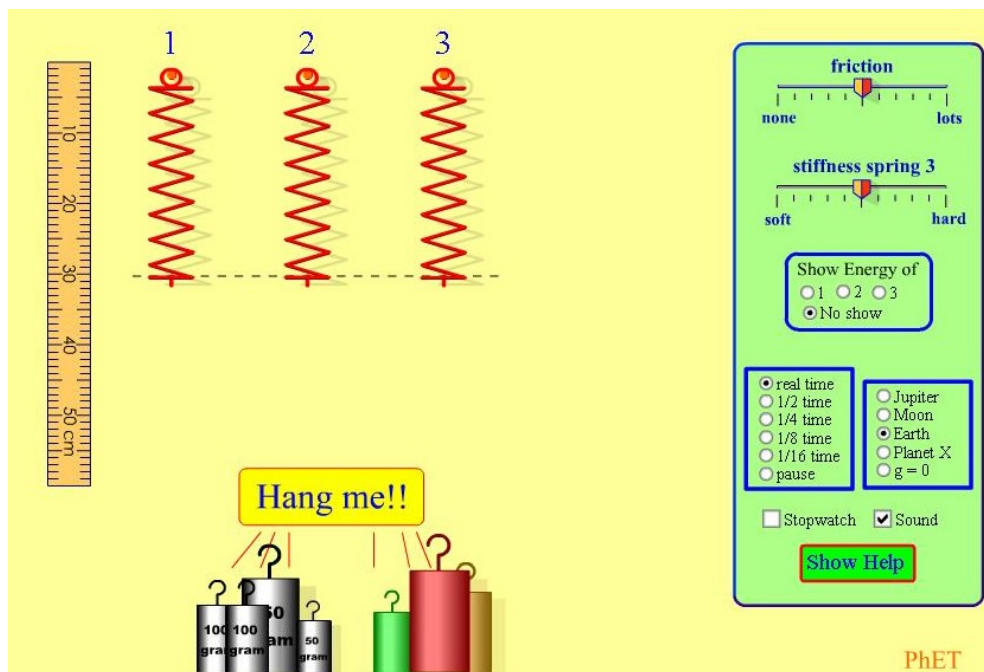


Masses, Springs, and Energy

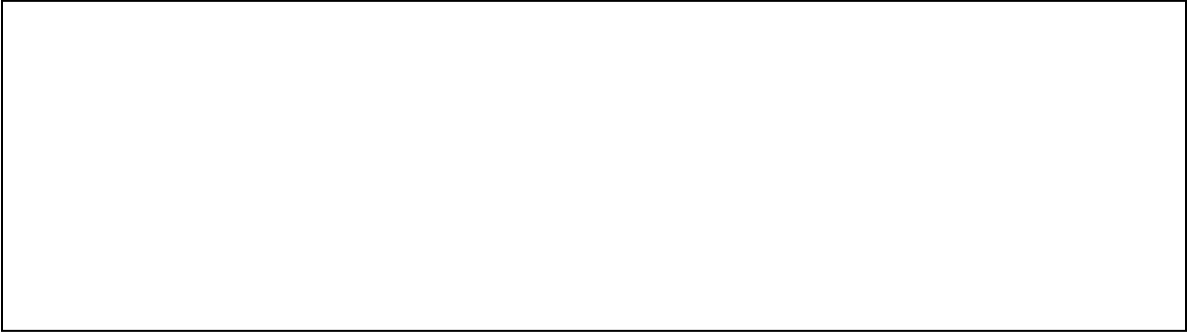
Lab Procedure – Answer questions in red. Requires Adobe Flash to be enabled.

Download and run the Java application “mass-spring-lab.en”. It should look like the screen below. Click the “stopwatch” selection to display a stopwatch. Also select “Show Energy” of mass 3.

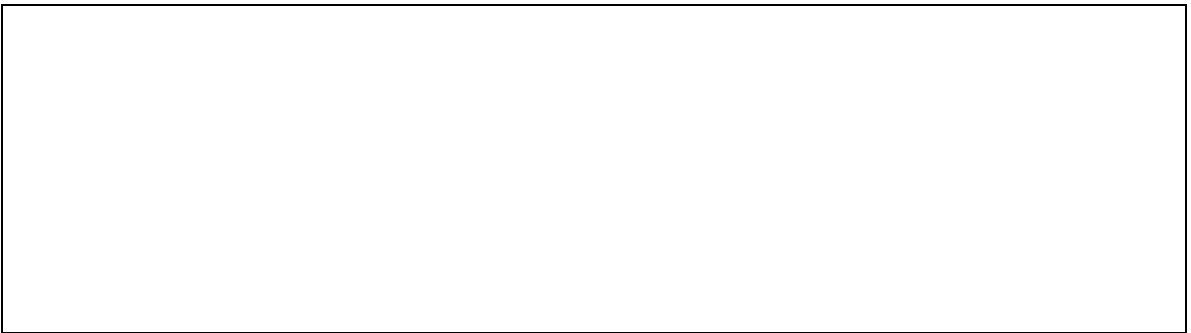


1. Play with this simulation for a while. Try to figure out what all the controls do.
 - a) With the friction slider and the spring softness (spring constant) set about midpoint, describe what happens when you hang the 100g mass onto spring 3.

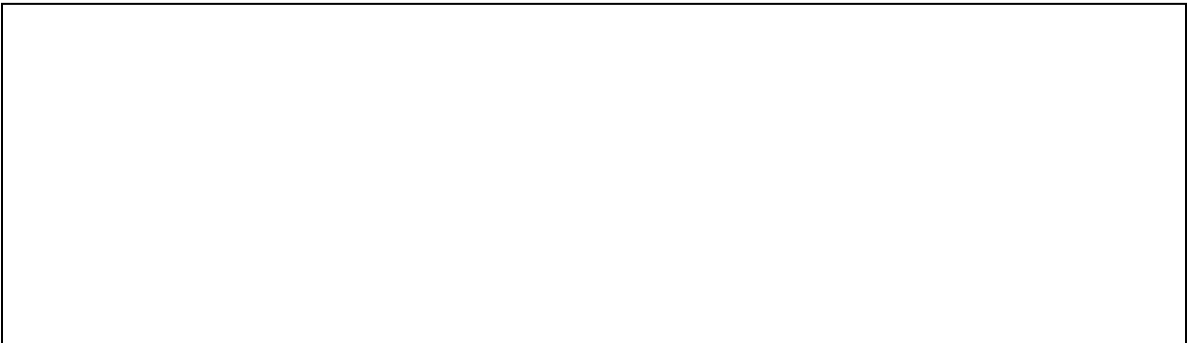
b) Figure out a way to determine the spring constant k of Spring 3, and explain your reasoning. What do you calculate?



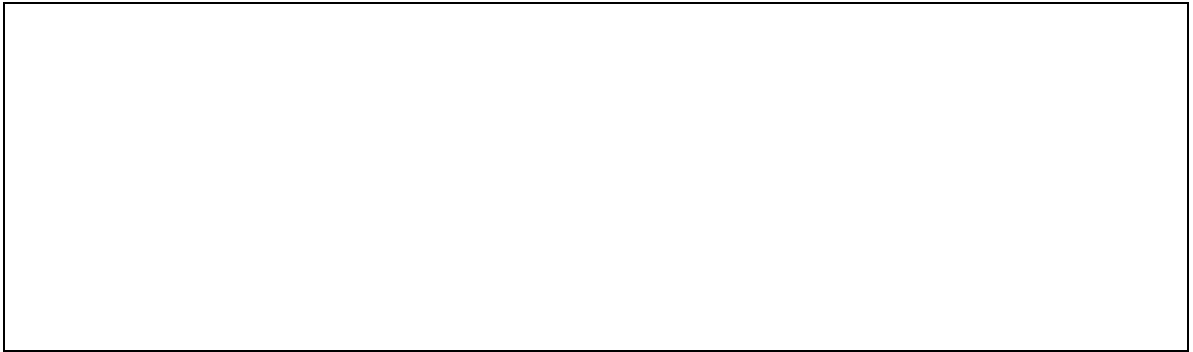
c) With the 100g mass at rest on spring 3, describe the contributions to the total energy of the mass-spring combination. You can neglect “thermal energy”.



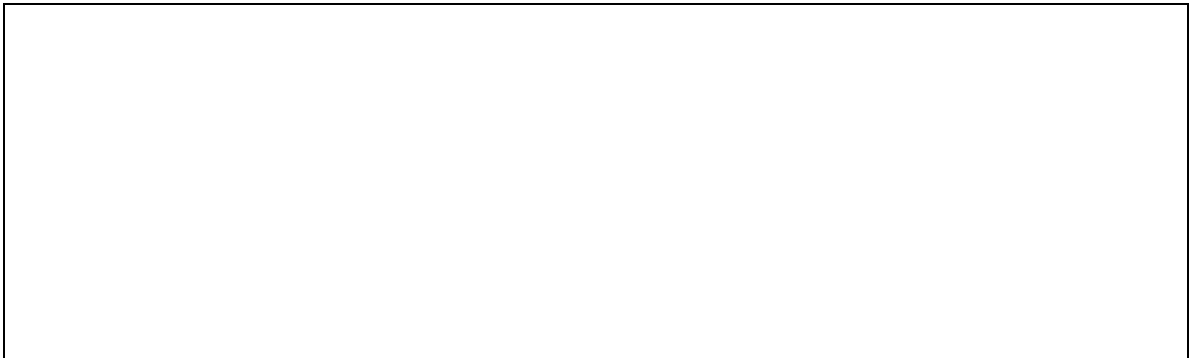
d) Using your mouse, drag the mass down on the screen until the gravitational potential energy reads zero. What can you say about the vertical position of the mass when its gravitational PE is zero?



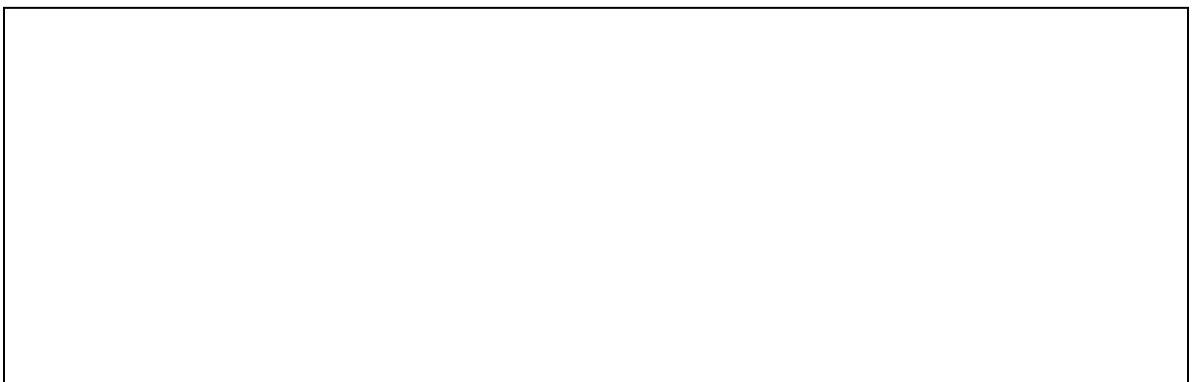
e) At the same point as in part (d), what has happened to the potential energy of the spring (PE elas)?



f) Again clicking and dragging the mass, can you find a vertical position for the mass where the total energy of the mass-spring system is all gravitational potential energy? Why is there no spring potential energy at this point?



g) Now drag the mass still higher on the screen, above the dashed black line. Describe the contributions to the total energy (neglect thermal energy). Explain your observations.



2. Remove the 100g mass from spring 3. Make sure that the spring constant of spring 3 is at its midpoint on the slider.

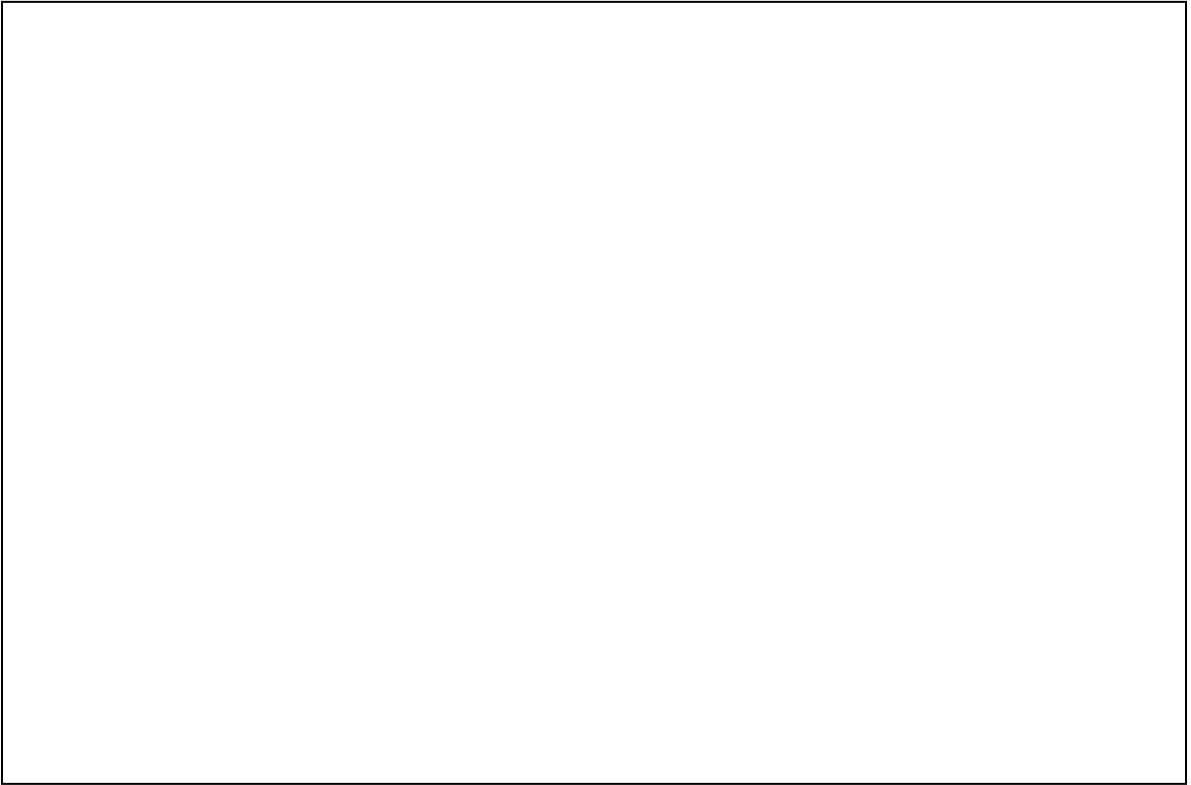
a) Devise a method to actually measure the spring constant of spring 3. Explain your method.

b) Now, calculate the spring constant of spring 3.

3. Using your results from part 2, Devise a method to determine the masses of the three colored unknown masses.

a) Explain your method.

b) Calculate the three unknown masses.



4. On the right column of the app, select “planet x”.

a) Determine the acceleration due to gravity on Planet X. Explain how you found the value.

