Lab Activity
Using Excel (2026)

Purpose

Microsoft Excel® is a computer spreadsheet program that scientists use to manipulate and graph data. This lab will ensure that you are able to use this program. In this activity, you will use sample volume and mass data to calculate density and generate graphs.

Part 1 Data analysis (How to use Excel)

Measurements of mass and volume for various pieces of an unknown metal are shown in Table 1.

Table 1. Volume and mass measurements of an unknown metal

Volume (ml)	Mass (g)
2.00	5.100
3.10	8.900
4.00	10.900
5.30	13.800

A straight line can be described as:

$$y = mx + b \qquad (1)$$

Where y is the y-axis, x is the x-axis, m is the slope and b is the y-intercept.

Graphing grams as y and milliliters as x, equation 1 above becomes

$$g = m * mL \qquad (2)$$

Rearranging (2) gives us the meaning of the slope:

$$m = g/mL \qquad (3)$$

(slope, m, equals density given in g/mL)

This activity will help you graph data using Excel. You will also learn how to enter equations into the spreadsheet. The skills you will learn are very useful in many disciplines.

Graphing

(Please follow along, even if you know how to use Excel!)

Students can access Excel through Microsoft 365 (with BC login) if they have an electronic device. You can start by logging into your email and choosing the Excel app https://www.bellevuecollege.edu/current-students/

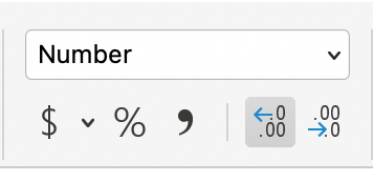
If you don't have Excel or a computer at home, you may use the computers in the Science Study Center (S-114) or various open labs on campus such as the Open Lab (N 250).

THE FOLLOWING PROCEDURE IS FOR EXCEL Version 16.106 (through Microsoft 365 Subscription).

1. Open a blank workbook in Excel. Begin column A and B with a heading so that it is clear what **value and units** the numbers in the rest of the column correspond to. For example, in cell A1, type "Volume (mL)". Resize the columns as necessary **Home> Cells> Format> Column Width**. Do the same for mass in cell B1.

2. Enter the data given in Table 1.

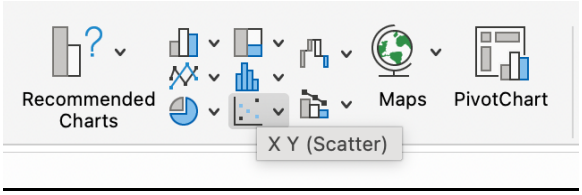
3. It is important to use significant figures. Highlight the data in column A and in the **Home** menu find the Number format panel and select the button (see image below, the grayed button) that increases decimal points to the correct number of decimal places to which the data should be displayed. Use the same number of decimals as in Table 1. Repeat for column B.



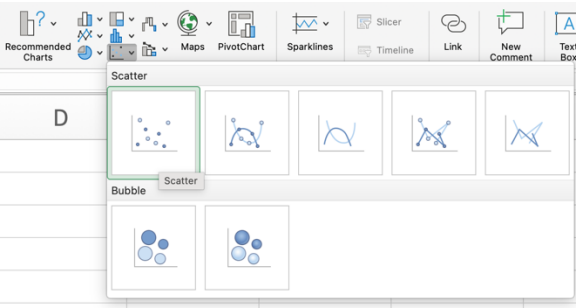
At this point, your spreadsheet should look like this:

	A	B
1	Volume (mL)	Mass (g)
2	2.00	5.100
3	3.10	8.900
4	4.00	10.900
5	5.30	13.800

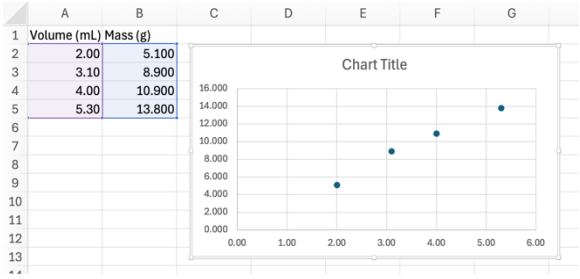
4. Now you're ready to graph. Select your data by dragging your mouse over cells A1 through B5 to highlight those cells, then click the Insert menu. Choose the **X Y (Scatter) option**.



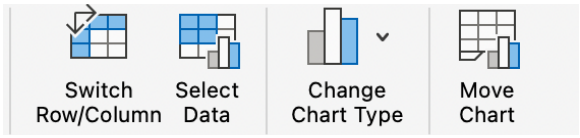
Then choose the first scatter option (dots only, no connecting lines). You do not want to connect your data points in any way at this point.



Your graph will automatically be embedded in your spreadsheet like so:



It is best to have your graph as large as possible, so in the ribbon menu, choose "Move Chart" (should be in the top right of your screen). Choose to have the chart as a New Sheet: Chart 1. Now your graph is on a whole sheet of paper.

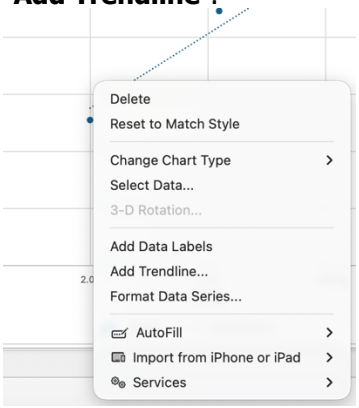


You can change the look of your graph by clicking through **Chart Design > Quick Layout** (or the displayed options). Choose the look that is best appropriate for your graph.

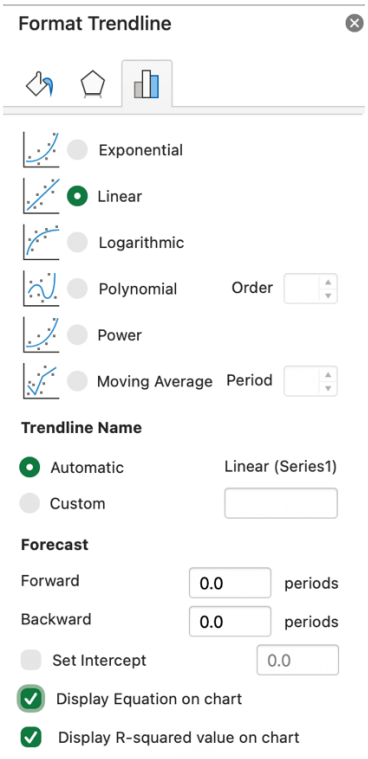
5. It is also important to have a Chart Title and axes labels. For a chart title: **Chart Design > Add Chart Element > Chart Title**. A good graph title is a short description of what the data is of (do not restate the axes). For example, "Mass and Volume Data For An Unknown Metal" is better than "Mass vs. Volume".

Repeat for vertical (y) and horizontal (x) axes labels (Add Chart Element > Axes Titles), or if they already appear, click the labels and rename them. Include units!

6. A "best-fit line" averages the data points to approximate a straight line. Right click on one of the data points and all the points should be highlighted automatically. An option will be to "**Add Trendline**".



Select the **linear regression type** and before saying enter, check the last two boxes "**display equation on chart**" and "**display R^2 value**". The R^2 value is a correlation factor (the closer it is to a value of 1, the more the data fits a linear relationship.)



You will now see an equation and R^2 value on your graph.

So far, make sure:
a) Your graph is on a full page and has a title and the x- and y-axes are labeled with units;
b) The best fit line is displayed with the equation and R^2 (correlation) value.
c) Optional: You can erase the Series box since you only have one series (select and delete). This will make your graph bigger.
d) Save your work!!!

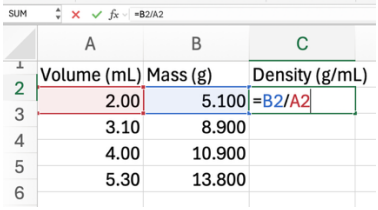
Congratulations! You are done with your graph! Save your graph. **But don't close the program just yet...**

Entering Equations

1. Equations can be entered into Excel. Go back to the Sheet1 tab (to open the workbook containing the data). In cell C1 make a column heading called "Density (g/mL)". We will use an equation to calculate the values already knowing the equation:

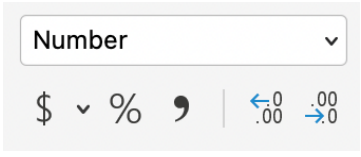
$$d = m / V$$

2. In cell C2, type "**=B2/A2"** and press enter. A value of 2.55 will be shown in C2.



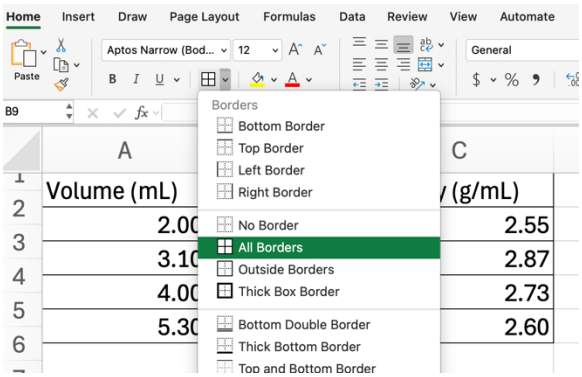
3. Select cells C2-C5 and select **Home>Edit>Fill** then **Down**. The values for these cells will appear. [An alternative method is to select cell C2 and use the bottom right corner of the cell to drag down to C5 – this also fills down the equation.]

Set the number of sig figs to be appropriate for this column by using the decimal formatting button to increase or decrease the decimal places.



4. Save and print both data table (sheet 1) and graph (chart 1). Do not print extra copies for classmates—they need to make their own unique graph.

NOTE: You can add borders to your cells using the border button (select "all borders") or print gridlines on your data table by clicking **File**, then **Page Setup**, **Sheet** tab then check **gridlines**. Otherwise, gridlines will not be printed.



Follow-up Questions

Open a Word document and copy paste your Excel graph and data table into it (make sure to resize the graph so it is an appropriate size where the equation and data points can be seen clearly).

Then in the Word document, answer these questions and show your work.

1) Using your graph, estimate the volume for a 4.50-g mass of this unknown metal. (Do this by finding 4.50-g on the y-axis to the best-fit line, then from that point on the line to the x-axis.) What is your estimated value for volume at that mass?

2) Using the equation displayed on your graph, calculate the volume for a 4.50-g mass of the unknown metal. Show your work.

3) What is the correlation factor for the best-fit line shown on your graph? Is this a good correlation and how do you know?

4) Use the table below to identify the metal based on the information obtained from your graph. Explain how you chose the metal's identity and what information from the graph you used.

Substance	Density (g/mL)
Magnesium	1.72
Aluminum	2.70
Titanium	4.50
Iron	7.86
Copper	8.93
Gold	19.32

5) How does your density compare to what it should have been based on the identity of your metal (chosen in the previous question)?

Scientists usually calculate a % error to compare their values with standard values.

% error is the difference between your experimental value and the accepted value divided by the accepted value, multiplied by 100 and expressed as a positive value.

$$\%\,\text{error} = \left|\frac{\text{experimental} - \text{accepted}}{\text{accepted}}\right| \times 100\%$$

To calculate % error for this lab, use your slope as the experimental value and the slope of the known conversion (in the table provided in #4) as the accepted value. Show your work.

Submit your Word file in Canvas by the deadline.