NEWTON'S LAWS

Name:____ Section:____________

Partner:____ Date:____________

PART A: Attach copies of the 2 pairs of graphs (that is 2 from your group and 2 from the other group).

You are told in the instructions that this section deals with the Third Law, $\vec{F}_1 + \vec{F}_2 = 0$. But since there is no acceleration, the Second Law also tells us that $\vec{F}_1 + \vec{F}_2 = 0$. Explain clearly how the application of the two laws differs for this experiment. [Hint: a force diagram might make your explanation clearer.] How would you have to modify the experiment to consider it a verification of the Second Law?

In your graphs notice that the force varies with time. Does the Third Law apply to the peak force or the average force or some other force? Explain.

Do your data verify this law? Does it matter whether the collision is fast or slow? Do you need to integrate over the time of the entire collision, i.e. does the law apply for just part of the collision? Explain.

PART B: Take at least five data points for force as a function of mass.

TABLE 1. Force and Mass Measurements

Force	Mass	Force	Mass

Attach your Excel plot with the best straight line fit. What are the meanings of the y-intercept and slope?

From the fit, what is g in MKS units? Estimate your error in determining g by examining the graph to determine which points are furthest off the best line fit. Then replot with the two points that will give a line with the greatest slope and the least slope. [Be sure to round off your value for g to the number of digits consistent with your estimated error.]

$g =$ __________ $\pm$ __________ __________ (units)

PART C: Attach your Excel plot of F vs. a with the best straight line fit. Explain why this graph is a verification of Newton's Second Law.

Clearly describe the **extra** experiments relating to the Second Law that you carried out on the spring/mass system. Be sure to explain what you learned from these experiments. Attach any graphs that you plotted.