

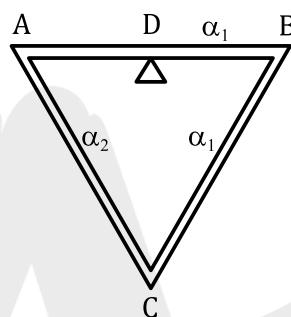


DPP 03

- Q.1** Two metal rods of the same length and area of cross-section are fixed end to end between rigid supports. The materials of the rods have Young moduli Y_1 and Y_2 , and coefficients of linear expansion α_1 and α_2 . The junction between the rods does not shift if the rods are cooled. Then:

(A) $Y_1\alpha_1 = Y_2\alpha_2$ (B) $Y_1\alpha_2 = Y_2\alpha_1$ (C) $Y_1\alpha_1^2 = Y_2\alpha_2^2$ (D) $Y_1^2\alpha_1 = Y_2^2\alpha_2$

- Q.2** Three rods of equal length are joined to form an equilateral triangle ABC. D is the midpoint of AB. The coefficient of linear expansion is α_1 for AB, and α_2 for AC and BC. If the distance DC remains constant for small changes in temperature,



(A) $\alpha_1 = \alpha_2$ (B) $\alpha_1 = 2\alpha_2$ (C) $\alpha_1 = 4\alpha_2$ (D) $\alpha_1 = \frac{1}{2}\alpha_2$

- Q.3** If I is the moment of inertia of a solid body having α -coefficient of linear expansion then the change in I corresponding to a small change in temperature ΔT is

(A) $\alpha I \Delta T$ (B) $\frac{1}{2}\alpha I \Delta T$ (C) $2\alpha I \Delta T$ (D) $3\alpha I \Delta T$

- Q.4** When a copper ball is heated, the largest percentage increase will occur in its
 (A) diameter (B) area (C) volume (D) density

- Q.5** A metal rod of Young's modulus Y and coefficient of thermal expansion α is held at its two ends such that its length remains invariant. If its temperature is raised by $t^\circ\text{C}$, the linear stress developed in it is-

(A) $\frac{\alpha t}{Y}$ (B) $Y \alpha t$ (C) $\frac{Y}{\alpha t}$ (D) $\frac{1}{Y \alpha t}$

- Q.6** An aluminum sphere of 20 cm diameter is heated from 0°C to 100°C . Its volume changes by (given that coefficient of linear expansion for aluminium $\alpha_{\text{Al}} = 23 \times 10^{-6} / {}^\circ\text{C}$)

(A) 28.9cc (B) 2.89cc (C) 9.28cc (D) 49.8cc

- Q.7** A pendulum clock loses 12 s a day if the temperature is 40°C and gains 4 s a day if the temperature is 20°C . The temperature at which the clock will show correct time, and the coefficient of linear expansion (α) of the metal of the pendulum shaft are respectively:

(A) $60^\circ\text{C}; \alpha = 1.85 \times 10^{-4} / {}^\circ\text{C}$ (B) $30^\circ\text{C}; \alpha = 1.85 \times 10^{-3} / {}^\circ\text{C}$

(C) $55^\circ\text{C}; \alpha = 1.85 \times 10^{-2} / {}^\circ\text{C}$ (D) $25^\circ\text{C}; \alpha = 1.85 \times 10^{-5} / {}^\circ\text{C}$



Q.8 Two rods one of aluminium of length l_1 having coefficient of linear expansion α_a , and other steel of length l_2 having coefficient of linear expansion α_s are joined end to end. The expansion in both the rods is same on variation of temperature. Then the value of $\frac{l_1}{l_1+l_2}$ is

(A) $\frac{\alpha_s}{\alpha_a+\alpha_s}$

(B) $\frac{\alpha_s}{\alpha_a-\alpha_s}$

(C) $\frac{\alpha_a+\alpha_s}{\alpha_s}$

(D) None of these

Q.9 A cube of coefficient of linear expansion α_s is floating in a bath containing a liquid of coefficient of volume expansion γ_l . When the temperature is raised by ΔT , the depth upto which the cube is submerged in the liquid remains the same. Find the relation between α_s and γ_l , showing all the steps.

**ANSWER KEY**

1. (A) 2. (C) 3. (C) 4. (C) 5. (C) 6. (A) 7. (D)
8. (A) 9. $\gamma_1 = 2\alpha_s$

Home Work

Ex. 1	Q. 8, 10, 12,
Ex. 2	Q. 10
Ex. 3	Q. 5, 6, 7,
Ex. 4	Q. 6
Ex. 5	Q.