Answer on Question #41143, Physics, Mechanics | Kinematics | Dynamics

A wire suspended vertically from one end is stretched by attaching a weight of 20 N to the lower end. The weight stretches the wire by 1mm .How much energy is gained by the wire

Solution:

Elastic potential energy is an energy stored as a result of deformation of an elastic object, such as the stretching of a wire. It is equal to the work done to stretch the spring, which depends upon the spring constant k as well as the distance stretched. According to Hooke's law, the force required to stretch the wire will be directly proportional to the amount of stretch.

The force has the form

$$F = -kx$$

The work done to stretch the spring a distance x is

$$W = PE = \frac{kx^2}{2}.$$

Thus, the energy stored in the stretch wire is

$$PE = \frac{1}{2}Fx$$

where

PE = elastic strain energy in joules (J)

F = force in newtons (N)

x = change in length in meters (m)

So,

$$PE = \frac{1}{2} \cdot 20 \cdot 0.001 = 0.01 \text{ J}$$

Answer. $PE = 0.01$ J.