Newton’s First Law of Motion Investigation

Part 1 – The Law of Inertia

Sir Isaac Newton developed three laws about motion. Newton’s First Law of Motion is referred to as the Law of Inertia. Let’s investigate a few physical phenomena to understand the Law of Inertia.

A. Place a dynamics cart on a level floor. Observe what happens and record your observations below.

B. Place a piece of paper on the lab bench near the edge so the paper extends beyond the bench top. Place a button smooth-side down at the other end of the paper. Quickly pull the sheet of paper off the bench top. Be sure to pull the paper horizontally and not at an angle. Observe what happens and record your observations below. Repeat this phenomenon as often as necessary so you understand what is happening.

C. Place a dynamics cart on a level floor and give it a firm push. Observe what happens and record your observations below. Repeat this phenomenon as often as necessary so you understand what is happening.

D. Place a dynamics cart on the track at the open end. Place a wood block on top of the cart and give it a push toward the closed end of the track. Observe what happens and record your observations below. Repeat this phenomenon as often as necessary so you understand what is happening.
Conclusion
These four phenomena demonstrate the key points of the Law of Inertia.

1. Based on your observations, write the Law of Inertia in your own words.

2. Read what the textbook has to say about the Law of Inertia. How does your definition compare to the textbook’s definition?

3. Would you revise your Law of Inertia? If so, write your new version below.

4. In phenomenon C, will the cart eventually come to a stop? If so, what causes it to stop?
Part 2 – Inertia
An object’s mass is a measure of its inertia. So what is inertia? Let’s investigate a few physical phenomena to develop an understanding of inertia.

A. Moving an Object at Rest: Measure and record the mass of a wood block. Attach a spring scale to the wood block and gently pull the other end of the spring scale until the block begins to move. Record the amount of force it took to start the block moving. Do a second trial and record the measurements. Repeat this process two more times adding additional mass to the block each time. Create a data table below to record the total mass and force for each of the 6 trials (3 different masses and two trials for each mass).

B. Incline the closed end of a short track about 5cm to 10cm above the lab bench. Place a rubber band barricade about 1 ½ cart lengths from the end of the ramp. Measure and record the mass of the dynamics cart. Place the dynamics cart at the top of the inclined track and let gravity move it down the ramp toward the barricade. Measure and record the distance the barricade stretched to stop the forward motion of the cart. Next, attach a spring scale to the barricade and slowly pull the spring scale until the barricade is stretched the same distance as the cart stretched it. Measure and record this “stopping force”. Do a second trial and record the measurements. Repeat this process two more times adding additional mass to the cart each time. Create a data table below to record the total mass of the cart, the “stretch distance” and the “stopping force” for each of the 6 trials (3 different mass and two trials for each mass).
Conclusion
These two phenomena demonstrate the characteristics of inertia.

1. Based on your data, describe the characteristics of inertia in your own words. (Remember, mass is a measure of inertia.)

2. Read what the textbook has to say about inertia. How does your definition of inertia compare to the textbook’s definition?

3. Would you revise your definition of inertia? If so, write your new version below.