

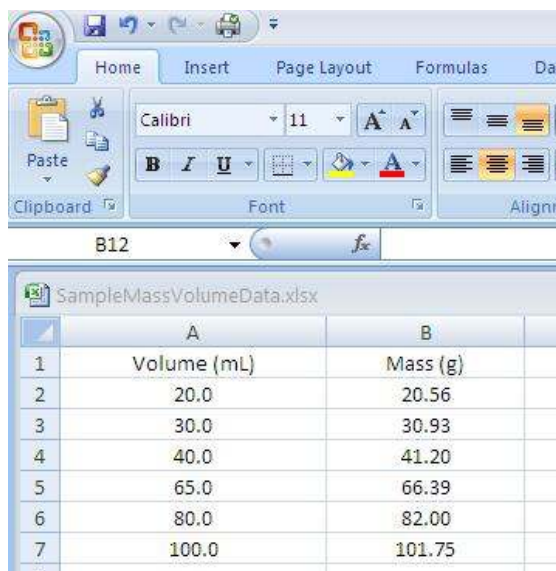
Making a Scientific Graph Using Microsoft Excel 2007

Entering Data:

An *Excel* workbook, or spreadsheet is divided into columns and rows. Columns are labeled with letters, and rows are labeled with numbers.

A “cell” is found at every intersection between a column and a row. Data is entered into these cells. It is recommended that data NOT be entered into row 1. This row should serve as “labels” for the data to be entered into each column. This label should also include units.

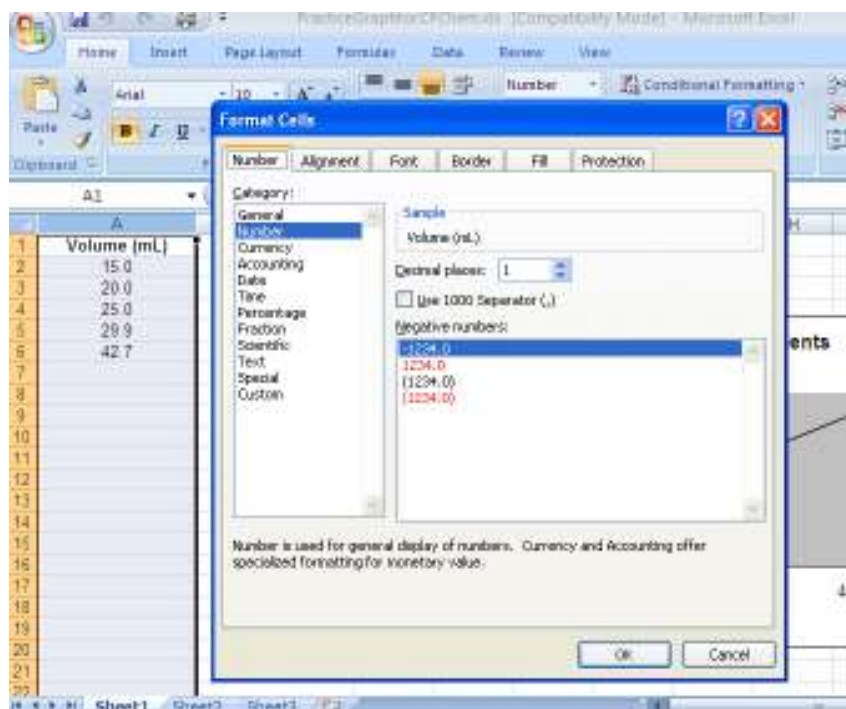
Data is entered into the appropriate column. Generally, the independent variable data is entered in column A and will appear on the x-axis. The independent variable is what is deliberately changed during the experiment. The dependent variable data is entered in columns B, C, D, etc; and will appear on the y-axis. The dependent variable is what is measured during an experiment. For example:



	A	B
1	Volume (mL)	Mass (g)
2	20.0	20.56
3	30.0	30.93
4	40.0	41.20
5	65.0	66.39
6	80.0	82.00
7	100.0	101.75

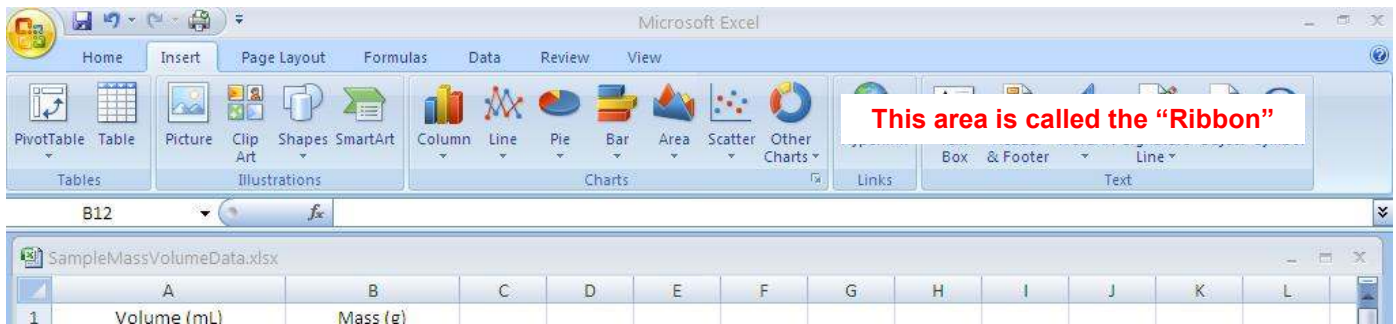
After all data has been entered, you are ready to make a graph (“chart”). To begin, highlight all of the data (Numbers ONLY!) in the spreadsheet. Place the cursor over cell A1, hold down the left mouse button, and drag the cursor over all of the data.

About entering data: At times, excel will not keep the required number of decimal places that are entered by the user for the data in columns A and B. To fix this, you will need to left-click on the top of the column, then right-click to “Format Cells”. When the format cells window opens, select the “number” tab and then number from the category list. Then set the required number of decimal places.

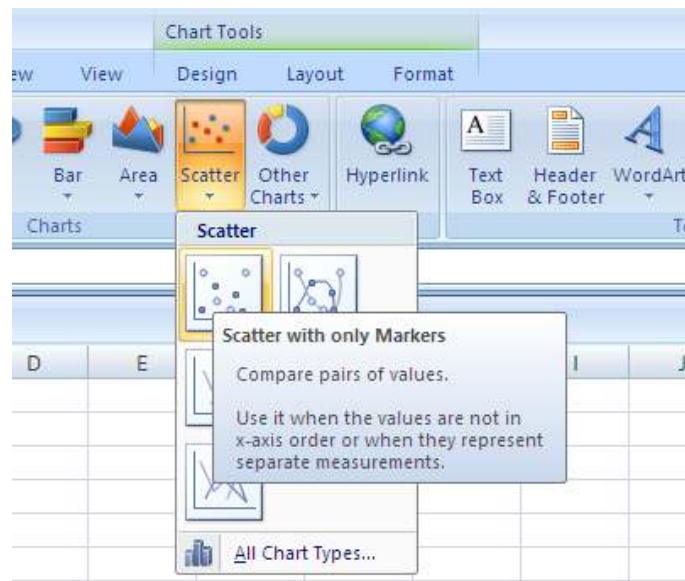


Making the Graph:

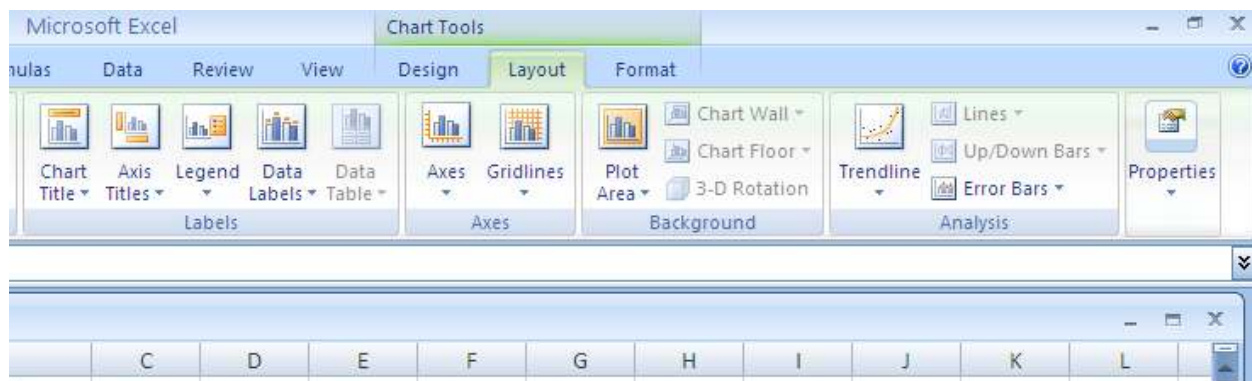
1. Once the data is highlighted, click on the “Insert” tab along the top of the screen:



2. Select the appropriate type of graph from the “Charts” area of the ribbon. (Generally, Science graphs will be the “Scatter” type).
3. Select the “Scatter with Only Markers” option under the “Scatter” button on the ribbon:



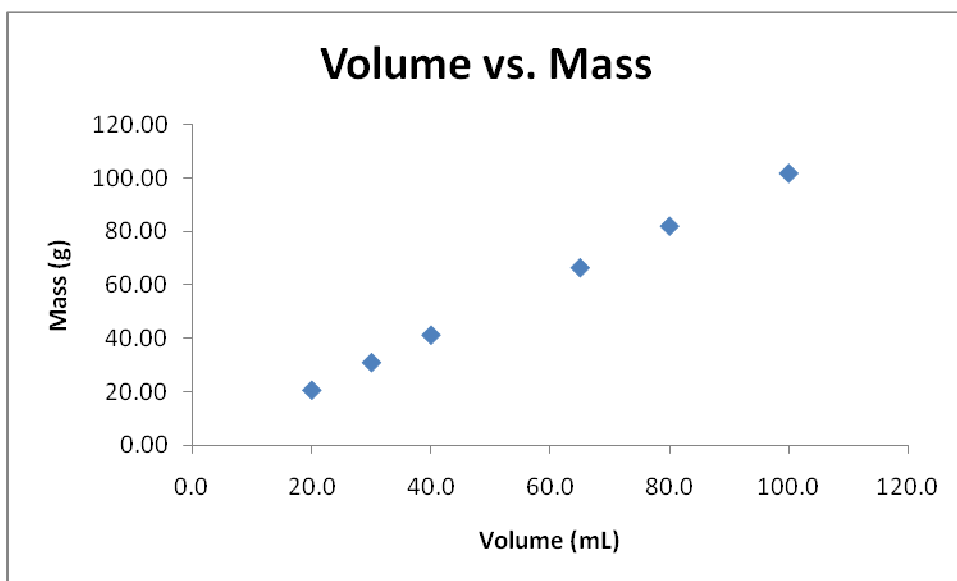
4. Once the graph is created, double-check that the data appears on the graph as you thought it would. The following items can then be added/modified using the buttons under the “Layout” tab of the ribbon:



- **Chart Title** - Type a chart title in the space provided.
- **Axis Titles** – Label each axis, include units of measure.
- **Gridlines** – Only show if needed (generally, NOT needed)
- **Legend** – The choice here depends on the data. You **ONLY** need a legend if there are multiple sets of data on your graph. The graph will show a legend unless you tell it not to do so.
- **Data Labels** - Show data labels only if they will not clutter the graph. Data labels show specific numerical values for each point.

*****SAVE YOUR WORK NOW!!*****

Example:



Modifying the Graph:

Most modifications to a graph can be made by right-clicking on whatever needs to be modified. A few common modifications are:

- **Format Axis** – Right clicking on a number on either axis, allows you to select the “Format Axis” option (see right). The “Axis Options” tab is the most useful as it allows changes to the numerical values that appear on the axis, as well as the minimum and maximum values displayed on the axis.

For graphs that include negative values, it is also useful to move the intersection of the XY axis to a different value. This can be specified by using the “Value (X or Y) axis Crosses” command near the bottom of the window. Both the X and Y axis can be formatted independently.

Format Axis

Axis Options

Number: ☒ Auto ☐ Fixed 0.0

Fill: ☒ Auto ☐ Fixed 120.0

Line Color: ☒ Auto ☐ Fixed 20.0

Line Style: ☒ Auto ☐ Fixed 4.0

Shadow: ☐ Values in reverse order

3-D Format: ☐ Logarithmic scale Base: 10

Alignment: Display units: None

☐ Show display units label on chart

Major tick mark type: Outside

Minor tick mark type: None

Axis labels: Next to Axis

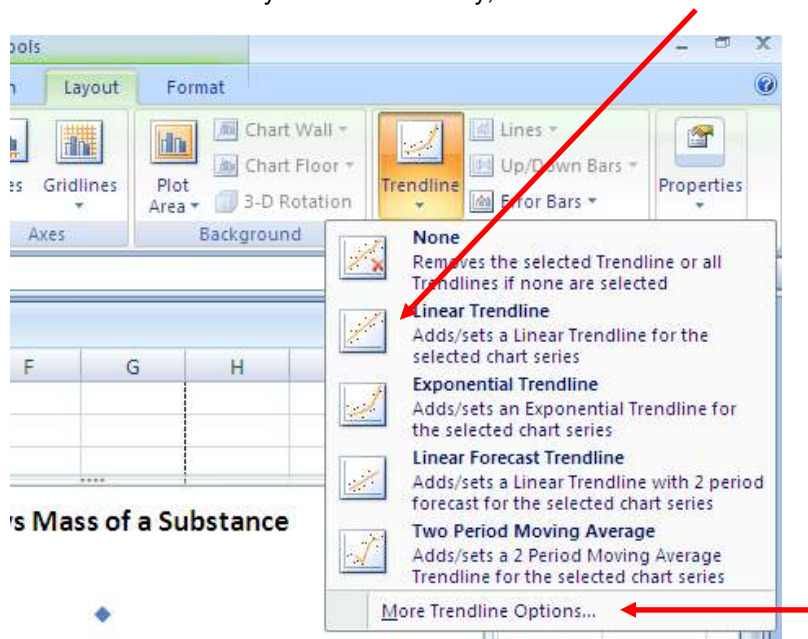
Vertical axis crosses: ☒ Automatic

☐ Axis value: 0.0

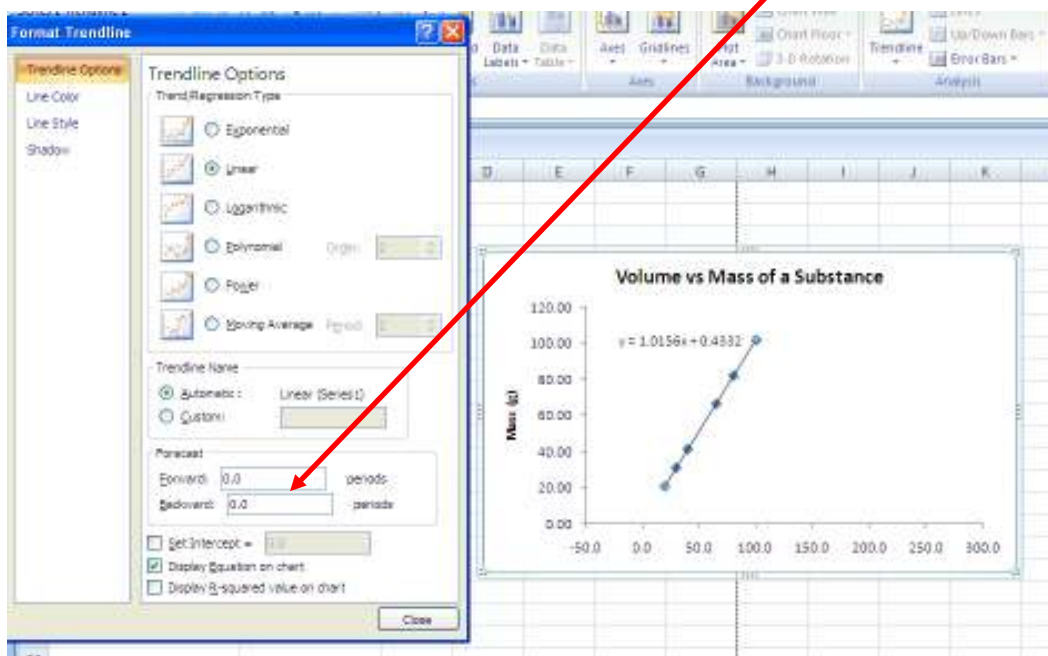
☐ Maximum axis value

Close

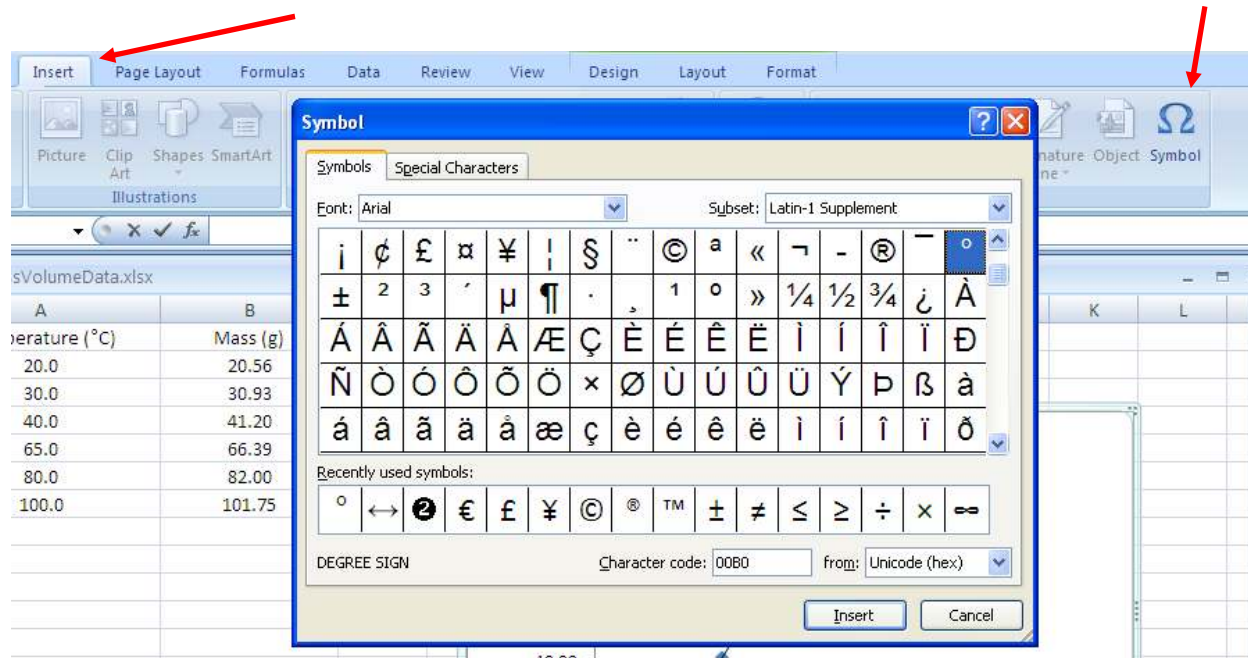
- **Colors** – PLEASE refrain from using any colors on a science graph. All graphs should have a white background (NOT gray, purple, pink, etc). This is a science graph, not an art project! To change the color of an area, right-click in that area. This will open the “Format Plot Area” Window. Change all colors to white.
- **Trend lines** – If the data in the graph should show a linear relationship, *Excel* can add a “best fit” line between all of the data points. This line is called a “Trend line”. To add a trend line, click on the Trend line button on the ribbon under the Layout tab. Generally, our trend lines will be linear.



If desired, the formula for the trend line (in the form $y = mx + b$) may also be added to the graph. Click on the Trendline button, then “More Trendline Options”, this will open the “Format Trendline” window. Check the box for “Display Equation on Chart”. You may also forecast the trend line above and/or below your collected data values. This is useful when you want to predict results outside of your range of data. To “forecast” your trendline, adjust the values in the “Forward” and/or “Backward” boxes, until your line extends as needed.



- **Adding Special Characters** – Sometimes graph titles and axis labels need characters that aren't on the keyboard. These can be Inserted anywhere that you can type text. In Excel, select Insert, Symbol:



Then select the desired symbol from the window above. Click “Insert” and the selected symbol will appear where your cursor was located.

Printing the Graph

Before printing any graph, please be sure that it is a graph worth printing. If it looks like junk on the screen, it will print like junk as well!

To print the graph, click on an “empty” place near the outside border of the graph. This will highlight the entire area of the graph. Once the graph is highlighted, select print, from the Windows button in the top left corner of the screen:



The computer will print one copy of the graph. *Excel* will automatically size the graph to print on a single piece of paper.

****It is also possible to “Copy and Paste” the graph into a *Word* document.**** This is useful when including the graph as part of a lab report. To do this, follow the same steps as to print the graph. However, instead of printing, “Copy and Paste” the graph into your lab report.