25 points maximum based on accuracy completeness, neatness, on-task, cooperation, clean-up

Experimenter_____ Period/My Name/Seat #
Materials_____
Recorder_____
Reporter_____

Teacher's clean-up stamp of approval

NEWTON'S THIRD LAW OF MOTION LABORATORY

Purpose: *Forces act in sets of two*. Identify Action - Reaction "force p_____".
F = ma Explain how Mass or Force affects acceleration as judged by distance traveled.

Newton's Third Law of Motion: When the first object exerts a force on a second object, the second object will exert a forces of equal m_____back on the first object, so that

both objects a_____away from each other in o_____ directions.

Materials & Equipment:

18 wooden Dowels
1 meter stick
1 Newton cart
3 wooden blocks of different mass: light, medium, heavy
3 rubber bands
6 loops of 20 cm long string
Pair of scissors

Procedure:

1. Mass each of the three wooden blocks and record their masses in the data table.
2. Space the dowel rods 5 cm apart alongside the meter stick.
3. With your partner holding one of the dowel rods, wrap a piece of string about 20 cm long around the dowel rod. Your partner puts a finger on the string to hold it in place while you tie a square knot to create a string loop. Remove the string loop from the dowel rod.
4. Repeat step 3 to prepare a total of six string loops.
5. Referring to the picture of the set-up (**Figure 1**), pass a rubber band through one string loop, then attach the ends of the rubber band to the two screws on the left and the string loop to the center screw on the right of the Newton cart. This creates a loaded "sling shot."
6. Place the lightest wooden block on the Newton cart with the pointed end of the block against the rubber band.
7. Line up the cart so that the cart's back end is at the 0 cm mark on the meter stick. This is your reference point.
8. Hold the scissors upright with the cutting blades pointed down. Get ready to lift your hand up quickly and out of the way. Carefully cut the string releasing the wooden block and allowing the cart to move on the dowel rods. Did you move your hand away fast enough?
9. Note the distance the reference point on the cart traveled and record it in the data table.
10. Repeat steps 5 - 9 using the medium mass wooden block and the heavy mass block.
11. Repeat steps 5 - 9 using two rubber bands to create even greater force.

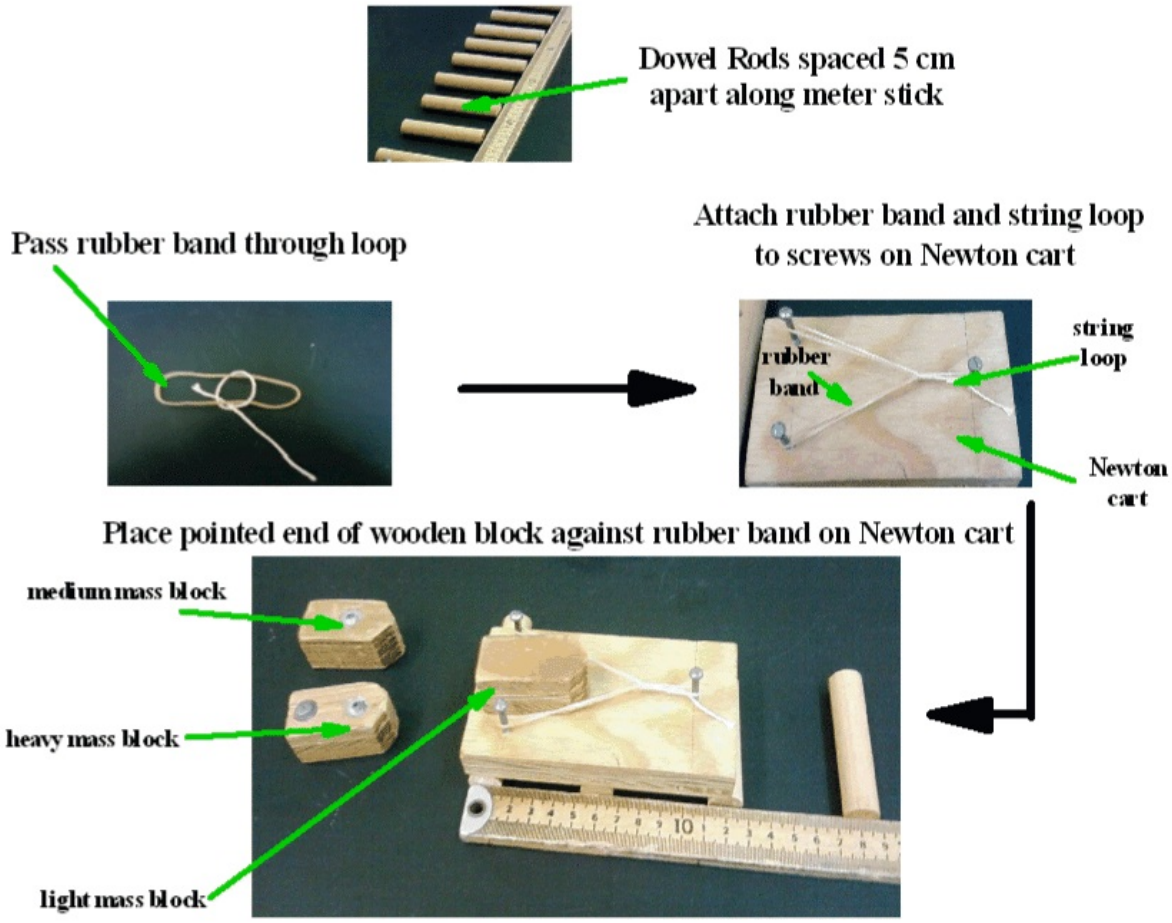

FIGURE 1

Newton Cart Set-up Procedure

HYPOTHESIS A

If mass (± 0.1g) increases, **then** acceleration will: *(circle 1)*

increase
stay constant
decrease

when force is kept constant, as judged by distance (cm) the cart travels.

HYPOTHESIS B

If force (# rubber bands) increases, **then** acceleration will: *(circle 1)*

increase
stay constant
decrease

when mass (± 0.1 g) stays constant, as judged by distance (cm) the cart travels.

DATA TABLES

Mass of Wooden Blocks
Record the mass of each of the three wooden blocks to the nearest gram.

Average Mass:	___18 g____	_____30 g___	___40 g____
	Light Block	Medium Block	Heavy Block

Test Results
Record the distance the Newton car traveled to the nearest (± 0.1 cm) centimeter

	Trial 1: 1 Rubber Band	Trial 2: 2 Rubber Bands
Light Mass Block	_____	_____
Medium Mass Block	_____	_____
Heavy Mass Block	_____	_____

BAR GRAPH
Make a line graph of your results with the x axis = block mass and the y axis = distance. Use metric units. For each block, color two bars; one color for each trial. Make a key. Title your graph.