	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:

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heet No:10 ITH ANS	Topic: THERMAL PROPERTIES OF MATTER		Note: A4 FILE FORMAT ROLL NO:		
AME OF THE CLASTUDENT:		S & SECTION:			
CTIVE TYE	PE QUESTIO	NS:			
of linear exp	pansion of the	substance is			
(a) 1	0^{-4} °C ⁻¹	(b) $10^{-2} {}^{\circ}\text{C}^{-1}$	(c) 10^{-3} °C ⁻¹	(d) 10^{-5} °C ⁻¹	
* *	_		•		
(a) 0	.15%	(b) 0.3%	(c) 0.4%	(d) 0.6%	
(a) 1	.003	(0) 1.0003	(C) 1.000	(u) 1.0000	
				73 K). Given: its coefficient	of
(a) ().1	(b) 0.2	(c) 0.4	(d) 1.2	
same amour	nt of heat is giv	ven to 50 g of water,	then the rise in its tem	perature is	
(a) 4	$^{\circ}$ C	(b) 5.25 °C	(c) 8 °C	(d) 10.5 °C	
_				1,40,1,61,1	
(a) lo	OW	(b) high	(c) remains unch	anged (d) infinite	
person with	out any losses,				
		(b) 40°C	(c) 35°C	(d) 45°C	
	The density of linear expander (a) 1 A copper with percentage (a) 0 The ratio of (a) 1 A metal cub linear expander (a) 0 Certain among same amount (specific heat (a) 4 Specific heat (a) 4 Person weight person with 0.83 cal g ⁻¹ of 10	TH ANS OF THE CLASS & SE ENT: CTIVE TYPE QUESTIO The density of a substance of linear expansion of the (a) 10 ⁻⁴ °C ⁻¹ A copper wire of length L percentage change in area 40°C is (a) 0.15% The ratio of densities of ire (a) 1.003 A metal cube of length 10 linear expansion is 2 x 10 ⁻¹ (a) 0.1 Certain amount of heat is given as a same amount of heat is given as a substance (a) 4°C Specific heat of a substance (a) low Person weighing 60 kg take	THE ANS COF THE CLASS & SECTION: CTIVE TYPE QUESTIONS: The density of a substance at 0°Cis 10 g/cc and of linear expansion of the substance is (a) 10 ⁻⁴ °C ⁻¹ (b) 10 ⁻² °C ⁻¹ A copper wire of length L increases in length b percentage change in area of a copper plate of 40°C is (a) 0.15% (b) 0.3% The ratio of densities of iron at 10°C and 30°C (a) 1.003 (b) 1.0003 A metal cube of length 10 mm at 0 °C (273 K) linear expansion is 2 x 10 ⁻⁵ K ⁻¹ . The percent change in a given to 50 g of water, (specific heat capacity of copper = 400 J kg ⁻¹ K (a) 4 °C (b) 5.25 °C Specific heat of a substance at the melting point (a) low (b) high Person weighing 60 kg takes in 2000 kcal diet is person without any losses, his rise in temperature 0.83 cal g ⁻¹ °C ⁻¹)	CTIVE TYPE QUESTIONS: The density of a substance at 0°Cis 10 g/cc and at 100°C its density is of linear expansion of the substance is (a) 10 ⁻⁴ °C ⁻¹ (b) 10 ⁻² °C ⁻¹ (c) 10 ⁻³ °C ⁻¹ A copper wire of length L increases in length by 0.3% on heating from percentage change in area of a copper plate of dimensions 3L x 2L or 40°C is (a) 0.15% (b) 0.3% (c) 0.4% The ratio of densities of iron at 10°C and 30°C is (α of iron = 10 x 10 (a) 1.003 (b) 1.0003 (c) 1.006 A metal cube of length 10 mm at 0 °C (273 K) is heated to 200 °C (47 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 Certain amount of heat is given to 100g of copper to increase its temps ame amount of heat is given to 50 g of water, then the rise in its tem (specific heat capacity of copper = 400 J kg ⁻¹ K ⁻¹ and that for water = (a) 4 °C (b) 5.25 °C (c) 8 °C Specific heat of a substance at the melting point becomes (a) low (b) high (c) remains unch Person weighing 60 kg takes in 2000 kcal diet in a day. If this energy person without any losses, his rise in temperature would be nearly (G 0.83 cal g ⁻¹ °C ⁻¹)	A4 FILE FORMAT ROLL NO: CTIVE TYPE QUESTIONS: 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 ^{-4a} C ⁻¹ (b) 10 ⁻² °C ⁻¹ (c) 10 ⁻³ °C ⁻¹ (d) 10 ⁻⁵ °C ⁻¹ 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% The ratio of densities of iron at 10°C and 30°C is (a of iron = 10 x 10 ⁻⁶ °C ⁻¹) (a) 1.003 (b) 1.0003 (c) 1.006 (d) 1.0006 A metal cube of length 10 mm at 0 °C (273 K) is heated to 200 °C (473 K). Given: its coefficient 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 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 °C (b) 5.25 °C (c) 8 °C (d) 10.5 °C Specific heat of a substance at the melting point becomes (a) low (b) high (c) remains unchanged (d) infinite 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 0.83 cal g ⁻¹ °C ⁻¹)

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 x 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 = $11 \times 10^{-6} \, ^{\circ}$ 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 x 10⁻⁵ K⁻¹.
- 17) Volume of a lead ball is 100 cm³ at 273 K and 100.85 cm³ at 373 K. Calculate coefficient of cubical expansion.

ANSWERS:

1	(a) 10^{-40} C ⁻¹
2	(d) 0.6%
3	(d)) 1.0006
4	(d) 1.2
5	(a) 4 °C
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, $D_{27} = 2.5$ cm;
	$\Delta T = 327 - 27 = 300^{\circ}\text{C}$
	$\alpha = 1.9 \times 10^{-5} {}^{\circ}\text{C}^{-1} \; ; D_{327} - D_{27} = ?$ $D_{327} = D_{27} \left[1 + \alpha \Delta T \right] = D_{27} + D_{27} \alpha \Delta T$
	Change in diameter = $D_{327} - D_{27} = D_{27} \propto \Delta T$
	$= 2.5 \times (1.9 \times 10^{-5}) \times 300$
	= 0·014 cm.
14	
	Solution. Here, $\Delta T = ?$; $\frac{\Delta L}{L} = \frac{1}{100}$
	$\alpha = 0.00002 \text{ °C}^{-1}$
	As, $\Delta L = \alpha L \Delta T$
	$\Delta T = \frac{\Delta L}{L \alpha} = \frac{1}{100 \times 0.00002}$
	$L\alpha = 100 \times 0.00002$
	105
	$= \frac{10^5}{2 \times 10^2} = 500^{\circ} \mathrm{C}$
15	
	Here, $l = 60 \text{ m}$; $\Delta l = 3.60 \text{ cm} = 3.6 \times 10^{-2} \text{ m}$;
	$\theta_1 = 10^{\circ}\text{C}, \ \theta_2 = ?; \ \alpha = 11 \times 10^{-6} \ {}^{\circ}\text{C}^{-1}$
	$\alpha = \frac{\Delta l}{l(\theta_2 - \theta_1)}$ or $\theta_2 - \theta_1 = \frac{\Delta l}{l \alpha}$
	or $\theta_2 = \theta_1 + \frac{\Delta l}{l \alpha} = 10 + \frac{3.60 \times 10^{-2}}{60 \times 11 \times 10^{-6}}$
	or $\theta_2 = \theta_1 + \frac{1}{l \alpha} = 10 + \frac{1}{60 \times 11 \times 10^{-6}}$
	= 10 + 54.54 = 64.54°C
16	
	Solution. Here, $L_{T_1} = 5.231 \text{ m}$;
	$L_{T_2} = 5.243 \text{ m}$; $T_1 = 27^{\circ}\text{C}$, $T_2 = ?$
	$L_{T_2} - L_{T_1}$
	As, $\alpha = \frac{L_{T_2} - L_{T_1}}{L_{T_1}(T_2 - T_1)}$ $\therefore T_2 - T_1 = \frac{L_{T_2} - L_{T_1}}{L_{T_1} \times \alpha}$
	$L_{T_2} - L_{T_1}$
	or $T_2 = \frac{L_{T_2} - L_{T_1}}{L_{T_1} \times \alpha} + T_1$
	$=\frac{5.243-5.231}{5.231\times1.2\times10^{-5}}+27$
17	$= 191 \cdot 1 + 27 = 218 \cdot 1 \approx 218^{\circ}C$ $V = V_0 (1 + \gamma \Delta T)$
	$\Delta V = V_0 \gamma \Delta T$
	$0.85 = 100 \gamma(100)$
	$\gamma = 85 \times 10^{-6} K^{-1}$

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