Name _____ Date _____ Period _____

Lab: Rubber Band Cannon

CONCEPTUAL PHYSICS: UNIT 2

***BACKGROUND**:* Several factors affect how far a projectile will travel. The two most important variables are the launch angle and the magnitude of the initial force that sets the object into motion. In order to determine how a single variable affects a projectile's horizontal distance, experiments need to be designed to test each variable independently. This is done by making observations under controlled conditions where only one variable at a time is changed. Controlled experiments make it possible to separate or isolate the factors that are responsible for a given observation in a complex series of events. In this activity, students examine how launch angle affects the horizontal distance traveled by a rubber band. (taken from: https://www.flinnsci.com/globalassets/flinn-scientific/all-free-pdfs/dc10873.pdf)

***MATERIALS**:*

- Rubber Band Cannon
- Rubber Bands
- Meter stick or Measuring Tape

Changing Angle of Launch

***PROCEDURE**:*

1. Divide students into groups of 4
2. Each group will need a cleared floor area, and assigned materials.
3. Lift up the free end of the ruler (launcher) so that its center is over the 10° mark on the protractor and secure the ruler at this angle with the wingnut.
4. Place the Rubber Band Cannon on the floor and hold it in place with your hand. Use your free hand (or help from a partner) to place a rubber band on the end of the ruler. Pull the rubber band back to the 12-cm mark on the ruler. Do this by pinching the rubber band between the thumb and index finger.
5. Making sure the area in front of the Rubber Band Cannon is clear; quickly release the rubber band to launch it from the cannon. One lab partner should fire the cannon while the other becomes the spotter. The spotter should watch where the rubber band first hits the ground.
6. Use a tape measure to determine the horizontal distance traveled by the rubber band. Measure from the front end of the ruler to the front end of where the rubber band hit the floor. Record distance traveled in Data Table #1.
7. Repeat steps 3-6 for launch angles of 30°, 45°, 60°, and 80°. Be sure to consistently pull the rubber band back to the 12-cm mark on the ruler. To change the angle, first loosen the wingnut securing the ruler in place. Position the ruler so its center is at the new launch angle, and then re-secure the ruler with the wingnut. Record distance in Data Table #1.
8. Analyze the data to determine which launch angle resulted in the greatest horizontal distance traveled by the rubber band and answer conclusion questions 1-5.

DATA TABLE # 1

Launch Angle	Stretch Distance	Launch Distance				
		Trial 1	Trial 2	Trial 3	Trial 4	Average
10º						
30º						
45º						
60º						
80º						

***Conclusion Questions**:*

1. What angle launched the rubber band the greatest distance?

2. Do you see any other relationships between the different launch angles and distances traveled? Explain

3. What was the purpose of having 4 trials at each angle?

4. What other forces were acting on the rubber band as it flew through the air? (Name 2)

5. What could you do to increase the distance your rubber band traveled? Explain