Answer on Question #49060 – Engineering – Other

1. A spring extends by a distance of 5 cm when subjected to a 10 N force.

Q: What is the amount of elastic potential energy contained in this spring when extended by 10 cm?

Give your answer in Joules and as a positive value.

$\Delta x_1 = 0.05\,m$ $F = 10\,N$ $\Delta x_2 = 0.1m$	*Solution.*
$E - ?$	According to Hooke's law, the force needed to extend or compress a spring by some distance is proportional to that distance. So, we can write $F = k \cdot \Delta x_1,$

where a spring constant k is the proportionality factor.

Thus, the spring constant is $k = \dfrac{F}{\Delta x_1}$.

Elastic potential energy contained in this spring when extended by Δx_2 is

$$E = \frac{k \cdot \Delta x_2^{\,2}}{2} = \frac{F}{\Delta x_1} \cdot \frac{\Delta x_2^{\,2}}{2}, \quad \boxed{E = \frac{F\,\Delta x_2^{\,2}}{2\Delta x_1}}.$$

Let check the dimension: $[E] = \dfrac{N \cdot m^2}{m} = N \cdot m = J$.

Let evaluate the quantities: $E = \dfrac{10 \cdot 0.1^2}{0.5} = 0.2(J)$.

Answer: 0.2 Joules.