Name

Date

Period

**Newton’s 1st Law of Motion (Inertia) Lab**

**Station1- A Body at Rest**

In this experiment you will learn about inertia. In it, you will try to remove a book cover from under an object without moving the object on top. Magicians do this all of the time. Remember seeing a magician pull a tablecloth out from under a pile of dishes? Was it magic or science?

1 Place the poster paper on a flat, smooth surface.

2 Put the book with the glossy cover on top of the poster paper.

3 Quickly (in one smooth motion) yank the poster paper from under the book.

(The book should not move.)

4 Draw a free-body diagram demonstrating the forces acting on the book.

5 Do the experiment again, this time putting other (flat) objects on top of the poster paper. Observe what happens.

6 Does weight have any effect on the experiment?

8 Was it easier or harder to pull the poster paper out underneath other random objects? Why?

**Station 2- Field Forces**

Confetti and a Balloon

This experiment will teach you more about field forces. Remember field forces are those forces that do not actually have any physical contact to make objects come together.

1 Rub the balloon either on your own “cotton” shirt or something that will create static electricity.

2 Then place the “charged” balloon over the confetti.

3 Observe what happens to the balloon and confetti.

4 Draw the free-body diagram of the forces working.

5 If you want, test this same experiment on your hair. First rub off all of the confetti. Recharge your balloon by rubbing it on your clothes. Then use a group member that does not have hair gels or hairspray or other hair “stuff” in. Hold the balloon close to the end of their hair. Watch!

6 Explain why water “breaks” the forces connection.

7 Since we live in the desert and have a lot of static electricity present. Identify one other situation where static electricity is present in your everyday life.

8 Name one other field force.

**Station 3- Inertia**

This experiment will teach you more about why Newton’s First Law of Motion is also called the Law of Inertia. The method used in this experiment is very similar to the one that Galileo conducted.

You will be racing two jars. One jar is empty. The other is filled with rocks.

1 Place both 3-ring binders (or ramps) close to each other on the smooth counter. Place each jar on its side and release both from the top of the ramps at exactly the same time.

2 Record how far each jar rolled. Do not measure the binder (or ramp) itself, just the distance from the end of the binder (or ramp) to where each jar actually stopped.

3 Repeat Steps 1-2 for each of the surfaces listed on the table.

4 Fill-in the table with your results for each race.

|  |  |  |  |
| --- | --- | --- | --- |
| Race | Surface | How far did the empty jar travel? | How far did the rock jar travel? |
| 1 | Counter top |  |  |
| 2 | Towel |  |  |

5 How do you think the surface affected the ability for the jar to roll?

6 Define inertia.

7 Which jar had more inertia?

8 Explain how inertia affected the distance the jar rolled.

**Station 4- Rotational inertia**

Rotational inertia is the inertia of an object rotating on an axis. Just as objects travelling in a straight line will continue to do so, rotating objects (such as tops toys, flywheels, and gyroscopes) want to keep spinning. The rotational inertia of an object is directly related to its rate of rotation. This means that objects with large rotational inertia will require a large force to change its spin, while objects with small rotational inertia will require only a small force.

Rotational inertia accounts for the stability of gyroscopes and bike riders, and has applications for navigation of planes and figure skaters performing lightning fast spins.

An old disc will be used to simulate rotational inertia. Hold the apparatus by the pencil. The disc should be suspended by a string.

1 Swing the disc back and forth like a pendulum (think north and south). Try to achieve smooth, even movements.

2 Draw the free-body diagram for the disc.

3 Now give the disc a spin so that it rotates in a circular motion.

4 Draw the free-body diagram for the spinning disc.

5 While it is spinning in a circular motion, try to swing the disc again like a pendulum (back and forth or think north and south).

6 Describe what you are observing. What do you notice about the angle the disc makes with the counter as it swings along its pendulum arc?

**Station 5- Hot Wheels Car Accident (Objects in Motion Stay in Motion…)**

This station is used to show you how a body in motion stays in motion unless acted by an external force.

1 Give the hot wheels car a good push towards the “wall”. Pretend this is a car accident in which a car hits a concrete wall.

2 Observe what happens to the car and the “wall”.

3 Does the “wall” move? Explain why or why not.

4 Draw the free-body diagram of the car hitting the wall.

5 Now gently tape an action figure on top of the car. Give the car an extra good push towards the wall. (If the action figure falls off before it hits the wall, then you’ll need to start over.)

6 Draw a free-body diagram of the action figure in the car, then another diagram of what happens to the action figure not snuggly strapped in.

7 Explain how a seatbelt would “help” someone in a car accident.