

A student records the initial length l , change in temperature ΔT and change in length Δl of a rod as follows:

S.No.	l (m)	ΔT (C)	Δl (m)
1.	2	10	4×10^{-4}
2.	1	10	4×10^{-4}
3.	2	20	2×10^{-4}
4.	3	10	6×10^{-4}

If the first observation is correct, what can you say about observations 2, 3 and 4.

From 1st observation ;

$$l = 2 \text{ m}, \quad \Delta T (^{\circ}\text{C}) = 10, \quad \Delta l = 4 \times 10^{-4} \text{ m.}$$

$$\Rightarrow \Delta l = l \alpha \Delta T$$

$$\Rightarrow \alpha = \frac{\Delta l}{l \Delta T} \Rightarrow \frac{4 \times 10^{-4}}{2 \times 10}$$

$$\Rightarrow \boxed{\alpha = 2 \times 10^{-5} \text{ } ^{\circ}\text{C}^{-1}}$$

For 2nd observation;

On putting the given values

$$\alpha = \frac{4 \times 10^{-4}}{1 \times 10} \Rightarrow 4 \times 10^{-5} \text{ } ^{\circ}\text{C}^{-1} \neq 2 \times 10^{-5} \text{ } ^{\circ}\text{C}^{-1}$$

(Incorrect)

For 3rd observation;

$$\alpha = \frac{2 \times 10^{-4}}{2 \times 10}$$

$$\Rightarrow \alpha = 10^{-5} \text{ } ^{\circ}\text{C}^{-1} \neq 2 \times 10^{-5} \text{ } ^{\circ}\text{C}^{-1} \text{ (Incorrect)}$$

For 4th observation;

$$\alpha = \frac{6 \times 10^{-4}}{3 \times 10}$$

$$\Rightarrow \alpha = 2 \times 10^{-5} \text{ } ^{\circ}\text{C}^{-1} \text{ (Correct)}$$