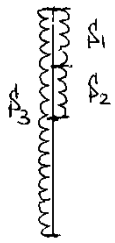
Answer on Question #83964, Physics / Molecular Physics | Thermodynamics

Question:

The system shown in figure consist of three spring and two rods as shown. If the temperature of the rods is increased by T, calculate the energy stored in each of the springs.The spring are relaxed

Solution:

Owing to the lack of a figure let's suppose the springs and rods are connected as below.



Then after the temperature of the rods is increased by T, the rod length increment is $\delta = \alpha l T, \alpha$ - linear thermal expansion coefficient, l – rod length. In this case energy saved in the spring 3 equals to $E_3 = \frac{k(2\delta)^2}{2} = 2k(\alpha l T)^2$, in the springs 1 and 2 each $E_1 = \frac{k(\delta/2)^2}{2} = 0.125k(\alpha l T)^2$, k is stiffness coefficient.

The answer:

$E_3 = 2k(\alpha l T)^2$, $E_1 = 0.125k(\alpha l T)^2$, designations see above.