Lab Report
Conservation of Energy Lab

Purpose: The purpose of this experiment is to test first hand the application of the Law of Conservation of Energy, which states that within a closed, isolated system, energy can change form, but the total amount of energy is constant.

Hypothesis: In an ideal, isolated system, our potential energy and kinetic energy quantities would be equal. But, because we couldn't create this perfect system, our calculation should yield approximately 75% of the total energy of the system, not lost to friction, sound, heat, and other variables.

Method:

Materials:

1.012 kg Dynamics cart with a 10.0 cm metal vane
Photogate Timer
Ramp with track in the center
Ramp Stand (With 8 levels)

Procedure: Set up the ramp on the first designated "bar". Measure the height of the ramp at the point that the back end of the cart sits. Then measure the height at the point that the photogate sits. Record these results. Before letting the cart go, push the reset button on the front of the photogate. Station one person at the end of the ramp to catch the cart after it goes through the photogate. Then, have another person release the cart at the top of the ramp. Read and record the time on the front of the photogate. Repeat this using all eight levels on the ramp stand.

Conclusion: After doing all eight trials on different levels, we came out with the average of 81% of potential energy measured as kinetic energy at the photogate. The percent range varied from 72%-93%. These results were to be expected because going into the experiment, we knew that our system provided for energy loss in many ways. Energy was lost to sound, friction in the cart, heat, and the fact that we measured the velocity before the end of the ramp, which reduced the measured kinetic energy. Our hypothesis was supported by the experiments results, except that we underestimated the accuracy of our results.

Data:

Given Data:
Cart Mass = 1.012 kg
Distance = 0.10 cm

Level	Height Initial (m)	Height Final (m)	Time (seconds)
1	0.180 m	0.075 m	0.082 s
2	0.335 m	0.111 m	0.054 s
3	0.481 m	0.144 m	0.043 s
4	0.637 m	0.176 m	0.037 s
5	0.780 m	0.210 m	0.031 s
6	0.932 m	0.220 m	0.029 s
7	1.070 m	0.252 m	0.027 s
8	1.329 m	0.310 m	0.026 s

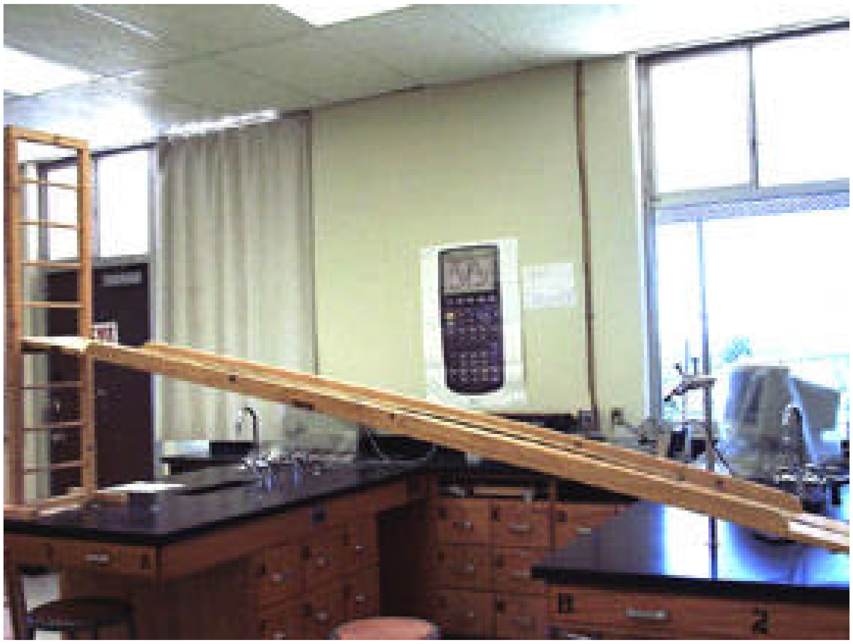

Photo property of Mr. Bunning

Results:

Equations: **PE = mg(height(f) – height (I))**
KE = 1/2m(.10/time)^2
(KE/PE) × 100 = % of energy transfer

Level 1:
PE = (1.012 Kg)(9.8)(0.075 – 0.180) = -1.04J
KE = _(1.012)(1.220)^2 = 0.75 J
0.75 J/-1.04 J = 72%

Level 2:
PE = (1.012)(9.8)(0.111-0.335) = -2.22J
KE = _ (1.012)(.10/0.054)^2 = 1.74 J
1.74 J/ -2.22J = 78%

Level 3:
PE = (1.012)(9.8)(0.144 –0.481)= -3.34 J
KE = _ (1.012)(.10/0.043)^2 = 2.74 J
2.74 J/-3.34 J = 82%

Level 4:
PE = (1.012)(9.8)(0.176 –0.637)= -4.57 J
KE = _ (1.012)(.10/0.037)^2 = 3.70 J
3.70/-4.57 = 81%

Level 5:
PE = (1.012)(9.8)(0.210 –0.78)= -5.65 J
KE = _ (1.012)(.10/0.031)^2 = 5.26 J
5.26/-5.65 = 93%

Level 6:
PE = (1.012)(9.8)(0.220 –0.932)= -7.06 J
KE = _ (1.012)(.10/0.029)^2 = 6.02 J
6.02/-7.06 = 85%

Level 7:
PE = (1.012)(9.8)(0.252 –1.070)= -8.11 J
KE = _ (1.012)(.10/0.027)^2 = 6.94 J
6.94/-8.11 = 86%

Level 8:

PE = (1.012)(9.8)(0.310 –1.329)= -10.11 J

KE = _ (1.012)(.10/0.026)^2 = 7.94 J

7.94/-10.11 = 74%

The closest to an isolated system was in the trail on level five. The reason we didn't get 100% transfer of potential to kinetic energy was because energy was also converted into sound, heat, and other frictional losses between the cart and the ramp. These other variables should account for most of the loss of energy, beyond the normal amount of experimental error.