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Laboratory 2: Uniformly Accelerated Motion Picket Fence

**Introduction:** this lab is about observing an object in free fall. The main objective is to measure the acceleration of a freely falling body to better than 0.5% precision using a Picket Fence and a Photogate.

**Materials:**

* Power Macintosh or Windows PCd
* Universal Lab Interface
* Logger Pro
* Vernier Photogate
* Picket Fence
* Clamp or ring stand to secure Photogate

**Procedure:**

1. Fasten the Photogate rigidly to a ring stand so the arms extend horizontally. Make sure the entire Picket Fence can fall freely through the Photogate. Place a soft surface in the area the Picket Fence would land (to avoid damaging it).
2. Connect the Photogate to the DG 1 input on the ULI.
3. Prepare the computer for data collection by opening “Ex 05” from the *Physics with Computers* experiments files of Loggers Pro. Two graphs will appear on the screen. The top graph displays distance vs. time, and the lower graph velocity vs. time.
4. Observe the reading in the status bar Logger Pro at the bottom of the screen. Block the Photogate with your hand; note that the Photogate is blocked. Remove your hand and the display should change to unblocked.
5. Click Collect to prepare the Photogate. Hold the top of the Picket Fence and drop it through the Photogate. Be careful when releasing the Picket Fence. It must not touch the sides of the Photogate as it falls and it needs to remain vertical. Click stop to end data collection.
6. Examine your graphs. The slope is the measure of acceleration. If the velocity graph is approximately a straight line of constant slope, the acceleration is constant. If the acceleration of your Picket Fence appears constant, fit a straight line to your data.
7. Repeat steps 5 and 6 five more times, do not use drops in which the Picket Fence hits or misses the Photogate.

**Results:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Trial | 1 | 2 | 3 | 4 | 5 | 6 |
| Slope (m/s2) | 9.686 | 9.739 | 9.785 | 9.757 | 9.708 | 9.741 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Minimum | Maximum | Average |
| Acceleration | 9.686 | 9.785 | 9.736 |

|  |  |
| --- | --- |
| Acceleration due to gravity | 9.736 + or – 0.05 m/s2 |
| Precision | 0.5% |

**Discussion:** Basically, these results are saying that with 0.5% precision the average acceleration due to gravity is approximately 9.736 with a 5% chance of errors.

**Conclusion:** In conclusion, I learned that even with proper experimentation free fall can have simple factors that affect its calculation. Gravity and other objects (such as anything around that could hit the object that is in free fall) can change the outcome of any calculations.