**Lab** – Constant Force – Changing Mass

**Purpose:** To investigate the effect of increases in mass on an accelerating system.

**Materials:**

|  |  |  |
| --- | --- | --- |
| Meterstick | 2 Pasco dynamic cars | 4 500 g masses |
| 1 50 –g hook mass | Pulley with table clamp | Scale |
| String | Small weights | Stopwatch |
|  |  |  |

**Discussion:**

Airplanes accelerate from rest on the runway until they reach their takeoff speed. Cars accelerate from a stop sign until they reach cruising speed. And when they come to a stop, they decelerate. How does mass affect these accelerations?

In the previous lab, “Getty Pushy”, you discovered that less massive people undergo greater acceleration than more massive people when the same force is applied to each. In this experiment you will accelerate a dynamics carts. You will apply the same force to carts of different mass. You will apply the force by suspending a weight over a pulley. The cart and the hanging weight comprise a *system and accelerate* together. A relationship between mass and acceleration should become evident.

**Procedures:**

**Step 1 -** See example set up**.**

**Step 2 –** Set up table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **TIME TO COVER THE SAME DISTANCE** | | | | **ACCLERATION**  **m/s** |
| MASS | Trial 1 (s) | Trial 2 (s) | Trial 3 (s) | Average Time |  |
| 500 g |  |  |  |  |  |
| 1000 g |  |  |  |  |  |
| 1500 g |  |  |  |  |  |
| 2000 g |  |  |  |  |  |

**Step 3** – Record Data

Time the cart with different mass for 3 trials (distance must remain the same) then average the time. Calculate the acceleration. Use the equation ∆x = Vit + ½ at2  (Remember the carts starts from rest)

**Step 4** – Graph

Make a graph of acceleration, mass on horizontal axis and acceleration on vertical axis.

**Analysis**

1. Describe your graph of acceleration vs mass. Is it a straight line or curve?
2. How does increasing the mass affect its acceleration?
3. Compare your results with two other groups. How does it compare?