	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	**Department: SCIENCE 2022 – 23** **SUBJECT: PHYSICS**	**Date of submission:** **30-01-2023**
Worksheet No:10 **WS WITH ANS**	**Topic: THERMAL PROPERTIES OF MATTER**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT:	**CLASS & SECTION:**	**ROLL NO:**

OBJECTIVE TYPE QUESTIONS:

1) The density of a substance at 0°Cis 10 g/cc and at 100°C its density is 9.7 g/cc. The coefficient of linear expansion of the substance is
   (a) 10^{-4}°C^{-1} (b) 10^{-2} °C^{-1} (c) 10^{-3} °C^{-1} (d) 10^{-5} °C^{-1}

2) A copper wire of length L increases in length by 0.3% on heating from 20°C to 40°C. Then percentage change in area of a copper plate of dimensions 3L x 2L on heating from 20°C to 40°C is
   (a) 0.15% (b) 0.3% (c) 0.4% (d) 0.6%

3) The ratio of densities of iron at 10°C and 30°C is (α of iron = 10 x 10^{-6} °C^{-1})
   (a) 1.003 (b) 1.0003 (c) 1.006 (d) 1.0006

4) A metal cube of length 10 mm at 0 ºC (273 K) is heated to 200 ºC (473 K). Given: its coefficient of linear expansion is 2 x 10^{-5} K^{-1}. The percent change of its volume is
   (a) 0.1 (b) 0.2 (c) 0.4 (d) 1.2

5) Certain amount of heat is given to 100g of copper to increase its temperature by 21°C. If the same amount of heat is given to 50 g of water, then the rise in its temperature is
   (specific heat capacity of copper = 400 J kg^{-1} K^{-1} and that for water = 4200 J kg^{-1} K^{-1})
   (a) 4 ºC (b) 5.25 ºC (c) 8 ºC (d) 10.5 ºC

6) Specific heat of a substance at the melting point becomes
   (a) low (b) high (c) remains unchanged (d) infinite

7) Person weighing 60 kg takes in 2000 kcal diet in a day. If this energy was to be used in heating the person without any losses, his rise in temperature would be nearly (Given sp. heat of human body is 0.83 cal g^{-1} °C^{-1})
   (a) 30°C (b) 40°C (c) 35°C (d) 45°C

CONCEPTUAL TYPE QUESTIONS: -

8) Can water be boiled without heating?

9) Why water is preferred to any other liquid in the hot water bottles?

10) The ice at 0°C is converted into steam at 100°C. State the isothermal changes in the process.

11) What is relegation?

12) What is sublimation?

NUMERICAL TYPE QUESTIONS: -

13) A brass disc has a hole of diameter 2.5 cm at 27°C. Find the change in the diameter of the hole of the disc when heated to 327°C. Given coefficient of linear expansion of brass is 1.9×10^{-5} °C^{-}

14) How much should the temperature of a brass rod be increased so as to increase its length by 1%? Given α for brass is 0.00002 °C^{-1}

15) Railway lines are laid with gaps to allow for expansion. If the gap between steel rails 60 m long be 3.60 cm at 10°C, then at what temperature will the lines just touch? Co-efficient of linear expansion of rail = 11×10^{-6} °C^{-1}

16) A blacksmith fixes iron ring on the rim of the wooden wheel of a bullock cart. The diameter of the rim and the ring are 5.243 m and 5.231 m respectively at 27°C. To what temperature should the ring be heated so as to fit the rim of the wheel? Coefficient of linear expansion of iron is 1.20×10^{-5} K^{-1}.

17) Volume of a lead ball is 100 cm^3 at 273 K and 100.85 cm^3 at 373 K. Calculate coefficient of cubical expansion.

ANSWERS:

1	(a) $10^{-4o}C^{-1}$
2	(d) 0.6%
3	(d)) 1.0006
4	(d) 1.2
5	(a) 4 ºC
6	(d) infinite
7	(b) 40°C
8	Yes. At low pressure. Below the room temperature, when the pressure is made low, the water starts boiling without supplying any heat.
9	Water is preferred to any other liquid in the hot water bottles because the specific heat of water is high. It does not cool fast.
10	Isothermal changes are (i) conversion of ice at 0°C into water at 0°C (ii) conversion of water at 100°C into steam at 100°C.

11	It is a phenomenon of refreezing the water into ice (on the surface of ice formed due to increase in pressure) on removing the increased pressure.
12	On heating a substance, the change from solid state to vapour state without passing through the liquid state is called sublimation.
13	**Solution.** Here, $D_{27} = 2{\cdot}5$ cm ; $\Delta T = 327 - 27 = 300°C$ $\alpha = 1{\cdot}9 \times 10^{-5}\ °C^{-1}$; $D_{327} - D_{27} = ?$ $D_{327} = D_{27}\,[1 + \alpha\,\Delta T] = D_{27} + D_{27}\,\alpha\,\Delta T$ Change in diameter $= D_{327} - D_{27} = D_{27}\,\alpha\,\Delta T$ $= 2{\cdot}5 \times (1{\cdot}9 \times 10^{-5}) \times 300$ $= \mathbf{0{\cdot}014\ cm.}$
14	**Solution.** Here, $\Delta T = ?$; $\frac{\Delta L}{L} = \frac{1}{100}$ $\alpha = 0{\cdot}00002\ °C^{-1}$ As, $\Delta L = \alpha\, L\, \Delta T$ $\therefore \quad \Delta T = \frac{\Delta L}{L\alpha} = \frac{1}{100 \times 0{\cdot}00002}$ $= \frac{10^5}{2 \times 10^2} = \mathbf{500°\,C}$
15	Here, $l = 60$ m ; $\Delta l = 3{\cdot}60$ cm $= 3{\cdot}6 \times 10^{-2}$ m ; $\theta_1 = 10°C$, $\theta_2 = ?$; $\alpha = 11 \times 10^{-6}\ °C^{-1}$ $\alpha = \frac{\Delta l}{l(\theta_2 - \theta_1)}$ or $\theta_2 - \theta_1 = \frac{\Delta l}{l\alpha}$ or $\theta_2 = \theta_1 + \frac{\Delta l}{l\alpha} = 10 + \frac{3{\cdot}60 \times 10^{-2}}{60 \times 11 \times 10^{-6}}$ $= 10 + 54{\cdot}54 = \mathbf{64{\cdot}54°C}$
16	**Solution.** Here, $L_{T_1} = 5{\cdot}231$ m ; $L_{T_2} = 5{\cdot}243$ m ; $T_1 = 27°C$, $T_2 = ?$ As, $\alpha = \frac{L_{T_2} - L_{T_1}}{L_{T_1}(T_2 - T_1)}$ $\therefore$ $T_2 - T_1 = \frac{L_{T_2} - L_{T_1}}{L_{T_1} \times \alpha}$ or $T_2 = \frac{L_{T_2} - L_{T_1}}{L_{T_1} \times \alpha} + T_1$ $= \frac{5{\cdot}243 - 5{\cdot}231}{5{\cdot}231 \times 1{\cdot}2 \times 10^{-5}} + 27$ $= 191{\cdot}1 + 27 = 218{\cdot}1 \approx \mathbf{218°C}$
17	$V = V_0(1 + \gamma\Delta T)$ $\Delta V = V_0\gamma\Delta T$ $0.85 = 100\,\gamma(100)$ $\gamma = 85 \times 10^{-6}K^{-1}$

Prepared by: Ms Vivette Shirly Lasrado	Checked by: HOD - SCIENCE