

Microsoft Excel in Scientific Applications I

Introduction

Computers and computer-based instrumentation are used in upper division science courses, as well as in professional laboratories. During this course you will become familiar with the use of computers in a laboratory environment. The analysis and reporting of experimental data is an important aspect of working in a scientific laboratory. In order to display and graph collected data, scientists often rely on computer applications called spreadsheets. To be prepared to work in any college or professional laboratory, you must be familiar with spreadsheets and other computer-based methods of data collection and analysis.

Learner Outcomes

Upon completion of this laboratory activity, the student should be able to

- demonstrate basic computer survival skills
 - opening, closing, printing, and saving files
 - copying, cutting, and pasting text and/or cells
 - formatting text and/or cells
- enter formulas and perform calculations using *Microsoft Excel*
- perform statistical analyses of data using *Microsoft Excel*
- prepare and display different types of graphs of data

Assignment

This is not a typical chemistry lab with reactions to investigate and discuss. Therefore, the format for this lab will be different than for the others. Instead of having the typical components of title, experimental design, results, and so on, you will follow the format described below and submit the file to your instructor.

REMINDER: Save your data early and often in order to avoid the accidental loss of your work. Use the following convention for naming your files: “**Lastname Firstname Spreadsheet1**” (include both names if you are working in pairs), saving to the H: drive and/or your own flash drive. (Note: Please inform your professor if you encounter any problems saving your files.) This lab may be done totally paperless, so follow directions carefully. The spreadsheet you will be creating will be submitted electronically.

1. Enter the data in Columns A and B from **Figure 1** onto *Sheet 1* of an *Excel* spreadsheet. Center the values in the columns. Then perform the following operations on *each row* of data.
 - In Column C, use a formula to add the value in Column A to the value in Column B.
 - In Column D, use a formula to subtract the value in Column B from the value in Column A.
 - In Column E, use a formula to multiply the value in Column A by 5 and divide the product by the value in Column B. Adjust the decimal place so that each answer in Column E has two places after the decimal.
 - In Column F, use a formula that finds the base-10 logarithm of the value in Column A. Adjust the decimal in each answer to three places after the decimal.

- In Column G, use a formula to calculate the cube of the value in Column B. Express each answer in scientific notation, using two places after the decimal.
 - Label each of the columns.
 - From the **Insert** tab, insert a header and footer. Put your name, your partner's name, course number, and lab section in the header, and the professor's name and the date in the footer. Save your file.
2. On *Sheet 2* of the same file, design a spreadsheet that would be used to determine the grades of nine students on five quizzes.
- Place the names of nine students into separate rows and assign grades by entering the scores obtained on five different 10-point quizzes into columns.
 - Make a column that calculates the sum of the quiz scores for each student.
 - Make a row below the students' names that show the points possible on each quiz.
 - Make five rows below the rest of the rows that use statistical functions to **calculate** the highest score, median score, lowest score, average score, and standard deviation on each quiz. Adjust the decimal place for the average score and standard deviation to one place after the decimal.
 - Columns and rows requiring labels should be properly labeled.
 - Save the file.
3. Enter the data in Columns A and B from **Figure 2** onto *Sheet 3* of the same file.
- In Column C, enter a formula to calculate a base-10 logarithm for each of the values in Column B.
 - In Column D, enter a formula to calculate the reciprocal of the values in Column B.
 - In your spreadsheet, go to **Page Layout** tab → **Orientation** and select Landscape.
 - Prepare three graphs – Plotting $[\text{NO}_2]$ vs. Time on Graph 1, $\log [\text{NO}_2]$ vs. Time on Graph 2, and $1/[\text{NO}_2]$ vs. Time on Graph 3. Remember to title each graph and label each of the axes. Each of your graphs should display gridlines on both the X- and Y-axes and should *not* have a legend.
 - Adjust the location and size of the graphs to be as large as possible, such that the data and the three graphs together fill an entire page (see *Figure 3*).
 - Place your name, course number, lab section, professor's name, and date underneath your data table. Once again, save your file. If printed, your output should look identical to that in **Figure 3**, covering a full page in the landscape mode. Identical means that all values should have the same number of significant figures, all graphs should have the same maximum, minimum, and spacing on each axis, same title, gridlines, etc. (*Help save paper: Don't actually print your document; use the "Print Preview" feature instead.*)
4. Submit your Excel file **as directed by your instructor**. If your instructor asks you to email your file, use your ARCC-assigned email account to email the file as an attachment to your professor. Remember to name the file as specified at the beginning of Assignment section (*Lastname Firstname Spreadsheet1*). In the subject line of your email message, type "Chem 1061 Lab: Spreadsheet Lab 1". Alternatively, your instructor may ask you to submit your file in the D2L dropbox.

X	Y
126	37
328	67
297	62
423	84
588	98
484	72

Figure 1

Time	[NO ₂]
(s)	(mol/L)
0	1.00E-02
60	6.83E-03
120	5.18E-03
180	4.18E-03
240	3.50E-03
300	3.01E-03
360	2.64E-03

Figure 2

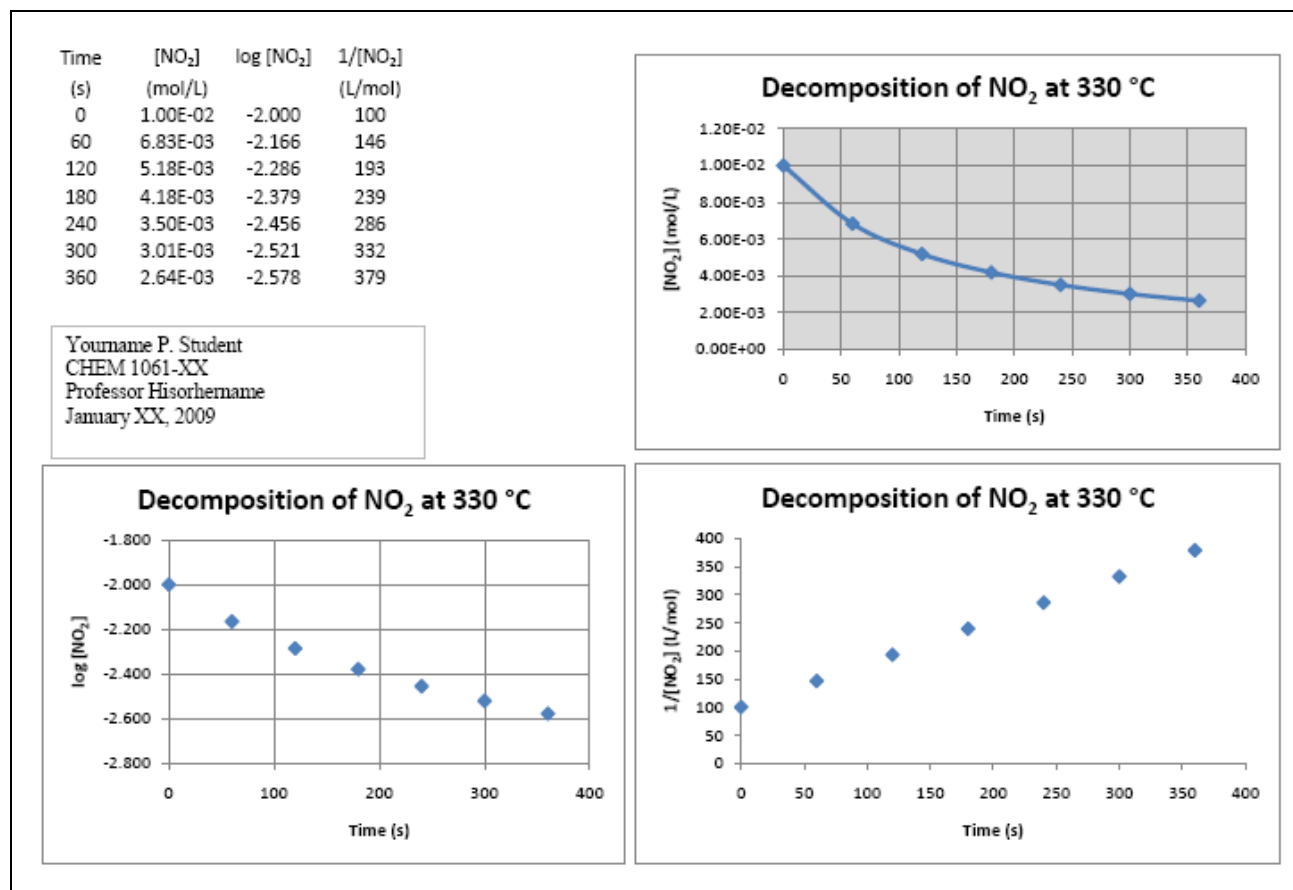


Figure 3

Appendix 1: Common Excel Functions

Operation	Example(s) of Function Format
Addition	=A1+A2
Subtraction	=A1-A2
Multiplication	=A1*A2
Division	=A1/A2
Powers (x^2 , $\sqrt[3]{x}$, etc)	=A1^2 =A1^(1/3)
Log	=log(A1)
Natural Log	=ln(A1)
Powers of 10	=10^(A1)
$e^{(\text{value in cell A1})}$	=exp(A1)
π	=pi()
Absolute value	=abs(A1)
Sum of values	=sum(A1:A3) =sum(A1,A3,A5)
Average of values	=average(A1:A3)
Median of values	=median(A1:A3)
Lowest value in range of cells	=min(A1:A3)
Highest value in range of cells	=max(A1:A3)
Standard deviation of values	=stdev(A1:A3)
Count the number of cells with values	=count(A1:A3)
To make cell coordinates absolute (do not change if copy/paste or drag formulas), add dollar signs	=\$A\$4*B2