

A steel rod of length 1 m rests on a smooth horizontal base. If it is heated from  $0^{\circ}\text{C}$  to  $100^{\circ}\text{C}$ , what is the longitudinal strain developed?

Steel rod is resting on a smooth horizontal base at  $0^{\circ}\text{C}$ . When temperature is increased to  $100^{\circ}\text{C}$ , it will lead to an increase in the length of steel due to expansion on heating. But, because there is no opposition in expansion of length, no longitudinal strain will be developed.

$$\Rightarrow \boxed{\text{Longitudinal strain} = 0}$$

→ (As there is no external horizontal force  
i.e. no friction or gravity)