature. **OR** Temperature is the effect of heat energy which determines the thermal state of a body.
**(b) Temperature :** On the basis of kinetic theory of matter, temperature is the average kinetic energy of all the molecules of a substance.

**Question 3.**
State three differences between heat and temperature.

**Answer:**
**Heat :**

1. Heat is a form of energy which flows.
2. Its S.I. unit is joule or J.
3. It flows from hot body to cold body.

**Temperature :**

1. Temperature is a quantity which tells the thermal state of body.
2. Its S.I. unit is Kelvin or K.

3. It determines the direction of flow of heat when two bodies at different temp, are placed in contact.

**Question 4.**
Define calorie. How many joules make one calorie?

**Answer:**
**One Calorie :** One calorie is the amount of heat energy required to raise the temperature of one gram of water through 1°C.
There are 4.2 J in one calorie
1 Cal = 4.2 J

**Question 5.**
A body absorbs 1680 J of heat energy. How many calories of heat is absorbed by the body?

**Answer:**
Heat energy absorbed by body = Q = 1680 J
We know 1 cal = 4.2 J
→ Q = 1680 J = 1680/4.2 Cal
Q = 400 Cal

**Question 6.**
A body radiates out 300 calories of heat energy. How much heat energy is radiated out by the body in joules?

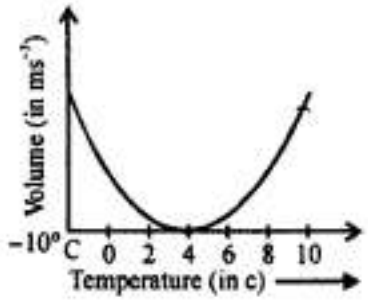
**Answer:**
Heat energy radiated by the body = Q = 300 Cal
As 1 cal = 4.2 J
Q = 300 Cal = 300 × 4.2 J
Q = 1260 J

**Question 7.**
What do you understand by the anomalous expansion of water?

**Answer:**
Anomalous expansion : A liquid which does not behave like a normal liquid on heating or cooling is said to have anomalous expansion. On heating or cooling, water does not behave like a normal liquid. Volume of water increases if we heat or cool it, provided initially the water is at 4°C.

**Question 8.**
Draw a graph between volume and temperature, when 5 $cm^3$ of ice at -10°C is heated to form water at +10°C.

**Answer:**




Mass 5 $cm^3$ of water is 5 g
Volume of water in minimum at 4°C.

**Question 9.**
How do fishes survive in frozen lakes?

**Answer:**
Fishes survive in pond even when the atmospheric temperature is below 0°C. It is because of anomalous expansion of water. When the temperature falls below 0°C water changes into ice and rises to the top and ice being poor conductor of heat helps to keep water below it at 4°C and fish can live in pond water.

**Question 10.**
Explain, why are soft drink bottles not completely filled?

**Answer:**
On lowering the temperature below 4°C, water expands due to its anomalous behaviour. So, if soft drink bottles are completely filled, then they may burst and cause accident. As a result, soft drink bottles are not completely filled.

**Question 11.**
Explain, why do water pipes burst during severe winter?

**Answer:**
In severe winter, water pipe lines often burst because water freeze at sub-zero

temperature and in doing so expands. Since there is no space within the pipes for expanding ice, it exerts very large pressure and bursts open the steel pipes.

**Question 12.**
Explain, why does a glass bottle completely filled with water and tightly capped burst when placed in a freezer?

**Answer:**
A glass bottle completely filled with water and closed tightly is likely to burst in the freezer of refrigerator because water changes into ice and its volume increases. Since water when cooled from 4°C to 0°C expands. Thus, exerts large pressure and glass bottle bursts.

**Question 13.**
Explain, why are the taps left dripping in sub-zero temperature during winter?

**Answer:**
Water freezes at sub-zero temperature and in doing so expands (anomalous behaviour of water).
So taps are left dripping in sub-zero temperature during winter so as to provide sufficient space for expansion of freezing water.

**Question 14.**
Explain, why are the exposed water pipes lagged with straw during severe winter?

**Answer:**
Water freezes at sub-zero temperature and in doing so expands (anomalous behaviour of water). So exposed water pipes during severe winter are lagged with straw so as to provide sufficient space for expansion of freezing water.

**Question 15.**
Explain why do vegetables and fruits get damaged during severe frost?

**Answer:**
Vegetables and fruits get damaged during severe fruits because the water present in them on freezing expands and burst open the cell walls of cells.

**Question 16.**
At what temperature the pure water has **(a)** maximum density **(b)** minimum volume?

**Answer:**
At 4°C, pure water has maximum density and minimum volume.

**Question 17.**
A deep pond of water has its top layer frozen. What will be the likely temperature of water layer

1. just in contact with ice
2. at the bottom of pond?

**Answer:**

1. Temperature of water layer just in contact with ice is 0°C.
2. At the bottom of pond is 4°C.

**Question 18.**
What is greenhouse effect?

**Answer:**
The process by which absorption and emission of infra-red radiation by the atmospheric gases warm up the surface of a planet and its lower atmosphere is called green-house effect.

**Question 19.**
Which gas is chiefly responsible for global warming?

**Answer:**
Carbon dioxide gas is chiefly responsible for global warming.

**Question 20.**
How can global warming can be reduced?

**Answer:**
With increasing economic growth and population, energy consumption is increasing and hence this leads to global warming. To minimise global warming following three measures should be taken.

1. Internal combustion engines in vehicles should be replaced by electric battery vehicles to reduce carbon dioxide emission.
2. Reforestation and sustainable use of land should be encouraged. Forest habitats should be maintained.

3. Controlling population, through family planing, welfare reform and the empowerment of women. This will help in reducing population, then consumption for energy and hence will reduce global warming.

**Question 21.**
State four effects of global warming.

**Answer:**
**The effects of global warming on the life on earth is as below :**

1. The variable changes in the climate in different parts of the world has created difficulty and forced the people and animals to migrate from one place to the other.
2. If has affected the blooming season of the different plants.
3. The climatic changes has shown the immediate effect on simple organism and plants.
4. It has affected the world's ecology.
5. It has increased the heat stroke deaths.