**PHYS 123, Lab 8 Questions**

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**(a) For the first experiment, explain why work done by the falling mass is independent of the path taken.**

In order to find the work done by the falling mass, the following equation is used:

The displacement of the object is simply equal to the change in distance. The displacement is changed when the height of the falling mass is changed. The equation of work does not consider the path that was taken, but rather how far it has been displaced from the original location.

**(b) What did the addition of a spring do to the overall system? Is this spring force a conservative force?**

Adding the spring to the system converted the kinetic energy of the cart to potential energy in the spring. Due to this change, the spring force is a conservative force.

**(c) Write down the energy equation relations for the second experiment.**

**(d) Where does the maximum kinetic energy in parts 1 and 2 occur?**

The maximum kinetic energy of the system in part 1 is experienced the moment before the second mass hits the ground.

In part 2, the maximum kinetic energy is experienced when the gravitational energy is the highest, which is at the point where the spring is stretched and the velocity is still increasing.

**(e) Can we truly ignore friction in this lab? Explain using your data.**

Part 1:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x (m)** | **m1 (kg)** | **m2 (kg)** | **v (m/s)** | **Kinetic Energy (J)** | **Potential Energy (J)** |
| 0.35 | 0.21 | 0.08 | 1.14 | 0.19 | 1 |
| 0.35 | 0.21 | 0.08 | 1.12 | 0.18 | 1 |
| 0.35 | 0.21 | 0.08 | 1.07 | 0.17 | 1 |
| 0.35 | 0.24 | 0.08 | 1.13 | 0.2 | 1.1 |
| 0.35 | 0.24 | 0.08 | 1 | 0.16 | 1.1 |

Part 2:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **m1 (kg)** | **m2 (kg)** | **h (m)** | **v (final)** | **F (N)** | **U (g) (J)** | **U(s) (J)** | **U(k) (J)** | **U(s)+U(k)** |
| 0.2 | 0.06 | 0.12 | 0.29 | 0.8 | **0.31** | 0.39 | 0.01 | **0.4** |
| 0.2 | 0.08 | 0.17 | 0.4 | 1.2 | **0.47** | 0.89 | 0.02 | **0.91** |
| 0.2 | 0.1 | 0.22 | 0.46 | 1.5 | **0.65** | 1.37 | 0.03 | **1.4** |
| 0.24 | 0.06 | 0.12 | 0.26 | 0.8 | **0.35** | 0.39 | 0.01 | **0.4** |
| 0.24 | 0.08 | 0.17 | 0.37 | 1.1 | **0.53** | 0.73 | 0.02 | **0.75** |
| 0.24 | 0.1 | 0.22 | 0.44 | 1.5 | **0.73** | 1.37 | 0.03 | **1.4** |
| 0.28 | 0.06 | 0.06 | 0.26 | 0.8 | **0.2** | 0.43 | 0.01 | **0.44** |
| 0.28 | 0.08 | 0.15 | 0.35 | 1.1 | **0.53** | 0.75 | 0.02 | **0.77** |
| 0.28 | 0.1 | 0.21 | 0.41 | 1.5 | **0.78** | 1.39 | 0.03 | **1.42** |

We cannot truly rule out friction from our experiments, because friction is one of the factors that caused the kinetic and potential energies to not be equal, unlike what the conservation of energy equation states.

**(f) Calculate the ratio of the kinetic and potential energies for parts 1 and 2. What do these ratios tell you about the conservation of energy?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ratio of KE to PE (part 1)** | **Ratio of U(g) to U(s)+U(k) (part 2)** | **Avg (Part 1)** | **Avg (Part 2)** |
| 0.19 | 0.78 | 0.174 | 0.62 |
| 0.18 | 0.52 |  |  |
| 0.17 | 0.46 |  |  |
| 0.18 | 0.88 |  |  |
| 0.15 | 0.71 |  |  |
|  | 0.52 |  |  |
|  | 0.45 |  |  |
|  | 0.69 |  |  |
|  | 0.55 |  |  |

If the experiment was conducted in a way where the system was completely elastic, then the ratios would be 1. However, due to the presence of friction and other factors, energy was not conserved, which resulted in a less consistent ratio.

**(g) What effect would the release point have on the final velocity?**

The final velocity depends on the height of the release point. If the point was higher up, the change in height would be greater, and the time for acceleration would be greater as well. Therefore, with more time to accelerate, the velocity will increase in part 1. In part 2, the release point does not matter, as long as it can travel the full distance because of the spring.