Background

You have read about the conservation of energy in an isolated system. The law of conservation of energy includes elastic potential energy.

Question

Does the law of conservation of energy make valid predictions when energy is converted from elastic potential energy into kinetic energy?

Part 1 (1 set of calculations/person - this must be completed before you start the experiment)

A 100 g spring with a spring constant of 250 N/m is placed on a ramp that makes an angle of 40° with the horizontal. One end of the spring is hooked over the end of the ramp and then the spring is pulled backward. The spring is stretched 15 cm and then released. If the end of the ramp is 1.5 m above the floor, determine:

{5} (a) the velocity of the spring as it leaves the ramp. {7.5 m/s}

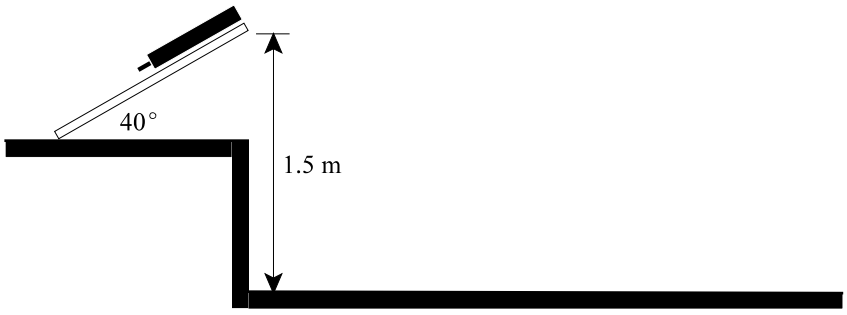
Hint: The spring must possess the same amount of energy when it is stretched and then released.

Note: Make sure to include a list of all known values!

{10} (b) the distance that the spring will travel horizontally (i.e. the range). {7.1 m}

Hint: This is now a traditional projectile motion problem. Remember that "t" is the common factor.

Note: Make sure to break your solution into two parts - vertical and horizontal - and to include a list of known values.



Part 2 (One lab report/person)

In teams of 2 or 3, use a spring and ramp to conduct an experiment to answer the question posed at the start. The setup is similar to the word problem given in part 1 above. You will need to:

(a) do several trials with various spring extensions/angles (3 minimum) to get average travel distances (be sure to include these trials in your data table). Note: (i) make sure you measure where the spring lands, not where it comes to rest and (ii) choose a spring extension that gives you a decent distance but does not deform the spring!

(b) determine the spring constant or "k" value of the spring. (Hint: measure F with a force probe and plot a F-x graph to find the spring constant "k".)

(c) calculate the theoretical values of the range (based on your equipment setup) and compare these to your actual values (i.e. the % error).

Submission

①	Full solutions (including lead-in strategies/thinking) to Part 1	/15	× 1	/15
②	Lab Report for Part 2	/20	× 1.5	/30

- "k" /5 {data chart, F-x graph & calculation of spring constant}
- Hypothesis /4 {calculations based on experimental setup showing the predicted theoretical range of flight}
- Observations /5 {data charts, several trials & averages, % error - don't forget to include a sample % error calculation}
- Conclusion /2 {answer the question posed at the start}
- Analysis /4 {discussion of sources of error, their impact on the results, & ways to minimize/eliminate}