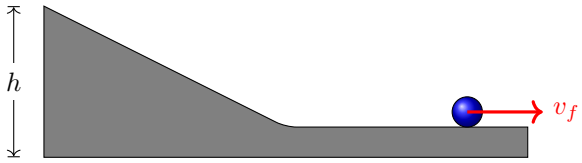
Name: Date: Period:

Marble Lab – Revisited (KE and PE)



1. Measure the height of the track (h): _____ cm. Convert it to meters.

$h =$ _____ m

2. Measure the mass of the marble (m): _____ g. Convert it to kg.

$m =$ _____ kg

3. Look at the four tracks on your ramp. Assuming that there was no friction, which ramp do you think would cause the marble to go fastest? Why?

4. Calculate the speed of the marble at the bottom of the ramp. Assume that there is no friction!

$v_f =$ _____ m/s
(*expected*)

5. Okay, let's measure it! Put the photogate at the bottom of each track to measure the speed of the marble.

Track	Measured Velocity (m/s)
Red	
Avg.	

Track	Measured Velocity (m/s)
Blue	
Avg.	

Track	Measured Velocity (m/s)
Yellow	
Avg.	

Track	Measured Velocity (m/s)
Green	
Avg.	

6. Look at the prediction you made in questions #3. Was it correct?

7. The final velocity should have been pretty consistent down each track. Calculate the average final velocity across all the tracks.

$v_f =$ _____ m/s
(*measured*)

8. Calculate the percent error of your measured average velocity (see #7) compared to the expected velocity (see #4).

$$\% \text{ error} = \frac{|\text{measured} - \text{expected}|}{\text{expected}} \times 100$$

9. Comment on this percentage. Does it seem like your results are accurate?

10. You should notice that percent error is pretty large. It turns out that it takes quite a large amount of work to make the marble start rolling. As a matter of fact, the work is 40% of the starting initial potential energy. It is also negative because it is taking energy out of the system. Go ahead and calculate the work needed to make the marble roll:

$$W = -0.40 \times mgh_i$$

11. Now, let's try our calculation again. Using the work you found in problem #10, and the initial height you found way back in #1, calculate the final velocity of the marble.

$v_f =$ _____ m/s
(*expected*)

12. Calculate the percent error of your measured average velocity (see #7) compared to the expected velocity (see #11).

$$\% \text{ error} = \frac{|\text{measured} - \text{expected}|}{\text{expected}} \times 100$$

13. Comment on this percentage. Now, does it seem like your results are accurate?

14. **Conclusion:** Explain in detail what happened to the energy of the marble as it went down the ramp and how the lab showed the concept of energy conservation.