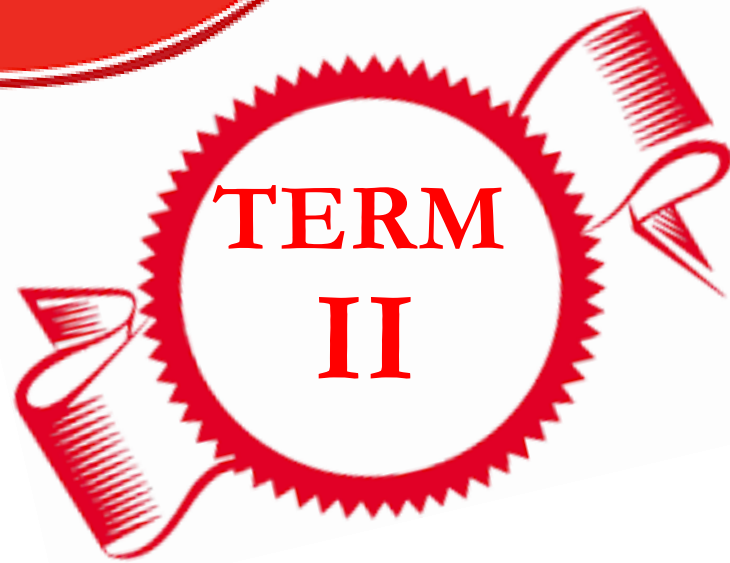


Science

Guide



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TERM - II

VOLUME 3

SCIENCE GUIDE



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E - book



Assessment



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UNIT

1

Heat



TEXT BOOK EXERCISES

I. Choose the correct answer:

1. Calorie is the unit of
 a) heat b) work
 c) temperature d) food

Ans: a. heat

2. SI unit of temperature is
 a) fahrenheit b) joule
 c) celsius d) kelvin

Ans: d.kelvin

3. The Specific heat capacity of water is
 a) $4200 \text{ Jkg}^{-1}\text{K}^{-1}$ b) $420 \text{ Jg}^{-1}\text{K}^{-1}$
 c) $0.42 \text{ Jg}^{-1}\text{K}^{-1}$ d) $4.2 \text{ Jkg}^{-1}\text{K}^{-1}$

Ans: a. $4200 \text{ Jkg}^{-1}\text{K}^{-1}$

4. Two cylindrical rods of same length have the area of cross section in the ratio 2:1. If both the rods are made up of same material, which of them conduct heat faster?
 a) Both rods b) Rod-2
 c) Rod-1 d) None of them

Ans: b.Rod-2

5. Two cylinders of equal height and radius are made of copper and aluminium. Which of them conducts heat faster?
 a) Copper rod b) Aluminium rod
 c) Both of them d) None of them

Ans: a.Copper rod

6. In which mode of transfer of heat, molecules pass on heat energy to neighbouring molecules without actually moving from their positions?

- a) Radiation b) Conduction
 c) Convection d) Both B and C

Answer: d. Both B and C

7. A device in which the loss of heat due to conduction, convection and radiation is minimized is
 a) Solar cell b) Solar cooker
 c) Thermometer d) Thermos flask

Ans: d. Thermos flask

II. Fill in the blanks:

1. The fastest mode of heat transfer is _____.

Ans: radiation

2. During day time, air blows from _____ to _____.

Ans: sea to land

3. Liquids and gases are generally _____ conductors of heat.

Ans: (poor conductor) Convection

4. The fixed temperature at which matter changes state from solid to liquid is called _____.

Ans: melting

III. Assertion and Reason type questions:

Mark the correct choice as:

- a. If both assertion and reason are true and reason is the correct explanation of assertion.

- b. If both assertion and reason are true but reason is not the correct explanation of assertion.
- c. If assertion is true but reason is false.
- d. If assertion is false but reason is true.

1. **Assertion:** Food can be cooked faster in copper bottom vessels.

Reason: Copper is the best conductor of heat.

Ans: a. If both assertion and reason are true and reason is the correct explanation of assertion.

2. **Assertion:** Maximum sunlight reaches earth's surface during the afternoon time.

Reason: Heat from the sun reaches earth's surface by radiation.

Ans: a. If both assertion and reason are true and reason is the correct explanation of assertion.

3. **Assertion:** When water is heated up to 100°C , there is no raise in temperature until all water gets converted into water vapour.

Reason: Boiling point of water is 10°C .

Ans: c. If assertion is true but reason is false.

4. **Assertion:** Aluminium conducts heat faster than copper.

Reason: Specific heat capacity of aluminium is higher than that of copper.

Ans: d. If assertion is false but reason is true.

IV. Short answers questions:

1. **Define conduction.**

Process of transfer of heat in solids from a region of higher temperature to a region of lower temperature without the actual movement of molecules.

2. **Ice is kept in a double-walled container. Why?**

Double walled container are used to make ice box because the space two wall is kept with a vacuum which provides a insulation cover to the inner box, therefore the outer heat of the box can't after inside the box and melt the ice.

3. **How does the water kept in an earthen pot remain cool?**

In earthen pot water gets evaporated quickly through the pores. Cooling is caused by evaporation. Some heat energy is utilised during the process of evaporation therefore water kept in earthen pot become cool in summer.

4. **Differentiate convection and radiation.**

Convection	Radiation
Flow of heat through a fluid from places of higher temperature to places of lower temperature by movement of the fluid itself.	flow of heat from one place to another by means of electromagnetic waves.

5. **Why do people prefer wearing white clothes during summer?**

During summer most of people prefer to wear white dress because white reflects light. whereas a black object is black because it's absorbing all the light, it's not reflecting any colour so in order to keep your body temperature normal it's better to wear white dress.

6. **What is specific heat capacity?**

Thus, specific heat capacity of a substance is defined as the amount of heat required to raise the temperature of 1 kg of the substance by 10°C or 1 K.

7. **Define thermal capacity.**

The amount of heat energy required to raise the temperature of a body by 10°C .

8. **Define specific latent heat capacity.**

Amount of heat energy absorbed or liberated by unit mass of substance during change of state without causing any change in temperature.

V. Answer in detail:**1. Explain convection in daily life.****Convection in daily life****Hot air balloons**

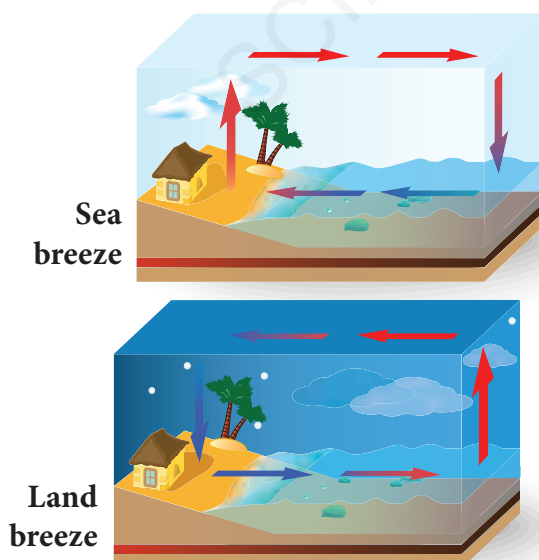
Air molecules at the bottom of the balloon get heated by a heat source and rise. As the warm air rises, cold air is pushed downward and it is also heated. When the hot air is trapped inside the balloon, it rises.



Hot air balloon

Breezes

During day time, the air in contact with the land becomes hot and rises. Now the cool air over the surface of the sea replaces it. It is called sea breeze. During night time, air above the sea is warmer. As the warmer air over the surface of the sea rises, cooler air above the land moves towards the sea. It is called land breeze.



Land breeze and sea breeze

Winds

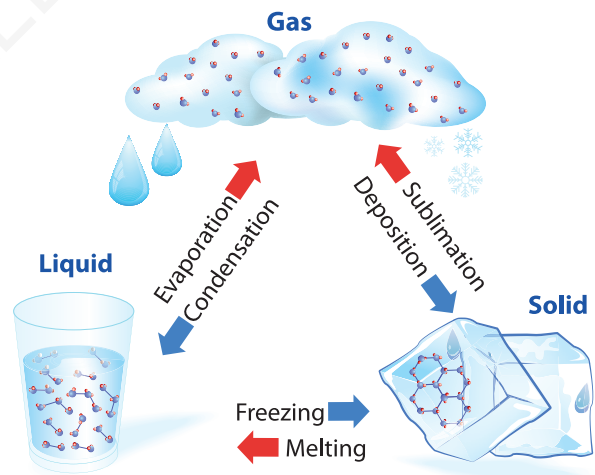
Air flows from area of high pressure to area of low pressure. The warm air molecules over hot surface rise and create low pressure. So, cooler air with high pressure flows towards low pressure area. This causes wind flow.

Chimneys

Tall chimneys are kept in kitchen and industrial furnaces. As the hot gases and smoke are lighter, they rise up in the atmosphere.

2. What are the changes of state in water? Explain.**Change of state of matter**

The process of changing of a substance from one physical state to another at a definite temperature is defined as change of state.



Change of state of matter

water molecules are in liquid state at normal temperature. When water is heated to 100°C , it becomes steam which is a gaseous state of matter. On reducing the temperature of the steam it becomes water again. If we reduce the temperature further to 0°C , it becomes ice which is a solid state of water. Ice on heating, becomes water again.

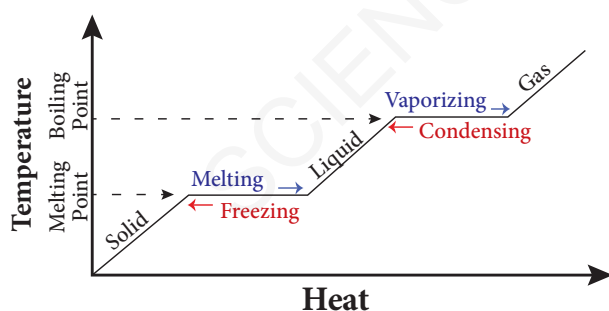
Thus, water changes its state when there is a change in temperature. There are different such processes in the change of state in matter.

Melting – Freezing

The process in which a solid is converted to liquid by absorbing heat is called **melting or fusion**. The temperature at which a solid changes its state to liquid is called melting point. The reverse of melting is freezing. The process in which a liquid is converted to solid by releasing heat is called **freezing**. The temperature at which a liquid changes its state to solid is called freezing point. In the case of water, melting and boiling occur at 0°C .

Boiling-Condensation

The process in which a liquid is converted to vapor by absorbing heat is called **boiling or vaporization**. The temperature at which a liquid changes its state to gas is called boiling point. The process in which a vapor is converted to liquid by releasing heat is called **condensation**. The temperature at which a vapour changes its state to liquid is called condensation point. Boiling point as well as condensation point of water is 100°C .



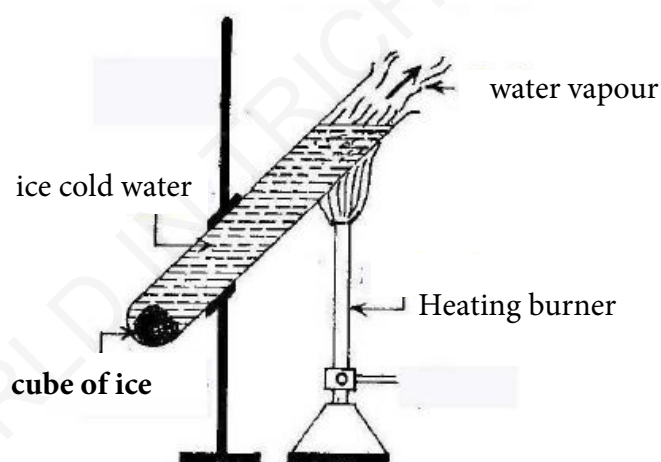
Various stages of conversion of state of matter

Sublimation

Some solids like dry ice, iodine, frozen carbon dioxide and naphthalene balls change directly from solid state to gaseous state without becoming liquid. The process in which a solid is converted to gaseous state is called sublimation.

3. How can you experimentally prove that water is a bad conductor of heat? How is it possible to heat water easily while cooking.

- i) Take hard glass test tube and drop in it a tiny cube of ice ,wrapped in a gauze. Fill $3/4$ of the tube with ice cold water and then set up the apparatus as shown in a diagram.Heat the test tube near its mouth. it is observed that in few moments water starts boiling near the top, but the ice at the bottom does not melt. This experiment shows that water is a bad conductor of heat.



- ii)The crucial knowledge to understand and apply is that boiling water doesn't get any hotter than $100^{\circ}\text{C}/212^{\circ}\text{F}$.Because of this ,high heat won't cook already-boiling -hot food faster. **Choose a pot with a lid:** A boil lid will trap faster. A large pot will take longer to boil.

VI.Complete the missing terms in the following table:

Process	Phase I	Phase II
Sublimation	<u>solid</u>	Vapour
Solidification	<u>liquid</u>	Solid
<u>melting</u>	Solid	Liquid
Freezing	Liquid	<u>solid</u>
Condensation	<u>vapour</u>	liquid

VII. Identify the answer for the following

O	N	E	L	A	T	E	N	T	S
Y	O	M	N	E	H	E	A	T	O
S	P	E	C	I	F	I	C	S	T
S	J	O	U	L	E	X	B	I	A
C	O	N	V	E	C	T	I	O	N

Clues:

1. A form of energy. **Answer: Heat**
2. Unit for heat energy. **Answer: Joule**
3. Hidden heat **Answer: Latent**
4. If the mass of substance is mentioned, then heat capacity can be replaced with ----- heat capacity.
Answer: Specific
5. Process taking place in fluids due to heat exchange. **Answer: Convection**

Problems:

1. What is the heat in joules required to raise the temperature of 25 grams of water from 0°C to 100°C? What is the heat in Calories?

(Specific heat of water = 4.18 J/g°C)

Solution:

Use the formula $q = mc\Delta T$

where

q = heat energy

m = mass

c = specific heat

ΔT = change in temperature

$$q = (25 \text{ g}) \times (4.18 \text{ J/g}^\circ\text{C}) [(100^\circ\text{C} - 0^\circ\text{C})]$$

$$q = (25 \text{ g}) \times (4.18 \text{ J/g}^\circ\text{C}) \times (100^\circ\text{C})$$

$$q = 10450 \text{ J}$$

2. What could be the final temperature of a mixture of 100 g of water at 90°C and 600g of water at 20°C.

For temperatures between the freezing and boiling point of water, the heating curve is linear. Thus, we can use:

$$= ((100 \times 90) + (600 \times 20)) / 700$$

Or: $((100 \times 90)(\text{temperature of first sample weighted by mass}) + (600 \times 20)(\text{temperature of second sample weighted by mass}) / (700)$
(total mass)

To find the final temperature.

100 can be factored out
to get $(1 \times 90) + (6 \times 20)) / 7$

$$= 90 + 120 / 7$$

$$= 210 / 7 = 30^\circ\text{C}$$

3. How much heat energy is required to change 2 kg of ice at 0°C into water at 20°C? (Specific latent heat of fusion of water = 3,34,000 J/kg, Specific heat capacity of water = 4200 J Kg⁻¹ K⁻¹).

$$\text{Heat} = m h_{fg} + m C_p \Delta T$$

Here, m (mass of ice) = 2 kg

$$h_{fg} (\text{latent heat of fusion of ice}) = 334000 \text{ J/Kg}$$

$$C_p \text{ of water (specific heat)} = 4200 \text{ J Kg}^{-1} \text{ K}^{-1}$$

$$\Delta T (\text{Temperature difference}) = 20^\circ\text{C}$$

Therefore, Heat required

$$= 2 \times 334000 + 2 \times 4200 \times (20 - 0)$$

$$\text{Heat reqd} = 8,36,000 \text{ J}$$

Therefore, to melt 2 kg of ice **8,36,000 J** of heat is required.

4. A piece of aluminium of mass 0.5 kg is heated to 100°C and then placed in 0.4 kg of water at 10°C. If the resulting temperature of the mixture is 30°C, what is the specific heat capacity of aluminium? (SHC of water = 4,200 J/Kg°C)

$$m_x C_x \Delta T = m_w C_w \Delta T$$

$$0.4 \times 4200 \times (30 - 10) = 0.5 \times C_x \times (100 - 30)$$

$$C = \frac{0.4 \times 4200 \times 20}{0.5 \times 70}$$

$$= 33600 / 35 = 960 \text{ J/Kg}^\circ\text{C}$$

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