LECTURE 8: NEWTON'S SECOND LAW – CONSTANT FORCE
REPORT

Name:……………………………………………………………….
Class:……………………………………………………………..

1. Purpose:

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2. Results:

2.1. Predict

1. What will happen to an object when you apply a net force to it?

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2. What will happen to the motion of an object if it has a constant mass but you change the magnitude of the net force on it?

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2.2. Data

Sketch a graph of position versus time for one run of data. Include labels and units for your y-axes and x-axes.

Sketch a graph of velocity versus time for one run of data. Include labels and units for your y-axes and x-axes.

2.3. Calculations

Calculate the theoretical acceleration when the mass is constant and the net force is changed and record the calculations in the Data Table 3.

• The theoretical acceleration is the ratio of the net force divided by the total mass.

$$a = \frac{m_{hanging} g}{m_{cart} + m_{hanging}}$$

• For runs #2, #3, and #4, the net force (hanging mass x 9.8 N/kg) increases but the total mass of the system (mass of cart + hanging mass) remains constant.

• Assuming no friction, the net force is the weight of the hanging mass (mass x 9.8 N/kg). Find the percent difference between the theoretical and experimental acceleration and record it in the data table.

$$\%difference = \left| \frac{theoretical - experimental}{theoretical} \right| x100$$

2.4. Data table 1

Item	Mass (kg)
Run #1: Initial mass of cart + masses (m_{cart}):	
Run #1: Initial mass of the hanging mass ($m_{hanging}$):	

Run #2: Total mass of hanging masses (0.02 kg + 0.02 kg):	
Run #3: Total mass of hanging masses (0.05 kg + 0.01 kg)	
Run #4: Total mass of hanging masses (0.05 kg + 0.02 kg + 0.01 kg)	

2.5. Data table 2: Experimental Acceleration

Run	Acceleration (m/s^2)
#1	
#2	
#3	
#4	

2.6. Data table 3

F_{net}, (net force) = hanging mass x 9.8 N/kg

Run	Hanging cart (kg)	F_{net} (N)	Acc., theory (m/s^2)	Acc., exp. (m/s^2)	%difference
#1					
#2					
#3					
#4					

2.7. Questions

1. Why did the slope of velocity versus time change for each run?

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2. For the runs, what did you observe about the slope of the Linear Fit as the net force increased but the total mass remained?

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3. What happens to an object's acceleration if the net force applied to the object increases but the total mass of the system remains constant?

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