1.

(a)

Total energy, E = 0.250 J

(b)

Energy at the end point = 0.258 J

(c)

No, the two energies are not the same. The given formula only applies to ideal springs. Real springs, which were probably used in the experiment, however, exhibit nonlinear behavior.

2.

Spring constant, k = 13.3 N/m
Uncertainty, α_k = 1.4 N/m
Final result : k = 13.3 ± 1.4 N/m

3.

Density, ρ = 8.78 g/cm^3
Uncertainty, α_ρ = 0.09 g/cm^3
Final result : ρ = 8.78 ± 0.09 g/cm^3

4.

Best estimated value of s_0 = 34.0 cm
Uncertainty = 0.8 cm
Final result : s_0 = 34.0 ± 0.8 cm

Best estimated value of v = 5.2 cm
Uncertainty = 0.3 cm
Final result : v = 5.2 ± 0.3 cm

Uncertainty in the measurement of s : 2 cm

5.

(a)

Please see Excel Sheet

(b)

Please see Excel Sheet

(c)

Concentration of mercury, [Hg] = 1.7 parts per billion
Uncertainty, $\alpha_{[Hg]}$ = 0.2 parts per billion
Final result, [Hg] = 1.7 ± 0.2 parts per billion