_____ # _____ AP Physics 1

Date _____

Bungee Jump Length

Introduction (Use your notes and summarize, in a paragraph, the energy changes that occur when Barbee falls. Be sure to cover 3 phases. A) Barbie is falling and the rope is not yet taut. b) The rope is taut, but the spring has not been stretched c) The spring stretches c) Barbie reaches the bottom of her fall. Also, note where KE and PE are at their maximum and minimum values. **(10 pts)**

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Purpose **(a)** To find the spring constant of a spring

(b) To use your spring constant to determine the maximum rope length that needs to be added to your spring to ensure that Barbie does not hit the ground when she is dropped from the bottom of the spring attached to our ceiling.

Materials

- rope
- spring
- Set of masses

Procedure **(6 pts)**

1._____

2._____

3._____

4._____

Data **(4 pts)**

Mass (kg)	Force (N)	Stretch (m)
0		

Red Max Force: 1500 g **Blue** Max Force: 1300 g **Yellow** Max Force: 2200 g

Include your F vs x plot after this page.

Bungee Setup Drawing - **(12 pts)**

a) Draw a picture of our Bungee drop setup on a separate page and attach it after this page.

b) Label your diagram with the following constants.

L - Barbie's height above the ground when dropped
X - maximum spring stretch
R - rope to be added

List and define other variables you will need to use.

A. Rope Length Calculation **(18 pts)**

a) Be sure to show every physics equation you used.
b) Use the variables listed above.

Bungee Analysis

1. Find the elastic potential energy of your spring when Barbie stops her descent. Show ALL of your work. **(5 pts)**

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2. If everything goes right and your Barbie just misses hitting the ground, how much work will your spring do to stop her from hitting the ground? (Be sure to include the sign) **(5 pts)**

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3. Describe how you can use your F vs x plot to calculate how much work you would need to stretch your spring 20.0 cm. **(5 pts)**

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4. How many times more work would you need to do to stretch your spring 40.0 cm? Explain your answer. **(5 pts)**

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5. What was Barbie's velocity just before the spring started to stretch? **(5 pts)**

Conservation of Energy Changes Equation

6. Using Newton's 2nd Law, determine the acceleration of the falling Barbie when the spring is stretched 0.06 m **and** when it is stretched 0.12 m.

a. Show the free-body diagrams. **(5 pts)**

FBD - 0.06 m **FBD - 0.12 m**

Acceleration Calculations - (14 pts)

0.06 m	**0.12 m**

7. If you attached Barbie to your spring and used it to launch her straight into the air, how high would she rise vertically if the spring was stretched to x = 0.50 m and all of the elastic potential energy was converted to kinetic energy? **(6 pts)**