Laboratory Investigation Name ____________________

Chemistry: Form L1.2A Date ____________ Period ______

Graphing Laboratory Data

PROBLEM

How can graphing be used to help interpret laboratory data?

INTRODUCTION

Graphing is a useful tool that helps scientists to interpret data gathered in the laboratory. In this laboratory exercise, you will measure the masses of several different samples of pennies. Then you will examine the relationship between the number of pennies and the mass by graphing your measurements.

MATERIALS *(per group)*

Balance, pennies (20)

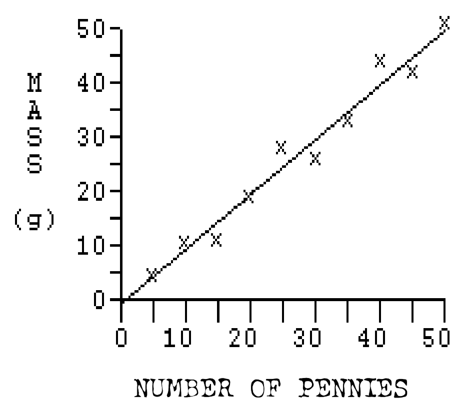
PROCEDURE

1. Obtain 20 pennies. Using a balance, measure the mass of several pennies at a time. Use any number of pennies between 1 and 20. Record the number of pennies in the sample you measured and the mass of the pennies in the data table on the next page.

2. Repeat step one until you have made ten different measurements. (You may use the same pennies over again but do ***NOT*** measure the same ***number*** of pennies twice!)

3. Prepare a suitable graphing space to plot your data. Select the proper axes, origin and intervals. After you have prepared your graphing space, plot your data points with ***Number of Pennies*** on the horizontal or *X*-axis and ***Mass*** on the vertical or *Y*-axis.

4. Check to see if there is a relationship between the mass and the number of pennies. As the number of pennies increases, does the mass appear to change in a predictable way? Does the relationship appear curved or linear? Is the relationship direct or indirect? If you made your measurements and plotted the points carefully, they should appear to fall approximately on a straight line. The relationship between the number of pennies and their mass is linear because the mass of the pennies changes at a constant rate with respect to the number of pennies. (For example, if the number of pennies doubles, the mass also doubles.)



5. Draw the best straight line through the points. The points do not all fall exactly on the straight line because of errors of measurement. Errors of measurement are usually random. This means that sometimes your measurements will be too high, but sometimes your measurements will be too low. As a result, the ***best*** straight line will have points scattered above and below it. See the diagram to the upper right showing the relationship between the mass and the volume of water.

6. Find the average mass of a penny by the two methods described below:
   (a) *Method 1:* Find the total number of pennies you measured by adding the number of pennies in column two of your data table. Find the total mass of all the pennies by adding column three of your data table. Find the average mass by dividing the total mass by the total number of pennies.
   (b) *Method 2:* Find the slope (m) of the line. Pick two points on the line. The difference between the Y-values of the points is the change in Y (ΔY). The difference between the X values of the points is the change in X (ΔX). The slope is the change in Y divided by the change in X ($m = \Delta Y/\Delta X$).

OBSERVATIONS

Trial	Number of Pennies	Mass
1st		
2nd		
3rd		
4th		
5th		
6th		
7th		
8th		
9th		
10th		
TOTAL		

Average by *Method 1* and by *Method 2*

Method 1 . . . . ______________

Method 2 . . . . ______________

CONCLUSIONS

1. Are the averages found by *Method 1* and *Method 2* the same? Why might they be different?

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2. Why is the slope of the line the average mass? (*HINT:* Slope is $\Delta Y/\Delta X$. Which variables are on the Y-axis and on the X-axis?) ______________________________

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3. Why don't all the points fall directly on the line? ______________________

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4. How was graphing useful in interpreting your data? ______________________

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5. What are some sources of error? ______________________________