Physical Science
Lab

Name___________________
Date___________

Rubber Band Stretch

Most students will agree that the longer they study for tests, the higher they score. In other words, test grades seem to be related to the amount of time spent studying. If two variables are related, one variable depends on the other. One variable is called the *independent variable*; the other is called the *dependent variable*. If test grades and study time are related, what is the independent variable: the test grades or the time spent studying? One of the most simple types of relationships is a linear relationship. In linear relationships, the change in the dependent variable caused by a change in the independent variable can be determined from a graph. In this experiment you will investigate how a graph can be used to describe the relationship between the stretch of a rubber band and the force stretching it.

Purpose:

- to measure the effect of increasing forces on the length of a rubber band
- to graph the results of the experiment
- to interpret the graph

Materials:

ring stand
ring clamp
100 g mass
200 g masses
500 g mass
metric ruler
3 rubber bands (same length but different widths)

Hypothesis:
Write a hypothesis predicting how the width of a rubber band will affect how far a rubber band will stretch. Be sure to write your hypothesis as an "If...then…" statement.

Procedure:

1. Set up the ring stand by placing the narrowest rubber band over the ring clamp.
2. Measure the width of the unstretched rubber band. Record this value in the data section.
3. Measure the length of the rubber band as it hangs from the ring clamp. Record this value in Table 1 as zero mass.
4. Carefully attach a 200 g mass to the bottom of the rubber band. Measure the length of the stretched rubber band. Record this value in Table 1.
5. Carefully add a 100 g mass to the 200 g mass to the bottom of the rubber band. Measure the length of the stretched rubber band. Record this value in Table 1.
6. Remove the 100 g mass from the rubber band. Carefully attach a second 200 g mass to the rubber band. Measure the length of the rubber band and record the value in Table 1.
7. Remove the 2 200 g masses and carefully attach the 500 g mass to the rubber band. Measure the length of the rubber band and record the value in Table 1.
8. Remove the rubber band. Replace the rubber band with a slightly wider one.
9. Repeat steps 2-7 for the second rubber band.
10. Remove the second rubber band. Replace the rubber band with a slightly wider one.
11. Repeat steps 2-7 for the third rubber band.

Data:

	Width (mm)
Rubber Band #1	___________
Rubber Band #2	___________
Rubber Band #3	___________

Table 1: Length of rubber bands that have been stretched by various masses.

Mass (g)	Length of Rubber Band #1 (cm)	Length of Rubber Band #2 (cm)	Length of Rubber Band #3 (cm)
0			
100			
200			
300			
500			

Analysis: *Draw the graph by hand on graph paper.*
In most experiments, the independent variable is plotted on the x-axis, which is the horizontal axis. The dependent variable is plotted on the y-axis, which is the vertical axis. In this experiment, the lengths of the rubber bands change as more mass is used to stretch them. The length of each of the rubber bands is the dependent variable. The mass that is used to stretch them is the independent variable. Use Graph 1 to plot the data for each rubber band. Your graph will have 3 lines. Be sure to include a key for your graph that identifies the width of each rubber band. Plot the values of the masses causing the rubber bands to stretch on the x-axis. Plot the lengths of the rubber bands on the y-axis. Label the x-axis Mass (g) and the y-axis Length (cm). Be sure to give the graph an appropriate title.

Conclusion: *Answer the following questions in complete sentences on a separate sheet of paper.*

1. What do the graphs you made describe?

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2. How is the steepness of the three graphs related to the width of the rubber band?

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3. How is the flexibility of these rubber bands related to their widths?

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4. Explain how someone looking at Graph 1 could determine the length of the unstretched rubber band.

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5. Predict the length of each rubber band if a 600 g mass is used to stretch it.

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6. How could you use the stretching of one of the rubber bands to measure the mass of an unknown object?

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