Conservation of Energy With Airtrack

View the following video, which explains the experiment in which a glider accelerates along an airtrack due to the slight tilt of the track.

https://cuny907-my.sharepoint.com/:v:/g/personal/darya_krym87_login_cuny_edu/ERH9SHqxvytEmSsSKL3BOZ4BkXEwTeVD00COKK1B8YMXXQ?e=eFZ9cB

Use the data in the accompanying excel file and fill out the two tables. You are asked to show that the sum of the kinetic energy with the gravitational potential energy remain constant throughout the motion. You are also asked to find the acceleration of the glider in two different ways.

The basic formulas you need are in the excel file and below

Kinetic energy: The kinetic energy is determined by the speed, v, and mass, M, of the object as

$$K = \frac{1}{2} M v^2$$

Gravitational energy: On Earth, the gravitational potential energy is defined in terms of the height, h, of the object as

$$U = M g h$$

Total energy: The total energy is the sum of all the energies stored in the system

$$E = K + U$$

In the absence of non-conservative forces, the total energy is conserved i.e. E remains constant in time.

Questions

Watch the video and fill out the excel file first. Then look at questions.

1. How is the effect of friction, a non-conservative force, removed in the experiment?

2. How is the speed of the glider measured in the experiment?

3. In principle, one could think about triggering the photogate on the glider itself, instead of using a flag, i.e. record the time it take the entire glider to pass the photogate. Would this make the measurement of the speed more or less accurate? Hint: the glider is accelerating everywhere along the track, including as its passing through the photogate.

4. If two people choose two different levels as the 0 height i.e. one person chooses the lab floor and another the table top, would the potential energy values be different? Could this spoil agreement between the energy sums?