CHEM 113L #1: Lab Exercises on Introductory Topics

Part I. Data Analysis Practice in Microsoft Excel (revised 6/2005)

Introduction:

Scientist are responsible for carefully reporting data and graphs. This guided exercise is intended to help you use a few of EXCEL's features. Please turn in the two **Problems** for a Grade.

Using various statistics functions in EXCEL are listed below:

Functions:	Entered as:
Average value	=AVERAGE(A1:A10)
Sample standard deviation	=STDEV(A1:A10)
Number of items	=COUNT(A1:A10)
Middle value	=MEDIAN(A1:A10)
Most frequent value	=MODE(A1:A10)

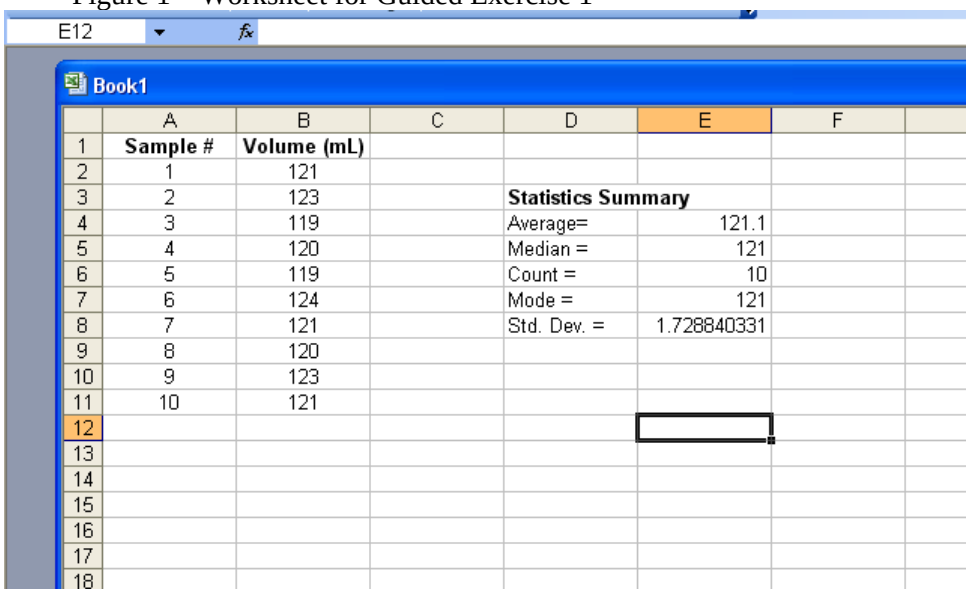
in each case the (A1:A10) indicates your data is in column A in rows 1 through 10

Guided Exercise 1:

a. Open a New Excel worksheet.
b. Entitle column A in Cell A1 – Sample #
c. Entitle column B in Cell B1 – Volume (mL)
d. Place the numbers 1 through 10 in Cells A2 through A11.
e. Place the **Ten** volume measurements (in mL): 121, 123, 119, 120, 119, 124, 121, 120, 123, 121 in Cells B2 through B11.
f. Place the phrase "Statistics Summary" in Cell D3
g. Place the words "Average=, Median = , Count=,. Mode = and Std. Dev.=" in Cells D4 through D8. Then place the corresponding formulas for the Words in Column E.
Example: D4 should contain = Average(B2:B11).

The completed sheet should look like the Figure below. See if you can adjust your column widths, centering, and bold text to match the figure. Note the numbers are reported to an arbitrary number of decimal places chosen by the computer. In appropriate significant figures, the **average** would most likely be reported as 121 with a **standard deviation** of +/- 2.

Figure 1 – Worksheet for Guided Exercise 1



	A	B	C	D	E	F
1	**Sample #**	**Volume (mL)**				
2	1	121				
3	2	123		**Statistics Summary**		
4	3	119		Average=	121.1	
5	4	120		Median =	121	
6	5	119		Count =	10	
7	6	124		Mode =	121	
8	7	121		Std. Dev. =	1.728840331	
9	8	120				
10	9	123				
11	10	121				
12						
13						
14						
15						
16						
17						
18						

Problem 1

Now use your newly constructed statistics page to analyze the following volumes (mL):

8.48, 9.01, 8.85, 8.65, 8.50, 8.72, 8.69, 8.85

Note this may simply be done by "Clearing" data in cells B2 through B11. Note also how the average, median, etc. changes as you key in the data.

Print a copy of your results to turn into your instructor.

Plotting and Fitting Linear Data using the Chart Wizard

Guided Exercise 2:

a. Create a New document or move to a new Sheet within the open one.
b. Enter the following two columns of data in colums A (x data) and B (y-data).

Concentration (M)	Absorbance (unitless)
0.00250	0.302
0.00500	0.600
0.00750	0.951
0.01000	1.211
0.01250	1.530
0.01500	1.893

c. Plot the data using the **chart wizard** with Absorbance on the y-axis and Concentration on the x-axis. (Select scatter plot. and go through the steps)*
d. When you have a plot, preferably on its own page, **right click** on one of the data points. This will bring up curve fitting.
e. Fit to a linear regression by using the "Insert" Menu, selecting Trendline.*
f. From the Options Tab, select Display equation for the on chart and the correlation coefficient (R^2 = goodness of it)

*Screenshots on next page.

Problem 2

Now use your newly constructed page to analyze the following data:

Concentration (M)	Absorbance (unitless)
0.00150	0.212
0.00300	0.428
0.00450	0.636
0.00600	0.800
0.00750	1.050
0.00900	1.260

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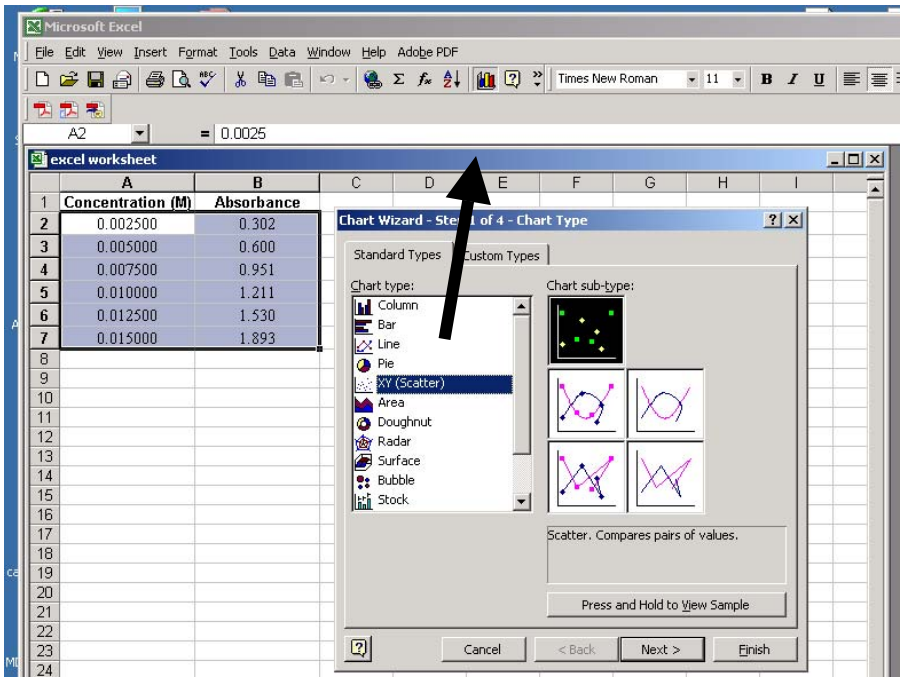
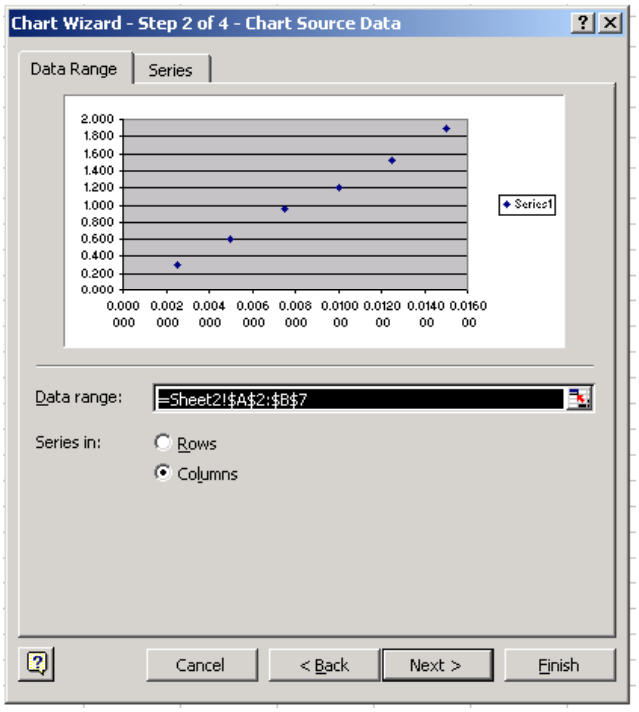
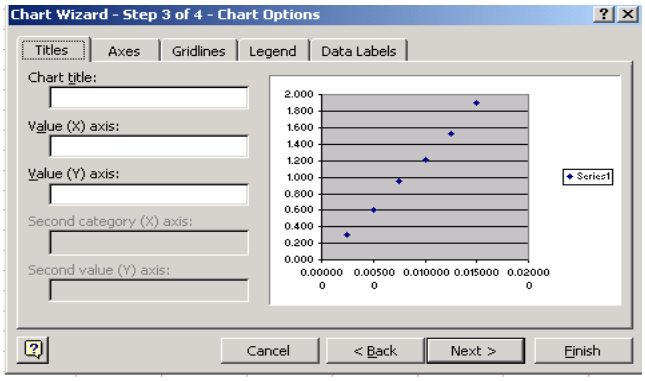
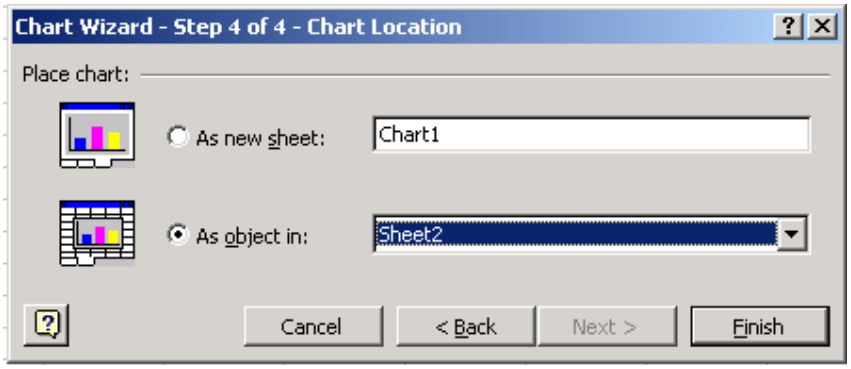
Print a copy of your results to turn into your instructor.
Title the graph = Problem 2 – Your Name
Label the graph axes.
Show equation and R^2 on graph.

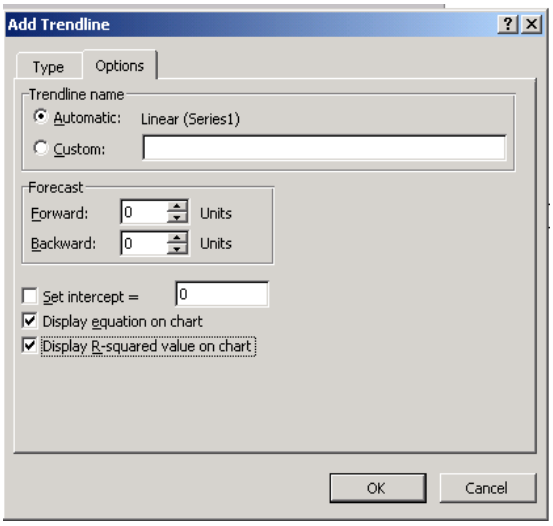
Screenshots of the Chart wizard and Associated Graph

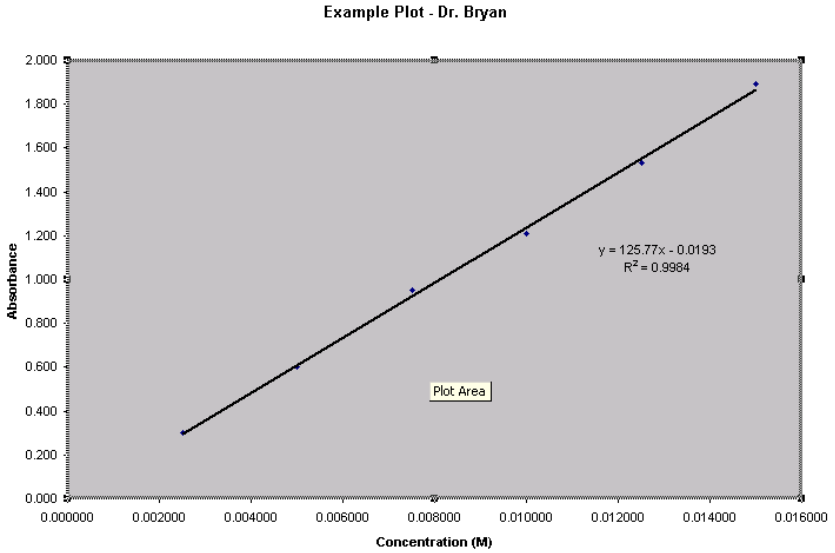












Part II. Exercises on Concentration Units (revised 6/2005)

Introduction:

Perhaps the most important lab techniques to learn, in any area of science, are careful weighing and careful solution preparation.

Solutions can be prepared to have gravimetric units (by mass, mole) or volumetric units (by volume). Gravimetric units are unaffected by temperature changes, while Volumetric units can vary measurably outside of a +/- 5 ºC range of temperature.

Volumetric unit and measurements are

molarity , density, and sometimes ppm and ppb.

Careful measurements of volume can be made with pipets, burets, and volumetric flasks.

Gravimetic units and measurements are

%(w/w), molality, mole fraction, and sometimes ppm and ppb.

Careful measurements of mass can be made with analytical balances (+/- 0.1 mg accuracy).

Dilution is used to take a Stock Solution (concentrated standard) and make it less concentrated.

Dilution equation: $M_1V_1 = M_2V_2$

Labeling solutions.

Most dilute aqueous solutions look the same. Memory can be very bad in this particular case . . . so good labeling is very important. Good labels list solute, solvent, concentration, preparer, and date!

Example:

0.133 M
NaCl (aq)
6/0/05 AMB

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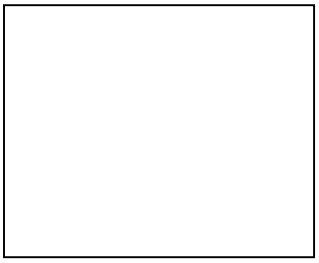
For each of the following problems on the next page:

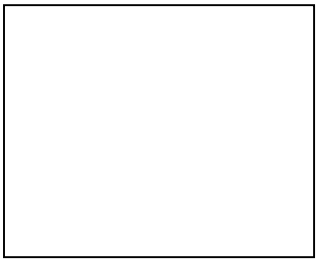
1. Show all work.
2. Show units
3. Draw a label showing the information for the final solution
4. Attach extra paper to show work.

Problem 1.
Calculate the mass of sucrose needed to make 100mL of of 0.525 M $C_{12}H_{22}O_{11}$. (aq)

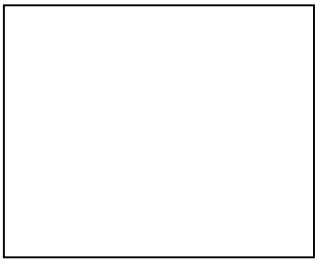
Describe how you would prepare it. Draw the label in the box.



Problem 2
Describe the preparation of 250 mL of 0.0525 M $C_{12}H_{22}O_{11}$. (aq) from the solution in Problem 1.



Problem 3
Calculate the mass of compound needed to make of 100 mL of a solution which is 0.250 M Al^{3+} using $Al_2(SO_4)_3$. $18H_2O$(s) as solute.



Problem 4
Describe the preparation of 250 g of 10.0%(w/w) NaOH (aq). What is the molality of this solution?