Name: _____ Date: _____

Constant Force and Changing Mass

Objective: To investigate the effect of increasing mass on an accelerating system.

Materials:

Meterstick	cart	one 500 gram mass
Two 250 g masses	hook mass	pulley with table clamp
Paper clips	masking tape	string

Procedure:

1. Fasten clamp and pulley to the edge of the lab table. The pulley will change the direction of the force from downward pull on the hooked mass to horizontal pull on the cart.
2. Mark off a distance from the tabletop edge slightly shorter than the height of the table. This is the starting point of the cart.
3. Use the triple beam balance to mass the cart.
4. Stack the 500 g and 250 g masses on top of the cart. Tie each end of the string to a paper clip. One end is connected to the hooked mass and the other end to the cart.
5. To ensure proper alignment, allow the cart to accelerate a few times. Make sure the path the straight, the hooked mass does not hit the floor, and most importantly – that the cart does not hit the pulley.
6. Time three runs of acceleration with a stopwatch and determine the average. Record the data in the table.
7. Repeat again, this time removing one of the masses from the cart. Continue until the last set of trials is with the empty cart. This should make a total of five trials. Total mass should range from cart + 0 g to cart + 1000 g.

Data:

Distance cart travels: _____ m Mass of cart: _____ kg

Cart + mass (kg)	Time 1 (s)	Time 2 (s)	Time 3 (s)	Average Time (s)	Computed Accel (m/s^2)	Theor Accel (m/s^2)	% error

Analysis/Calculations:

1. Compute average acceleration for each set of trials and record.
2. Use Newton's Second Law to find the theoretical acceleration.
3. Determine % error for each trial.
4. Construct a graph of average acceleration vs. mass. Mass must be in kilograms.

Conclusion:

1. Describe the proportionality (direct or inverse) of your graph. How does the shape of the graph reflect this?
2. For a constant applied force, how does increasing the mass of an object affect its acceleration?
3. Why is the theoretical acceleration different from the measured acceleration?
4. Determine the acceleration for an 800 g mass. How did you determine this?
5. Find the product of the coordinates for each data point. What is the significance of this value?