

USING THE EXCEL SPREADSHEET PACKAGE

Chemistry BC3252y

(modified version of handout for BC3338y and 3340y)

There are many ways of performing most of the operations below; these suggestions are designed for a beginner.

Versions: Most PC's on campus, with Windows 2000 or XP, use **Microsoft Excel 2003** or later. The instructions below apply to Excel 2003. If you wish to save a file to use it on a computer with an earlier version of Excel, you must explicitly save the file for that version. It is best not to switch versions during your work. Note that people sometimes alter settings, so the appearance of folders and locations of icons may differ from what is described below.

Before starting Excel, plan where you will save files. If you are in 613 Altschul, create a folder with your name in the "Student Files" folder. Be sure you have a floppy disk or USB jump drive to save you files. Always back-up files to a removable medium at the end of the session: many people use these computers and there no guarantee that files will remain.

Starting Excel. Double-click on the **XL** icon. You should see a blank spreadsheet. Click on the icon (picture) of a floppy disk (third from left on a row of icons). This invokes the **Save As** window. Even though you have done nothing yet, it is a good idea to do this step now. In the **Save in:** box, find and click when you want the file to go. Enter a name for the file (it will automatically get the extension **.xls**) and then press the **Save** button. *Save your file OFTEN.* If you want to try something you are not sure about, first save your file with a different name (i.e. ps3-backup): this way you have a backup version if something bad happens.

Reloading saved files. If you wish to resume working on a saved spreadsheet, use the open file icon (2nd from left) to access the **Open** menu box. Select the correct drive. A list of your files should appear. Select the Excel file (which must end in **.xls**) which you want to use: click on it so it is highlighted and press the **Open** button.

Cell contents and entering information into cells. A spreadsheet is a big table, with entries called "cells". Each cell's position is labeled by its row and column. For example, the 2nd cell in the top row is A2. A cell may contain text, data, or an equation.

Text, typed directly into a cell, is useful to label column headings etc.

Data are numbers that may be used in calculations. Data is also typed directly into a cell.

You can modify the format of any cell, or a column of cells. Highlight the values you want to format and choose **Format** from the main menu bar, then choose **Cells** or **Column** as appropriate. If you choose the **Number** tab and the Number category (below General), then you can adjust the number of decimal places displayed. The other tabs will helpful later in the course for formatting your graphs. Scientific notation may be used, with the letter E indicating the power of ten. For example, Avogadro's number would be written 6.022E23.

Equations take contents of cells, operate on them as indicated in the equation, and put the result into the cell containing the equation. **An Excel equation begins with an equal sign.** For example, if cell B3 contains the number 4, and cell B4 contained the equation "**=B3+5**" then the number 9 would appear in cell B4. If you look at the spreadsheet, you do not see the equations, but rather the results. When you click on a particular cell, the actual equation is seen in the equation box, above the top row of the spreadsheet, and must be edited in the equation box.

Equations may include functions, some quite complicated. These functions can be chosen with the f_x symbol on the menu bar.

Moving around the spreadsheet. You can move to any cell using either the mouse or the gray arrows on the keyboard. Sometimes you may wish to do something to a block of cells. Highlight multiple cells by moving the mouse to the upper left of the block you wish to highlight, clicking and holding down the left mouse key, and then moving the mouse to the lower right of the block and releasing.

Modifying cell entries. You can change cell contents without retyping the entire line. Click on the cell, so that the cell contents appear in the cell contents box above the spreadsheet. Using the mouse, place the cursor in the cell contents box where you want the correction, make the correction, and press the **Enter** key. To delete the contents of a cell or cells, highlight the cell(s) and press the delete key. Delete and backspace do not necessarily function the same way in Excel.

Copying cell contents. The power of a spreadsheet is in doing a calculation many times. To copy the contents of a cell, highlight the cell. There will be a blinking outline, indicating that the contents are to be copied. Click on the copy icon on the menu bar (to the right of the scissors). Move the cursor to the cell where you wish to place the copy, and highlight it. You may copy to many cells at once, by holding the mouse button down as you highlight cells. Click on the paste icon (next to the copy icon). When you copy an equation, Excel automatically adjusts the cell references. For example, if cell B4 is “=B3+5”, and you copy it to cell C4, then C4 will contain “=C3+5”. If you do not want a cell reference to be adjusted, place a dollar sign \$ before the row or column specifier that should not change. For example, suppose you have a constant in cell B1, and you want to add it to the values in column A, starting in A5, putting the results starting in B5. First, type “=A5 +B\$1” in cell B5. Then copy that formula to B6 etc.

When you cut and paste an equation to a new location, the cell references are not adjusted. Therefore moving equations can have unintended consequences if you are not very careful. Whenever you move an equation (cut and paste or copy), always look at the resulting equation and result to double check that the cells to which the equation refers are the ones you want!

Functions. Excel comes with many built in functions. One important example is SQRT. To put in cell D12 the square root of the contents of cell C12, type =SQRT(C12) in cell D12. The argument may be a number, a cell (which contains a number) or an expression. Other mathematical functions include LN(), LOG10(), SIN(), COS() and many more. PI() with *no* argument gives the value of π . These are listed under the f_x symbol on the menu bar. There are also a number of functions that can operate on a range of cells. COUNT(B3:B15) counts the number of cells in the B column between 3 and 15, which contain numbers (blank cells are not counted). SUM(D2:D9) adds the contents of the cells. You can either select the function from the menu or type in the abbreviation.

Getting Help. Click on the small icon with a question mark, or use the Help command on the menu bar: put the mouse on the word help, hold the left button down, and drag the mouse down to select the form of help you want.

Printing the spreadsheet. You can print the active spreadsheet by pressing on the **printer** icon. If you wish to print only part of the spreadsheet or you need to change the part of the spreadsheet being printed, use the page setup command on the drag-down menu under **File**. Please avoid excessive printing: use the **print preview** command under **File** (page with a magnifying glass on it) to see if there is a better way to set up your file before printing.

Graphs One of the most powerful features of spreadsheets is their ability to prepare graphs. Spreadsheet packages come with many kinds of graphs and in Excel these are easily constructed. Some of the instructions below will not make sense initially, but you should refer to them throughout the semester. Once you have data (!) click on the **Chart Wizard** icon (a little bar graph) and follow the series of steps.

Step 1. Chart Type. Always use **XY (Scatter)** plot for plotting data.

Step 2. Chart Source Data. Specify the data by referring to the range of cells (x, then y, separated by a comma), or highlight the cells directly. If your data for the x and y-axes are not in adjacent columns, use the **Series** tab to enter the data independently. The labels for the data that will appear in the legend are also entered with the **Series** tab. You can add additional columns as well and plot more than one set of y values against the same x-axis.

Step 3. Chart Options. The five tabs here are important to be familiar with.

Titles. Here you input the title for your graph and label the axes. All graphs must have a title and labeled axes.

Axes. This box toggles the scales on each axis on and off. All axes must have a scale.

Gridlines. You can add gridlines of different spacing to both the x and y-axes. This is used only when you need to read a value off the graph that you have not plotted explicitly.

Legend. This box is used to add a legend. If you have only one data set, do not include a legend.

Data Labels. If you want the x and/or y coordinates of every point to be printed on the graph, that is done here. You will rarely use this function.

Step 4. Chart Location. You can choose to have your chart (graph) on a separate sheet (page) or as an object in the spreadsheet you are already working with (on the same page as your data).

Once you have a chart (graph), you may get back into any of the steps above and change the settings through the menus. (You can also use **Chart Wizard** if you click on the graph first. Otherwise you will start a new graph.) Click on your graph so that you see 8 black boxes around the outside. Choose the **Chart** menu from above. Note the **Chart** menu is only there when you click on your graph. If you click somewhere else in the spreadsheet, so that your graph does not have the boxes around it, there will be a **Data** menu instead. In the Chart menu, you will see Chart Type, Source Data, Chart Options, and Location.

If you want to completely get rid of a chart, but the not the data, click on the chart and hit **Delete**.

Modifying an existing graph. Not all desired changes can be made through the Chart Wizard. The following commands are also extremely useful.

Format Data Series. Double-click on one point of your graph and you will have many tabs to choose from. Most important are **Pattern** (to change data points into circles, squares, triangles and switch from filled to empty, as well as alter size and color), **X Error Bars**, and **Y Error Bars**.

Format Axis. Double click on one number in the scale of an axis. Here you will see tabs for **Patterns** (tick marks etc.), **Scale** (changes the size of the divisions on each axis), **Font** (changes the size of axis labels and font) **Number** (for using scientific notation or changing the number of decimal places) and **Alignment** (make the axis labels vertical or horizontal).

To change the formatting of *one* character in an axis label, single click on that label, and highlight the character you wish to change. Then select the **Format** menu and the **Selected Axis Title**. This is useful for ^{superscripts} and _{subscripts}, inserting the degree symbol ($^{\circ}$) and using Greek letters (μ , ν , θ) which are in the **Symbol** font.

Least squares fitting. If you need a slope and intercept only, use the handy trendline function. If you need to know the uncertainties of m and b , use Excel's `Linest()` function. A separate sheet gives some pointers on using this.

Don't Panic! What happens if you do something very wrong? Don't worry. The best preventative medicine is *frequent backups*. Save as often as you have time to do your work over. If you can spare one hour to do it over, save every hour. If you can spare five minutes, save every five minutes.

Sometimes you inadvertently press one key that makes a mess of your work. This will almost never do any permanent damage. First try the **undo typing** button, (a curly blue arrow pointing backwards or **Ctrl-z**). If that fails, exit from Excel, **not saving** your work, and then start over from the file as you saved it most recently. However, if you do not want to lose work, it is essential to save your work frequently. For example, after you enter a large set of data, before making a graph **save the file**. Then if something goes very wrong, you can recover the data. On occasion everything stops and nothing seems to work, or the system seems to be spending forever doing something unknown. At this point, you can reboot the computer. Remove your floppy, disk first.

The fastest way to learn is to try things out. Working in a computer lab (like 613 Altschul) is useful, since people around you are often very helpful (or at least sympathetic) when you have a problem. If you are like most people, you will find yourself using Excel more and more, so the time spent learning how to use it is an excellent investment.