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Lab 5: Introduction to Energy Conservation Law

By

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We conducted an experiment where we rolled a ball down an inclined plane and onto a flat surface, measuring its average speed on the flat surface to be v(exp)=0.5m/s. Using the Law of Energy Conservation, we also estimated the ball's average speed to be v(theorical)=$\sqrt{2gh}$= 3m/s, which was similar the experimental measurement. This confirms the validity of the Law of Energy Conservation in this simple mechanical system.

Introduction:

The Energy Conservation Law states that the total energy in a system, consisting of Potential energy (PE) and Kinetic energy (KE), remains constant. In the experiment, the ball starts at the top of the inclined plane with maximum potential energy (PE=mgh) and no kinetic energy (KE=0) as it is stationary. As the ball rolls down the incline, its potential energy decreases to zero, and all the energy is converted to kinetic energy ($KE = mv^2/2$). This results in a final velocity of $v = \sqrt{2gh}$ at the base of the incline.

Apparatus and Materials: An incline plane, a ruler, and a timer (Fig. 1).

Fig. 1. Showing experimental setup.

(A) on the left, horizontal plane.

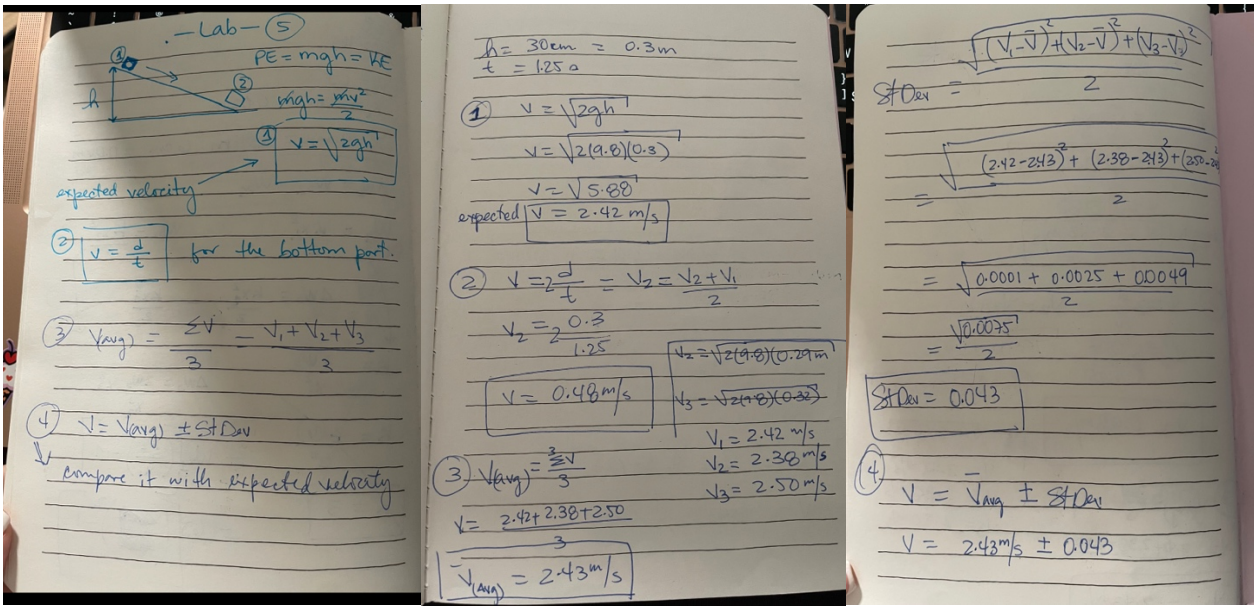
(B) at the right an incline plane.

Procedure:

- Measure the height of the incline (see fig. 1B)
- Determine the speed at the bottom of the incline.
- Compare the measured speed with the theoretical speed calculated using the equation v = sqrt(2gh).

Results & Discussion:

The height of the incline measured was: 30cm=0.30m. The length of the incline was: 50cm. The time it took the ball to roll this distance was: 1.25s. This resulted in an average speed of 2.43m/s. The expected (calculated) speed according to the Energy Conservation Law was: 2.42m/s. The close agreement between the experimental and theoretical results confirms the validity of the Energy Conservation Law.



The main error is related to measurement of time. The percent of error, e, was calculated as: e=0.05s/t *100%=4%, where 0.05s is an accuracy of measuring time.

Conclusions.

Experimental speed was 2.42m/s and theoretical speed was 2.43m/s which are relatively close that confirms the Energy Conservation Law.

Question.

What would you suggest increasing the accuracy of this experiment?

The accuracy of an experiment is confirmed when the experiment is conducted again and again. If after repeating the experiment, the same results are achieved then it shows that the experiment is accurate enough and results can be drawn on the basis of this experiment.