

HEAT AND THERMODYNAMICS

1. A 250 ml beaker is completely filled with mercury. The mercury and the beaker are in thermalequilibrium with a temperature of 25°C. The volume of the mercury overflows when their temperatures are raised to 65°C is: (The linear expansion coefficient for mercury and glass are $6 \times 10^{-5}/K$ and $4 \times 10^{-6}/K$ resp.)

a. 3.36 ml b. 0.56 ml c. 1.68 ml d. 1.12 ml

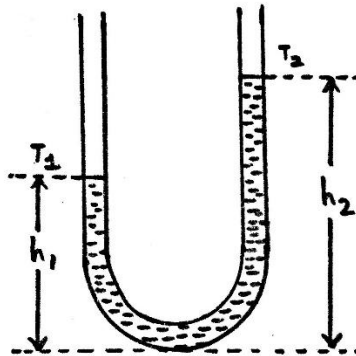
2. In a vertical U - tube containing a liquid, the two arms are maintained at temperatures T_1 and T_2 . The liquid levels in the arms have heights h_1 and h_2 . The coefficient of volume expansion of the liquid is:

a. $\frac{h_1-h_2}{h_2t_1-h_1t_2}$

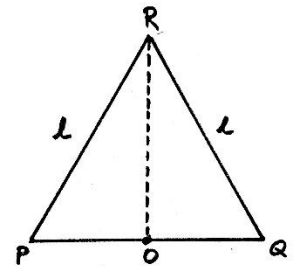
b. $\frac{h_1-h_2}{h_1t_1-h_2t_2}$

c. $\frac{h_1+h_2}{h_2t_1+h_1t_2}$

d. $\frac{h_1+h_2}{h_1t_1+h_2t_2}$



3. Three rods each of length l form an equilateral triangle PQR with O as the midpoint of PQ . The distance OR remains constant for small changes in temperature. If the coefficient of linear expansion for PR and RQ are α_2 and that for PQ is α_1 , then:



a. $\alpha_2 = 3\alpha_1$ b. $\alpha_2 = 4\alpha_1$ c. $\alpha_1 = 3\alpha_2$ d. $\alpha_1 = 4\alpha_2$

4. The temperatures of equal masses of three different liquids A , B and C are 12 °C, 19 °C and 27 °C respectively. When A and B are mixed, the temperature of the mixture is 16 °C and the temperature of the mixture of B and C is 23 °C. The temperature of the mixture of A and C is:

a. 18.2 °C b. 22 °C c. 20.5 °C d. 16.75 °C

5. The pressure of CO_2 in a container is given by: $P = \frac{RT}{2V-b} - \frac{a}{4V^2}$ then the mass of the gas in the container is:

a. 11 g b. 22 g c. 33 g d. 44 g

6. A solid cylinder of radius r and thermal conductivity K_1 is surrounded by a cylindrical shell of inner radius r and outer radius $2r$, same length and conductivity K_2 . The equivalent thermal conductivity is:

a. $\frac{K_1+3K_2}{4}$ b. $\frac{3K_1+K_2}{4}$ c. $\frac{4K_1+k_2}{3}$ d. $\frac{K_1+4K_2}{3}$

7. A gas mixture has 16 g of helium and 14 g of nitrogen. The ratio between C_p to C_v is:

a. 1.4 b. 1.54 c. 1.59 d. 1.61

Keys

1	C	6	A	11	A	16	C	21	B
2	B	7	D	12	C	17	D		
3	D	8	C	13	C	18	D		
4	C	9	A	14	B	19	B		
5	B	10	C	15	B	20	A		