# WORKSHEET 2

## CHAPTER 7 – HEAT

### A. Tick (✓) the correct option.

1. Which of the following is not a unit of heat?
   a. joule  b. calorie  c. kilocalorie.  d. kelvin
2. Water is cooled from 10 °C to 0 °C. It will
   a. contract.  b. expand.
   c. first contract and then expand.  d. first expand then contract.
3. Boiling point of a liquid is 78 °C. What is the value on Kelvin scale?
   a. 0 °C  b. 100 °C  c. 15 °C  d. 4 °C
4. The SI unit of temperature is
   a. cal.  b. joule.  c. celsius.  d. kelvin.
5. 1 J equals to
   a. 0.24 cal.  b. 4.18 cal.  c. 1 cal.  d. 1 kcal.

### B. Fill in the blanks.

1. The _____ of a body is its degree of hotness or coldness.
2. Temperature is that property of a body which determines the _____ when it is brought in contact with another body.
3. When objects at the same temperature in contact with each other do not exchange heat (i.e. energy), is called _____
4. Heat is the energy that is transferred from one object to another because of _____ difference between them.
5. Temperature is the effect of _____

### C. State whether the following statements are true or false.

1. The expansion of water when it is cooled below 4 °C is known as anomalous expansion of water.
2. Hope's apparatus is used for demonstrating the anomalous expansion of water.
3. During winters, due to extremely hot weather, fruit and vegetables get damaged.
4. During winters, water pipelines often burst in cold countries because of anomalous expansion of water.
5. During severe winter, the water in the cells of human beings expands.

### D. Match the following.

| | | |
|---|---|---|
| 1. 1 cal | = | 0.02 kJ |
| 2. 1 kcal | = | 4.186 kJ |
| 3. 5 kcal | = | 358.5 kcal |
| 4. 1500 kJ | = | 20920 J |
| 5. 20 J | = | 4.186 J |

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Class: IX Date: .....

## E. Answer the following questions.

### Very short answer questions

1. What happens when two bodies are brought in contact with each other?
2. Aquatic life including fishes survive in frozen ponds even when the atmospheric temperature is below 0°C. Why?

### Short answer questions

1. What is frost bite?
2. Give one practical consequence of anomalous expansion of water.

### Long answer questions

1. Write Hope's experiment to demonstrate anomalous expansion of water.
2. Why do water pipelines burst during winters?

# ANSWERS

## WORKSHEET 2

### A. Tick (✓) the correct option.

1. d
2. c
3. b
4. d
5. a

### B. Fill in the blanks.

1. temperature
2. direction of heat flow
3. thermal equilibrium
4. temperature
5. heat

### C. State whether the following statements are true or false.

1. T
2. T
3. F
4. T
5. F

### D. Match the following.

1. 1 cal = 4.186 J
2. 1 kcal = 4.186 kJ
3. 5 kcal = 20920 J
4. 1500 kJ = 358.5 kcal
5. 20 J = 0.02 kJ

### E. Answer the following questions.

**Very short answer questions**

1. When two bodies are brought in contact with each other, heat (i.e. energy) flows from the body at a higher temperature to the body at a lower temperature.
2. In cold countries, during winters, as the atmospheric temperature starts falling below 0 °C, the water bodies (like ponds, lakes and rivers) freeze from the top to form solid ice, whereas the water below the surface stays at 4 °C. Thus, fish and other aquatic life can easily survive in frozen water bodies, as water below the surface stays at 4 °C.

**Short answer questions**

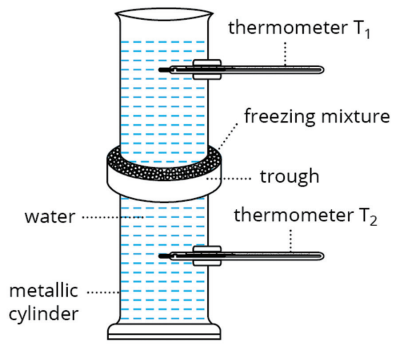
1. During severe winter, the water in the cells of human beings (especially in the exposed parts) freezes. It expands (anomalous expansion of water) exerting tremendous pressure and bursts open the cells.
2. During winters, due to extremely cold weather, fruit and vegetables get damaged because the water present in the cells expands on freezing (anomalous expansion of water). It exerts tremendous pressure and bursts open the cell walls.

## Long answer questions

1. **Hope's experiment to demonstrate anomalous expansion of water**

Hope's apparatus is used for demonstrating the anomalous expansion of water. This device was designed by T C Hope in 1805.

Hope's apparatus consists of a tall metallic cylinder (closed at one end) provided with two side openings, one near the top and the other near the bottom, fitted with thermometers $T_1$ and $T_2$ in them. The central part of the cylinder is surrounded with a cylindrical trough containing a freezing mixture of ice and salt. The cylinder is filled with water previously cooled to about 10 °C (Fig.).



Hope's apparatus

**Observations:** As water in the cylinder is cooled by the freezing mixture, the changes in the temperatures shown by the two thermometers are carefully observed.

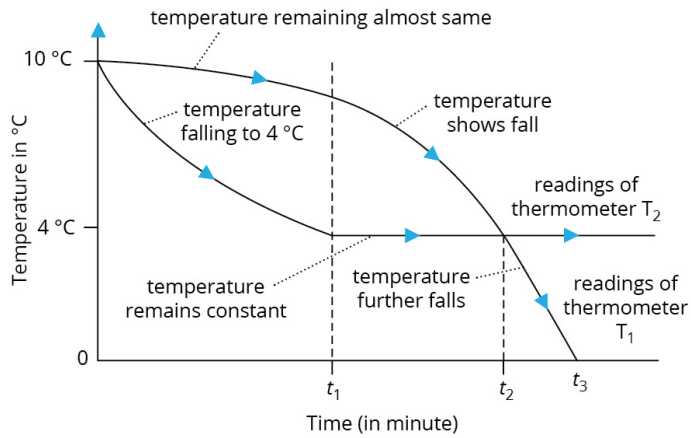
i. Initially both the thermometers show the same temperature, i.e. 10 °C.

ii. First, the temperature shown by the lower thermometer $T_2$ slowly falls to 4 °C, while the temperature shown by the upper thermometer $T_1$ remains almost unchanged during this time, i.e. up to time $t_1$ (Fig.).

iii. Now, the temperature shown by the thermometer $T_2$ remains constant at 4 °C, while the temperature shown by the upper thermometer $T_1$ slowly goes down until it reaches 0 °C, i.e. up to time $t_3$ (Fig.).

iv. After some time, a thin crust of ice is formed on the surface of water in the cylinder.

v. If graphs for time (in minutes) and temperature for both the thermometers are drawn, then the two graphs intersect at 4 °C.




2. During winters, water pipelines often burst in cold countries because water freezes at sub-zero temperature and thus it expands (anomalous expansion of water). Since, there is no space within the pipes, expanding ice exerts tremendous pressure and bursts open the steel water pipelines. It is for the same reason that people in cold countries leave the taps dripping at night so as to provide sufficient space for the expansion of freezing water.