Name

Date

Physics Semester End Project

Conclusion/ Calculate/ Analyze

**Due Monday, January 13th along WITH your Pre-Construction worksheet (part 1 of project)**

*Sorry, but you will have to do all of your calculations on a separate sheet of paper and ATTACH it to this worksheet.*

1 and 2) Draw a diagram of your rollercoaster from a top view (like you are looking down on it) AND a side view (like you are waiting in line to ride it)

Using the SIDE VIEW DRAWING- label all of the peaks and valleys where you find kinetic energy and gravitational potential energy. Please write KE and PE- not the whole word!

*\*\*Draw your diagrams on* ***piece of paper different than your calculation sheet****\*\**

EXTRA CREDIT- Using your answer from PEg and KE (with some average assumptions) make a line graph for your roller coaster. Height would be the y-axis and the x-axis could be distance or time- your choice. Your graph must be labeled with KE, PEg, a title, units, and correct scaling. If you want, there is graph paper in the back of the Physics crate.

**3) Measure your highest point** on the roller coaster. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (in meters- convert if necessary)

FYI- The marble we used to test our roller coasters has a **mass** of 6 grams. That would make it 0.006 kg!

4) Now calculate PEg (aka- GPE) for your highest point. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5) Pretend your roller coaster it at its lowest point, how much PEg does it have? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

6) That means your KE would be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at the lowest point.

\*\*\*EXTRA CREDIT QUESTION- Calculate how much velocity your marble would have. (PEg=mgh) = (KE= .5mv2)

7) From the roller coasters I watched, the average time took 4.2 seconds. I initially gave you 24 feet of foam track. (Adjust the track length as needed.) Calculate the velocity of your marble. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8) Why is your roller coaster measured in velocity and not speed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9) If you increase the mass of the marble, what do you also increase? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10) Use your velocity answer for this question. How much momentum is in your roller coaster? (Hint- use the simple formula with mass for the marble). \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11) Will a roller coaster’s acceleration be effected by the mass of the marble (or pretend passenger weight)? Explain- this is not as simple as you may think. Look at all the variables in your formulas! \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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12) What is the acceleration of a marble that went from 0 to 1.5 m/s in 2.1 seconds? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

13) What is the acceleration of a marble that went from 0 to 2.4 m/s in 2.9 seconds? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Elastic Potential Energy

14) Pretend you were about to go bungee jumping. The bungee cord has a stretch (displacement) of 0.75 m. The spring constant is 180 N/m. Calculate the elastic potential energy. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Work and Power

15) Pretend your roller coaster is a real ride. Somehow your roller coaster must make it to the top of your initial drop. Your rollercoaster cart with seating for four needs 3500 N to make it move. The roller coaster cart will be pulled up on a 40 degree angle for a total of 75 meters. Calculate how much work the pulley will do in order to get your cart up the hill to begin the ride. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16) Your roller coaster safely made it up the initial drop hill in 13 seconds. How much power did the machine produce? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17) The X-Scream on top of the Stratosphere hotel (or Giant Drop Six flags or Tower of Terror Disney) roller coaster ride brings the riders straight up at a 90 degree angle, then lets gravity pull them down. Explain why we cannot calculate work or power for a ride like this. (If you need some numbers to plug in- Force 4000 N, distance 35 m, angle 90 degrees, and it falls in 6 seconds). \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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17b) Reference the roller coaster in # 17- if the passengers and their car have a mass of 800 kg, how fast will the acceleration due to gravity be? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17c) Again use the above two questions. What will be their acceleration be? \_\_\_\_\_\_\_\_\_\_\_\_\_\_