P Chem Problem Set
Chem 361lab
Robertson

1. The following student values were obtained in a high school laboratory for the acceleration due to gravity experiment. All numbers are in units of cm per sec^2. (These are the crude data; disregard differences in the number of significant figures)

996.9	986.96	1095	986.96
740	987.0	987.0	947.67
986.96	764.3	785.8	986.96
1122.94	1279	918.67	921.33
921.33	1095	1245.9	1178.8

Determine the best value the class could report for the acceleration due to gravity. Keep all data points.

2. A class of 9 students determined the percentage of aluminum in an Al-Zn alloy. The results are as follows: 60., 62, 39, 64, 58, 56, 61, 69, and 62. What is the best value which can be reported? Check to see if any points can be discarded.

3. A student measures the following gaseous variables:

Pressure	748 mm Hg
Volume	1.78 liters
Temperature	290. K

Assume the scale error of each measurement is 1 in the last significant figure. Calculate the best value of the number of moles of gas (n) from the ideal gas law equation. The best value will be the result $\pm$ the propagated error. Assume the error in R is negligible.

4. From the data given below plot and find the best straight line fit for the data by linear regression. Predict using your equation what the demand would have been in 2005. What was the actual figure for 2005? See http://tonto.eia.doe.gov/dnav/pet/pet_cons_psup_dc_nus_mbbl_a.htm . Be careful with the units.

Motor Fuel demand (millions of barrels of gasoline)	Year
696	1945
994	1950
1330	1955
1512	1960
1750	1965
2162	1970
2243	1971
2382	1972
2484	1973

5. The following are data from one of my research students who was trying to determine the lead concentration in soil samples. She extracted the lead from the soil and analyzed the solution on the Atomic Absorption Spectrometer. This was her calibration graph for her analysis using known lead solutions.

Standard (ppm)	Absorbance
4.00	0.078
10.00	0.188
20.00	0.362
40.00	0.650
50.00	0.757

a) Curve fit this data using *Graphical Analysis, Excel* or another curve fitting program and find the equation for the best curve. For this exercise plot absorbance on the x axis and concentration (ppm) on the y axis. Print out the graph and the best fit equation.

b) Use this equation and set up a spreadsheet in *Excel* (or similar program) and find the lead concentrations for various soil depths on Wilma Rudolph Blvd. This is actual data. Print out the spreadsheet.

Depth of soil (inches) on WRB	Absorbance	Concentration (ppm)
0	.534	
6	.274	
12	.055	
18	.036	

c) Next use this data to graph and curve fit lead concentration (dependent axis) versus depth of soil sample (independent axis). Print out the graph and best fit equation for a model that might be extended past 18 inches.