Making Graphs with Excel — for the **Density Lab**, and later in the **Wine Lab** & **Project Lab**

Don't study these steps ahead of time; they'll make sense when you're at the computer. In the directions, CAPITAL LETTERS indicate a menu option, which probably won't be all-capitalized on the menu.

1. Find a computer in Chem 1375 and open Excel by clicking START and MICROSOFT EXCEL 2007.

2. For graphing data in Part C of the Sugar Lab, type your values of V & m (for each run) into the A & B columns, which plot on the x & y axes, to make a graph of y-versus-x, which here is m-versus-V (not V-vs-m as in the lab manual's typo-error), then CLICK-AND-DRAG with your mouse to "select" all of this data,

3. To make the graph, in the INSERT-menu click SCATTER, then click the first icon (in upper-left) that is labeled (when your cursor hovers over it) "Scatter with only Markers,"

4a. in CHART TOOLS, click LAYOUT and AXES and GRIDLINES and PRIMARY HORIZONTAL GRIDLINES and MAJOR & MINOR GRIDLINES, then go back and choose PRIMARY VERTICAL GRIDLINES and MAJOR & MINOR GRIDLINES.

4b. in CHART TOOLS, click LAYOUT and CHART TITLE and ABOVE CHART, and type a title for your graph; then click AXIS TITLES and choose the HORIZONTAL AXIS and type a label that tells you (for the x-axis) *what is being measured* and *what the measuring-units are,* then choose the VERTICAL AXIS and type a label that tells you (for the thing represented on the y-axis) *what it is* and *what its units are.*

4c. in CHART TOOLS, click LAYOUT and ANALYSIS and TRENDLINE and MORE TRENDLINE OPTIONS (at bottom), then choose LINEAR and DISPLAY EQUATION ON CHART and DISPLAY R-SQUARED VALUE ON CHART, and we won't do "SET INTERCEPT = 0" (even though when V = 0, m should be 0, right?) and CLOSE. (if you want, try it with and without "set intercept = 0" to see what happens),

5. click on the equation to "select" it, then right-click and choose FORMAT TRENDLINE LABEL and NUMBER (on left) and NUMBER (on right) and increase the number of DECIMAL PLACES (and click "Add") until each of the three numbers has at least 4 significant figures (some will have more than 4 sig figs, and this is OK), then (because slope in "y = mx + b" is "change in grams / change in mL = density")

6. in CHART TOOLS, click FORMAT and SIZE and change it to "Height = 5", Width = 7", then **select** the graph, click OFFICE BUTTON (top left) and PRINT and PRINT PREVIEW, and PAGE SETUP so you can try both views (PORTRAIT & LANDSCAPE) to see which makes your graph bigger, because bigger is better for Step 7; click MARGINS and set each margin to between .50" and .75"; save your file with a unique name (not the generic name assigned to it) so you'll recognize your file in the print-queue window, and click PRINT.

To make a calibration graph using class data from Part A, repeat Steps 2-6 with minor variations:

Step 2. Copy the class data (for **Part A**) into your data page, and type this data for c & d (for the sugar ***c****oncentration* and solution ***d****ensity*) into the C & D columns so you'll get a "d versus c" graph (**YOU MUST DECIDE** which will be x & y, so you can type these in the C & D columns, respectively), then mouseclick-and-drag to select the C & D columns to make your **calibration graph**. Then do steps 3-6 above.

Now determine the concentration of sugar in two ways, by OVER-AND-DOWN (visual) and SUBSTITUTE-AND-SOLVE (mathematical), and **show both methods on the calibration graph**:

7. OVER-AND-DOWN: use the value of density you have chosen (in Part C) as the beginning value for an over-and-down; you should write (on your graph) these four things: the STARTING NUMBER-VALUE, an OVER-LINE that becomes (when it intersects the best-fit line drawn by Excel) a DOWN-LINE, and the ENDING NUMBER-VALUE that is *your experimentally determined value for the concentration of sugar.*

8. SUBSTITUTE-AND-SOLVE: SUBSTITUTE into "y = mx + b" (using the numbers calculated by Excel in the line-equation), and SOLVE to calculate the sugar concentration; SHOW YOUR WORK in four lines by writing ***the general equation*** [y = mx + b] and ***the lab-specific equation*** [with c & d substituted into appropriate places in "y = mx + b"] and ***this equation with your numerical substitutions*** [using the values calculated by Excel, and the density you chose in Part C] and ***the answer you calculate*** for c, which is *your experimentally determined value for the sugar concentration of your soda.*

9. COMPARE your two values for concentration, in #7 and #8. Both should be the same, and if they're not approximately equal this is a clue that you did one, or both, incorrectly.