

29. If ' S ' is stress and ' Y ' is young's modulus of material of a wire, the energy stored in the wire per unit volume is [2005]

(a) $\frac{S^2}{2Y}$

(b) $2S^2Y$

(c) $\frac{S}{2Y}$

(d) $\frac{2Y}{S^2}$

29. (a) Energy stored in the wire per unit volume,

$$E = \frac{1}{2} \times \text{stress} \times \text{strain} \quad \dots(i)$$

We know that,

$$Y = \frac{\text{stress}}{\text{strain}}$$

$$\Rightarrow \text{strain} = \frac{\text{stress}}{Y}$$

On substituting the expression of strain in equation (i) we get

$$E = \frac{1}{2} \times \text{stress} \times \frac{\text{stress}}{Y} = \frac{1}{2} \cdot \frac{S^2}{Y}$$