**Newton’s Laws**

The scientist, Sir Isaac Newton, helped to organize the thinking about forces by formulating three laws. In his book Newton describes his three laws of motion. Newton’s Laws are all around us. To prove this, you will conduct 14 different activities showing everyday examples of these laws.

***Lab Procedure***

1. You will start at a lab station and then move from station to station until you have completed all 14 activities.
2. You will have 3 minutes to do the activity at each lab station.
3. Perform the activity as directed.
4. Write a description of what you observe in your notebook.
5. Determine which of Newton’s Laws of Motion is being demonstrated.
6. Record this in your table.
7. Move to each of the other lab stations and repeat steps 3 – 7.

***Lab Activities***

**Station 1 (Newton’s First Law of Motion)**

1. Place the note card on the table so about 1/3 of the card extends over the edge of the table.

2. Place the washer on the card that is on the table.

3. Predict what will happen to the washer when the card is removed.

4. As quickly as you can, pull/push the card from under the washer.

5. Observe the motion of the washer.

**Station 2 (Newton’s First Law of Motion)**

1. Hold your right hand next to your right ear with palm up.

2. Place a washer on your elbow.

3. Quickly straighten your arm and catch the washer.

**Station 3 (Newton’s First Law of Motion)**

1. Place washer in the cup.

2. Hold the bucket by the handle.

3. Twirl the bucket around in a circle.

4. BONUS: try this with the hanger and penny

**Station 4 (Newton’s First Law of Motion)**

1. Place the bottle containing water on the table.

2. Place the note card on top of this bottle.

3. Place the second bottle mouth down on top of the card and first bottle.

4. Remove the note card without disturbing either bottle.

**Station 5 (Newton’s First Law of Motion)**

1. Balance the meter stick on one hand and the ruler on the other hand.

2. Which is easier to balance?

**Station 6 (Newton’s First Law of Motion)**

1. Place the note card on top of the beaker.

2. Place the washer on the card, above the beaker.

3. Predict what happens when the card is rapidly removed.

4. Pull the card out as rapidly as you can.

5. Observe the motion of the washer.

**Station 7 (Newton’s Second Law of Motion)**

1. Place a washer near one end of your lab table.

2. Use your finger/hand to propel the washer toward the other end of the lab table trying to get it to stop exactly at the edge of the lab table.

**Station 8 (Newton’s Second Law of Motion)**

1. There are two carts with different masses on the table.

2. Give the cart with the lower mass a gentle push and record how far it goes.

3. Give the other cart a push, just as hard, and record how far it goes.

**Station 9 (Newton’s Second Law of Motion)**

1. Set up the cart so that it is at the starting tape.

2. One partner gently pushes the cart and the other times it.

3. Stop the stopwatch when the car reaches the finish line.

4. Repeat steps 1, 2, and 3 giving the cart a harder push.

5. Record your two times.

**Station 10 (Newton’s Second Law of Motion)**

1. Place the first marble at the lowest mark on the track.

2. Place the second marble on the bottom of the track.

3. Release the top marble so that it rolls down the track and collides with the second marble.

4. Repeat steps 1-3 with the other 2 tape marks.

**Station 11 (Newton’s Second Law of Motion)**

1. At the same time, drop the wadded up piece of paper & the flat piece of paper vertically onto the lab table.

Which hits first?

**Station 12 (Newton’s Third Law of Motion)**

1. Blow up the balloon completely.

2. Tape it to the straw on the string

3. Release the balloon.

4. Repeat steps 1-3, blowing up the balloon ½ way.

5. Return the balloon to your teacher.

**Station 13 (Newton’s Third Law of Motion)**

1. Stand with each of your feet on a separate sheet of paper.

2. Start to run.

3. Observe the paper

**Station 14 (Newton’s Third Law of Motion)**

1. Pull both pendulums back about 25cm (10 inches).

2. Let the metal spheres fall into each other at the same time.

3. Watch what happens to each sphere following the collision.

**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_\_\_\_ Binder Page # \_\_\_\_\_\_**

**Newton’s 3 Laws: A Stations Lab**

***Data Table***

|  |  |  |  |
| --- | --- | --- | --- |
| **Station #** | **Law #** | **What you did** | **Observations** |
| **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **4** |  |  |  |
| **5** |  |  |  |
| **6** |  |  |  |
| **7** |  |  |  |
| **8** |  |  |  |
| **9** |  |  |  |
| **10** |  |  |  |
| **11** |  |  |  |
| **12** |  |  |  |
| **13** |  |  |  |
| **14** |  |  |  |

***Post Lab Questions***

A. After you have completed all 14 stations, go back to your individual desk and read through your observations for each of the activities for Newton’s First Law of Motion. Find the one thing (**In Common**) that happens in each of the activities. Record in the table. Repeat for the Second Law activities and then the Third Law activities.

|  |  |
| --- | --- |
|  | **What observed in common** |
| **Newton’s**  **First Law of Motion** |  |
| **Newton’s**  **Second Law of Motion** |  |
| **Newton’s**  **Third Law of Motion** |  |

* 1. At station 6, what supplied the force necessary to make the nut drop into the beaker?
  2. At station 7, what supplied the force necessary to slow the penny down as it slid along the top of the table?
  3. Why is a meter stick easier to balance than a ruler?
  4. How many laws of motion did Sir Isaac Newton write?
  5. What are Newton’s three laws of motion?

1.

2.

3.