Zero-length Springs and Slinky Coils

Theory Question 1

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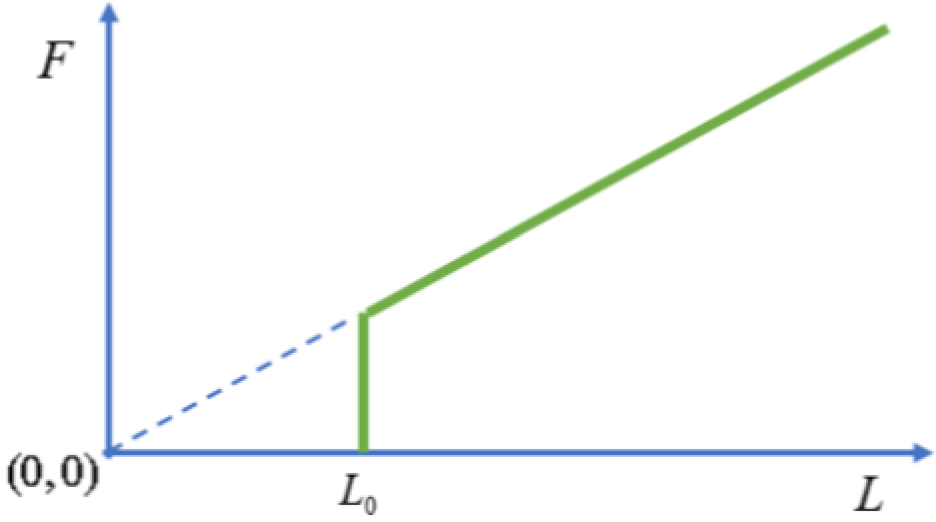
Part A, Zero-length spring

- Definition of Zero-length spring (ZLS):



Part A, Statics - Conclusions the the student should reach

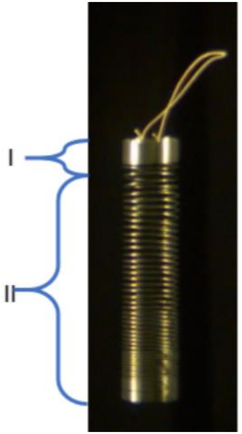
- Every part of a Zero-Length Spring (ZLS) is a ZLS
- Small spring element has large spring constant

Part B, Dynamics

- The bottom part remain static until the moving part reaches it
- We ask the students to calculate properties of the fall given this kind of dynamics

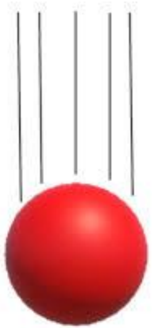
I Moving part

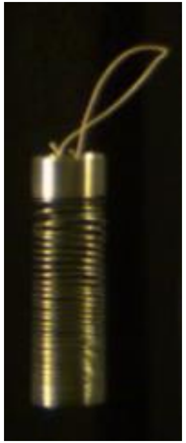
II Static part



Part B, Dynamics
Conclusions the the student should reach

- Center of mass position determines the fall rate of the spring





Part B, Dynamics

- The slinky decelerate along the fall (needs to accelerate larger mass densities per unit time)

Part B, Dynamics - tasks

- Calculate the total fall time:
    - Center of mass free falls from its initial stretched position to the collapsed one

- Calculate the velocity of the moving part

Part C, Energetics

- Energy is lost as a result of adding coils to the moving part