**Roller Coaster Lab**

**1. Using your Roller Coaster, draw a 2-D version of your track from start to finish using pencil.**

**2. Measure the total length of your roller coaster track.**

**3. Measure and label key heights and distances.**

**4. Calculate Maximum Potential Energy for your marble.**

**5. Calculate speed at the end of your track if your roller coaster is frictionless.**

**6. Record the average time it took for your marble to complete the roller coaster.**

**7. Using your average time and the length of your track, calculate the average speed at the end of your track.**

**8. Identify sections of your track where the marble speeds up...trace over those sections of your track with red pencil.**

**9. Identify sections of your track where the marble slows down...trace over those sections of your track with blue pencil.10. Fill in the table above for your roller coaster.**

**10. Complete Table below:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Position** | **Height (m)** | **Potential Energy**  **(J)** | **Kinetic Energy**  **(J)** | **Total Mechanical Energy**  **(J)** |
| **Start** |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **End** | **0** |  |  |  |

**11. Using the information in the table above create a line graph that shows how PE, KE, and TME change over the course of your track. The Y axis will be energy in joules. The X axis will be your Positions. Overlay a drawing of your roller coaster onto your graph. Your PE line will be red. Your KE line will be blue. Your TME line will be Green. Your roller coaster will be black,12. Why is there is a difference between the speed you calculated in Question # 5 and Question #7?**

**13. For a frictionless system, derive the following formula: v = (2gh)1/2**

**14. Summarize the relationship between KE, PE and TME in a frictionless system.**

**15. How does slope of your track affect the speed of your marble?**

**16. How could you have designed your roller coaster to have the lowest average speed and thus maximize your score?**