

### Experiment 3: Prelab Exercise

State Newton's 3 laws of motion.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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3. \_\_\_\_\_

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### Experiment 3: Newton's Laws of Motion

#### Station 1

1. Place the matchbox car on top of the cart, facing the same direction as the cart.
2. Hold the bare end of the spring with one hand against the end of the cart.
3. Push the cart and spring together, compressing the spring.
4. Release the cart and observe the motion of both the matchbox car and the cart.

Observation:

Which of Newton's laws best explains:

The motion of the cart during release from the spring \_\_\_\_\_

The motion of the cart after release from the spring \_\_\_\_\_

The motion of the matchbox car (left and right) \_\_\_\_\_

#### Station 2

1. With the spring scale attached to the block, grasp the other end of the spring scale.
2. Bring the block to a comfortable speed and maintain that speed across the table.
3. Observe the amount of force required to maintain a constant speed. Observation:

4. Now try to pull the block with 2x that force. Observation:

5. Now add the weight to the block, and pull with the same 2x force. Observation:

Which of Newton's laws best explains:

The motion of the block in step 3 ? \_\_\_\_\_

The motion of the block in step 4 ? \_\_\_\_\_

The motion of the block/weight in step 5 ? \_\_\_\_\_

#### Station 3

1. Place a piece of paper on the table and center a wax cup upside down on the paper.
2. Center a marble on top of the wax cup.
3. With a swift motion of your arm, jerk the paper from under the cup as fast as possible.

Observation:

Which of Newton's laws best explains the motion of the marble? \_\_\_\_\_

**Station 4**

1. Place the marble at the top of the incline, and then release it. Observation:

Which of Newton's laws best explains the motion of the marble? \_\_\_\_\_

**Station 5**

1. Attach one spring scale to a stationary rod, then attach 2 other scales to the first, forming a horizontal chain.

2. Pull horizontally on the unattached spring scale hook. Observation:

Which of Newton's laws best explains the observations? \_\_\_\_\_

**Station 6**

There are two pieces of crumpled paper. They are of similar mass, but one is crumpled tightly and the other not. Place them side by side and blow them simultaneously across the table.

Repeat. (Note: The force on the paper ball is roughly proportional to its size.) Observations:

Which of Newton's laws best explains the observations? \_\_\_\_\_

Explain how this law applies to the observations:

**Station 7**

There are two crumpled pieces of paper. They are of very similar size and shape, but one has more mass than the other. Place them side by side and blow them simultaneously across the table. Repeat. Observations:

Which of Newton's laws best explains the observations? \_\_\_\_\_

Explain how this law applies to the observations:

**Station 8**

You are standing or sitting. Gravity is exerting a force on your body downward. Why are you not moving into the floor, since Newton's 2<sup>nd</sup> law states that  $F = ma$ ?