21. A wire elongates by l mm when a load W is hanged from it. If the wire goes over a pulley and two weights W each are hung at the two ends, the elongation of the wire will be (in mm)
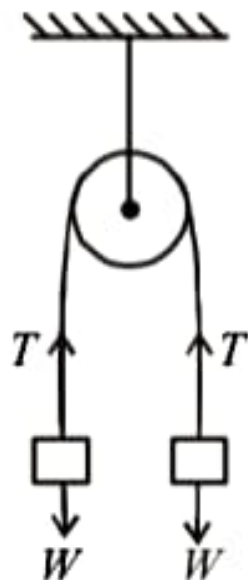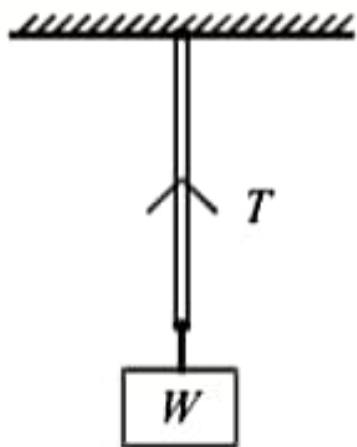
[2006]

(a) l　　(b) $2l$　　(c) zero　　(d) $l/2$

21. **(a)** Case (i)

At equilibrium, $T = W$

Young's modules, $Y = \dfrac{W/A}{\ell/L}$ .....(1)

Elongation, $\ell = \dfrac{W}{A} \times \dfrac{L}{Y}$

Case (ii) At equilibrium $T = W$

$\therefore$ Young's moduls, $Y = \dfrac{W/A}{\dfrac{\ell/2}{L/2}}$

$\Rightarrow \quad Y = \dfrac{W/A}{\ell/L} \qquad \Rightarrow \quad \ell = \dfrac{W}{A} \times \dfrac{L}{Y}$

$\Rightarrow$ Elongation is the same.