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CER Report on Motion with Constant Acceleration

Student Name:

EXAMPLE REPORT

Question

IN the space below, restate the question from your student guide on this lab topic (the student guide is found in a link on the virtual lab BEFORE this activity)

How does an object's position and velocity change as the object accelerates?

Claim

In the space below, make a statement (one sentence should be enough) that answers the question above.

As an object accelerates, its position will change quicker, increasing the object's displacement, and its velocity will increase.

Evidence:

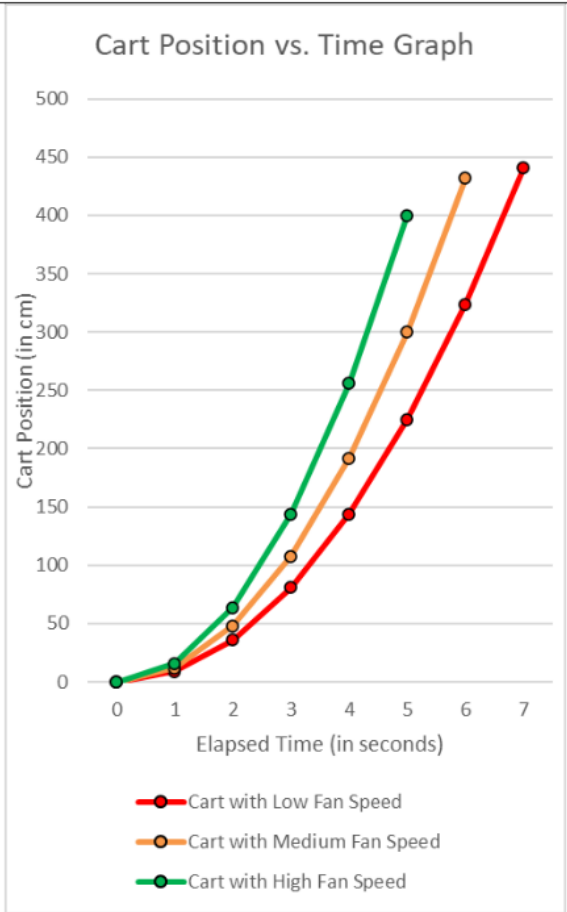
In the spaces below, give evidence from the virtual lab from your lesson that supports the claim you made. Evidence is the results of the experimentation. This evidence should be in the form of a data table, that data then graphically analyzed if possible, and finally a written summary in paragraph form that specifically explains how the data provided supports the claim

Data Table*				Graph of Data**
Cart Speed vs. Time Table (Table A on Student Guide)				<p>Cart Speed vs. Time Graph</p> <p>The graph plots Cart Speed (in cm/s) on the y-axis (0 to 250) against Elapsed Time (in seconds) on the x-axis (0 to 7). Three linear data series are shown: Cart with Low Fan Speed (red line), Cart with Medium Fan Speed (orange line), and Cart with High Fan Speed (green line). All three series start at (0,0) and show a constant positive slope, with the High Fan Speed series having the steepest slope and the Low Fan Speed series having the shallowest.</p>
Elapsed Time (in seconds)	Cart Speed with Low Fan Speed (in cm/s)	Cart Speed with Medium Fan Speed (in cm/s)	Cart Speed with High Fan Speed (in cm/s)	
0	0.0	0.0	0.0	
1	18.0	24.0	32.0	
2	36.0	48.0	64.0	
3	54.0	72.0	96.0	
4	72.0	96.0	128.0	
5	90.0	120.0	160.0	
6	108.0	144.0	192.0	
7	126.0	168.0	224.0	
Based on the above table, time is the independent variable while speed is the dependent variable.				
Cart Position vs. Time Table				
Elapsed Time (in seconds)	Cart with Low Fan Speed's Position (in centimeters)	Cart with Medium Fan Speed's Position (in centimeters)	Cart with High Fan Speed's Position (in centimeters)	
0	0.0	0.0	0.0	
1	9.0	12.0	16.0	
2	36.0	48.0	64.0	
3	81.0	108.0	144.0	
4	144.0	192.0	256.0	
5	225.0	300.0	400.0	
6	324.0	432.0	N/A	
7	441.0	N/A	N/A	

Based on the above table, time is the independent variable while position is the dependent variable.

Calculations Table (Table B on Student Guide)

	Low Fan Speed	Medium Fan Speed	High Fan Speed
1 Elapsed time to finish line; Δt (in secs)	7.4 secs	6.4 secs	5.6 secs
Total distance; Δx (in cm)	500 cm	500 cm	500 cm
Average velocity; $v_{avg} = \Delta x / \Delta t$ (in cm/s)	67.6 cm/s	78.1 cm/s	89.3 cm/s
Acceleration; a (in cm/s^2)	18.0 cm/s^2	24.0 cm/s^2	32.0 cm/s^2



1 Data Summary*** How does the evidence above support the claim?

The claim that an object's position changes quicker and its displacement increases faster as an object's continues to accelerate is supported by the evidence above because one can see on the Cart Position vs. Time graph that each cart's position is changing exponentially as the cart accelerates. It is also evident in the Calculations table and Cart Position vs. Time table that with higher fan speeds, not only does the cart's acceleration increase, but the cart's displacement and position also increase/change at higher rates. The additional claim that an object's velocity will increase as an object continues to accelerate is supported by the evidence above because one can see on the Cart Speed vs. Time graph that the velocity of each cart is increasing at a linear rate as each cart accelerates. It is also clear in Table A that with higher fan speeds, both acceleration (like stated earlier) and velocity of the cart increase.

Reasoning:

In the space below, explain WHY, according to science, these results were observed. In your answer, be sure to include the scientific concepts that support the claim.

This lab and its results have shown that there is a link between a change in acceleration and changes in velocity and position (or displacement). Acceleration, being a measurement of velocity over time, is linked to velocity because in order to calculate an object's acceleration, you need to determine that object's change in velocity over a certain period. To prove the link between velocity and acceleration, one can increase the velocity of an object over the same period as the object's previous velocity measurement in order to additionally increase the acceleration of the object, which was shown in the lab once the fan speeds of the carts were increased. Acceleration is also linked to position or displacement of an object because as stated earlier, acceleration is linked to velocity, but what hasn't been stated yet is that velocity is linked to position or displacement because when an object has a velocity greater than zero, it's moving and its position or displacement changes. Change in an object's position or displacement also needs to be determined in order to calculate an object's velocity. This can be viewed as a chain link as with increased displacement, there is increased velocity and with increased velocity, there is increased acceleration. To conclude this lab, it is certain that as an object accelerates, its velocity and displacement (or position) increase (change).

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