N e *Period* *D te*

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What factors affect the motion of objects? Aristotle (384 BC to 322 BC) believed that the natural

Sequenc ng Cha enge

The steps below are part of the Procedure for this lab activity. They are not in the right order. Determine the proper order and write numbers in the circles that put the steps in the correct sequence.

P ocedu e

After you complete a step (or answer a question), place a check mark in the box ( ) next to that step.

Note: When you see the symbol " " with a superscripted number following a step, refer to the numbered Tech Tips listed in the Tech Tips appendix that corresponds to your PASCO data collection system. There you will find detailed technical instructions for performing that step. Your teacher will provide you with a copy of the instructions for these operations.

Set Up

1 **Start a new experiment with your data collection system.** (1.2)

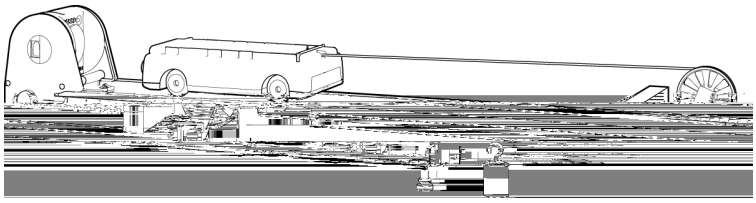
2 **Connect the motion sensor to the data collection system.** (2.1)

3 **Display Velocity on the -axis of a graph with Time on the -axis.** (7.1.1)

4 **Set the dynamics track on the lab table with one end of the track aligned with the edge of the lab table (or slightly hanging over the edge).**

5 **Attach the end stop and then the super pulley with clamp to the end of the track near the edge of the table.**

□□□ **Attach the motion sensor to the opposite end of the track with the face of the sensor pointed toward the super pulley. Be sure the switch on the sensor is set to the cart position.**



□□□ **Connect the motion sensor to your data collection system.** (2.1)

□□□ **Set the cart onto the track, and then adjust the level of the track using its adjustable feet so that the cart remains stationary when left at rest.**

□□□ **Cut a piece of string approximately 1 m long in preparation for data collection.**

□□□□ **What will happen to an object at rest if no force is applied?**

_____

□□□□ **What is required for an object to maintain motion at a constant velocity?**

_____

□□□□ **What will happen to an object if there is a constant net force applied to it?**

_____

Collect D t

□□□□ **With the cart stationary in the middle of the track, start data recording.** (6.2)

□□□□ **After approximately 5 seconds, stop data recording.** (6.2)

□□□□ **Now place the dynamics cart on the track approximately 15 cm in front of the motion sensor.**

□□□□ **Start data recording.** (6.2)

□□□□ □ **Give the cart a soft push towards the super pulley, then catch the cart just before it hits the super pulley at the end of the track.**

□□□□ □ **Stop data recording.** (6.2)

□□□□ □ **For the final data run, tie one end of your 1 m piece of string to the front of the dynamics cart, and tie the other end to the mass hanger.**

□□□□ □ **Run the string over the pulley with the mass hanger hanging freely below the pulley.**

□□□□ □ **Hold the cart in place approximately 15 cm in front of the motion sensor, and then attach 20 g of mass to the hanger. Continue to hold the cart.**

□□□□ □ **Start data recording.** (6.2)

□□□□ □ **Release the cart, and allow it to freely roll down the track.**

□□□□ □ **Catch the cart just before it hits the super pulley at the end of the track.**

□□□□ □ **Stop data recording.** (6.2)

An lyze D t

□□□□ □ **Sketch your graph of Velocity versus Time in the Data Analysis section, and label each run.**

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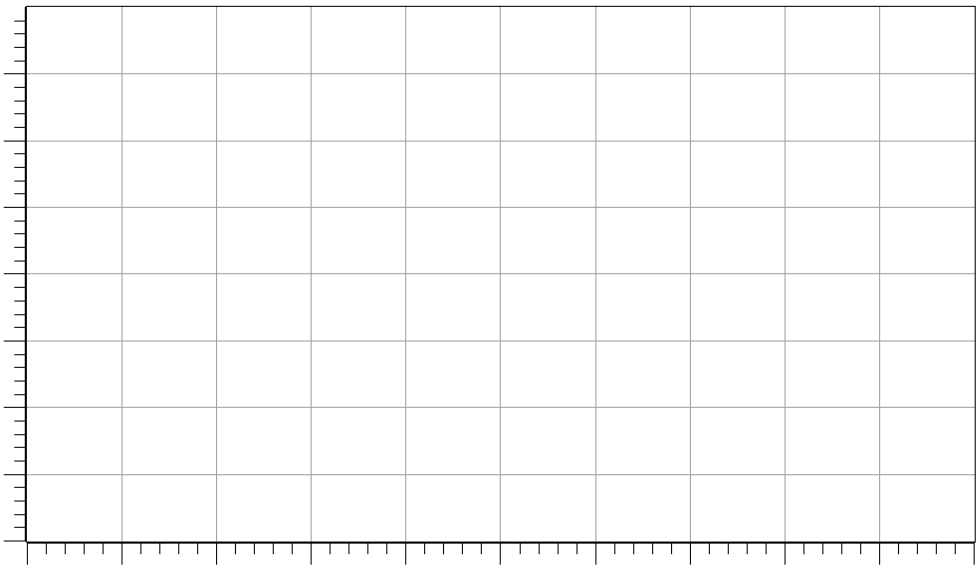

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□□ How was the velocity of the cart in Run 1 changing? Was there a net force acting on the cart? If yes, what is that force caused by?

_____

□□ Explain how you could tell how the cart's position was changing from a Velocity versus Time graph rather than directly from a Position versus Time graph.

_____

_____

□□ How was the velocity of the cart in Run 2 changing? Was there a net force acting on the cart? If yes, what was that force caused by?

_____

_____

□□ How was the velocity of the cart in Run 3 changing? Was there a net force acting on the cart? If yes, what was that force caused by?

_____

_____

□□ What evidence from the Velocity versus Time graph for Run #3 indicated there was a net force acting on the cart?

_____

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Use available resources to help you answer the following questions.

□□ What happens to the velocity of an object if it never experiences an unbalanced force?

_____

□□□ How do forces affect the motion of objects? (Think of a force as a push or pull acting on an object.)

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□□ Is it possible for an object to experience a net force without physically touching another object? If yes, give an example.

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Velocity

Massive

Acceleration

Momentum

Force

Energy

Nothing

Inertia

Displacement