Concentrations and Dilution's

Lab Activity

1. Using the materials provided, mix 20 ml of a 1-% (m / v) NaCl solution.

2. Dilute the entire solution to 200 ml at 500 ppm. Measure and record the 500ppm solution's conductivity.

3. Use the 500 ppm solution to mix 50 ml of each of the following solutions. Use the following table as a guide and be sure to double-check your calculations.

Dilute concentration (ppm)	Volume (ml)	Stock concentration (ppm)	Volume of stock solution (ml)	Total solution volume (ml)
400	50	500		
300	50	500		
200	50	500		
100	50	500		

4. Make a prediction about the conductivity of each of the solutions relative to the original 500 ppm.

5. Sketch a graph showing your prediction by plotting conductivity vs. concentration.

-- Set up the CBL with a conductivity probe as a conductivity meter. --

6. Prepare the conductivity probe for data collection.
   - Plug the conductivity probe into the adapter cable in Channel 1 of the CBL.
   - Set the switch on the 0-20,000 µS position.
   - Connect the CBL System to the TI Graphing Calculator with the link cable using the port on the bottom edge of each unit. Firmly press in the cable ends.

7. Turn on the CBL unit and the calculator. Press [PRGM] and select CHEMBIO. Press [ENTER], then press [ENTER] again to go to the MAIN MENU.

8. Set up the calculator and CBL for a conductivity probe and a calibration of 0 to 20,000 µS .
   - Select SET UP PROBES from the MAIN MENU.
   - Enter "1" as the number of probes.
   - Select CONDUCTIVITY from the SELECT PROBE menu.
   - Enter "1" as the channel number.
   - Select USE STORED from the CALIBRATION menu.
   - Select H 0-20000 MICS from the CONDUCTIVITY menu.

9. Set up the calculator and CBL for data collection.
   - Select COLLECT DATA from the MAIN MENU.
   - Select MONITOR INPUT from the DATA COLLECTION menu.
   - The conductivity reading (in µS) is displayed on the screen of the calculator. No readings are stored when using the MONITOR INPUT mode.

10. Measure the conductivity for each of the solutions.
    - Raise the beaker until the hole in the probe end is completely submerged and swirl the solution briefly.
    - Once the reading has stabilized, record the conductivity value (round to the nearest 1 µS).
    - Before testing the next solution, clean the probe by surrounding it with a 250-mL beaker and rinsing it with distilled water from a wash bottle. Carefully blot the outside of the probe end dry using a tissue. It is *not* necessary to dry the *inside* of the probe.

11. When you have finished collecting data, press [+] to quit MONITOR INPUT and select **Quit** from the MAIN MENU.

Construct a scatter graph plotting conductivity vs. concentration.

12. Describe the mathematical relationship.

13. How was your original prediction validated or refuted?

14. Calculate a linear regression for the data and record the equation information.

15. Add the equation line to the graph and sketch the graph.

DIRECTIONS FOR TI-82/83

[Y=] Clear all equations
[STAT] EDIT
L1=conductivity (uS)
L2=concentration (ppm)
[2nd] [Y=]
Plots Off
[ENTER]
[2nd] [Y=]
Plot1
ON
Xlist=L2 Ylist=L1 Mark: +
[ZOOM]
ZoomStat
[STAT] CALC LinReg(ax+b)L2,L1
ENTER
[Y=] Y1
[VARS] Statistics EQ RegEQ
[GRAPH]

Findings

1. Would you predict a difference in conductivity between a 500 ppm NaCl solution and a 500 ppm $AlCl_3$ solution? Explain. How about a 500 ppm KCl solution?

2. Would it be theoretically possible to distinguish between a 500 ppm KCl solution and a 500 ppm NaCl based upon conductivity? Explain.

3. Write a brief conclusion describing how a solutions conductivity is related to dissociation and concentration.