Student's Note

2006/6/14

1. In your idea, why did your collected water samples give heavier drop than pure water (review of the previous lesson)?

2. What is the appropriate method that can be used to determine the amount of dissolved salts in water sample?

3. What is a conductivity of aqueous solution?

4. Why does solution have ability to conduct electrical current?

5. List one or two environmental analysis that uses conductivity method.

Identification of Solution by Conductivity

You are given three solutions that are **pure water, salt solution and vinegar solution**, labeled A, B and C respectively. Measure conductivity of each solution and tell which solution is pure water, which is salt solution and which is vinegar solution?

Solution	Conductivity/mA	Identification
A		
B		
C		

Give the reasons of your identification.

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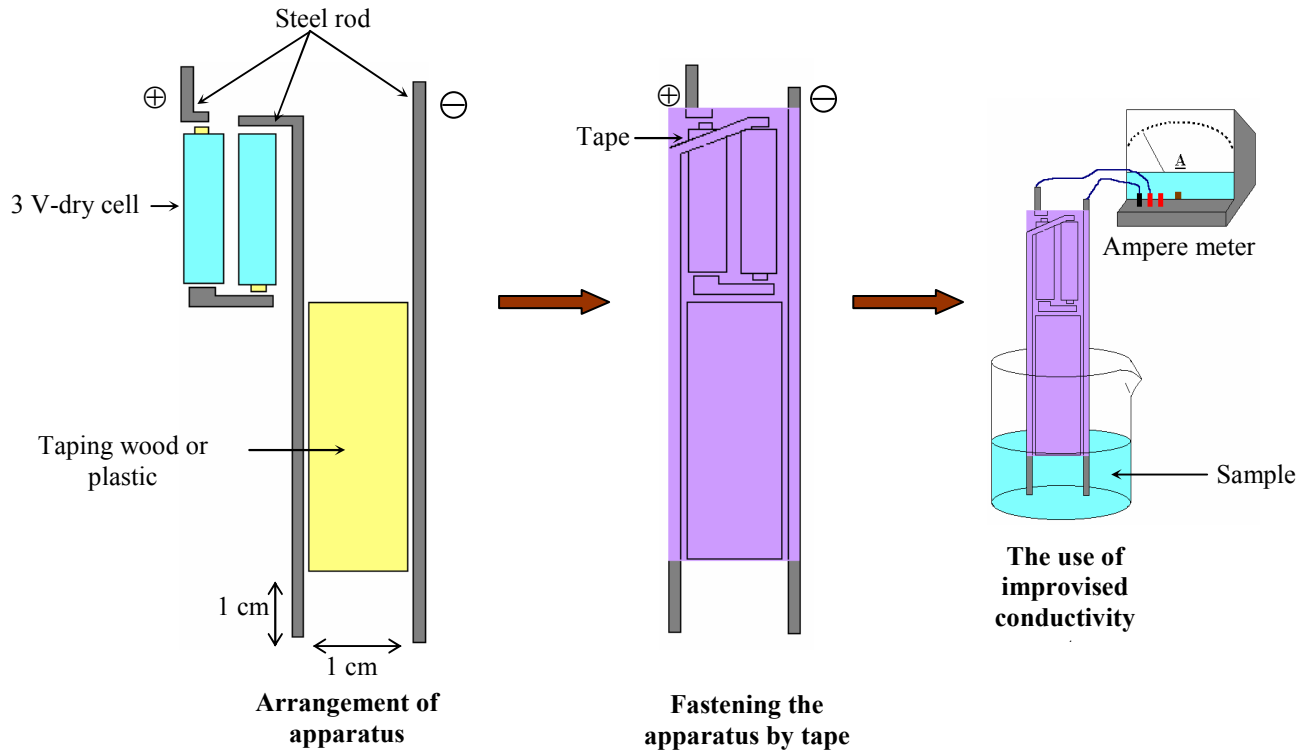
Diagram of making an improvised conductivity meter



Determination of Salinity in Sample by Conductivity Method

Materials

An ampere meter, an improvised conductivity meter, Salt standard solution with concentrations of NaCl: 0% (pure water), 0.25%, 0.5%, 1%, 1.5% and 2% respectively which already prepared in separated beakers and unknown sample.

Procedure

A. Calibration

(1). Connect an improvised conductivity meter with an ampere meter correctly.

(2). Measure the electric electrical current (mA) flows through pure water and each salt standard solution, and record into Table 1.

B. Determination of unknown sample

(3). Measure the electric electrical current flows through unknown sample and record into Table 2.

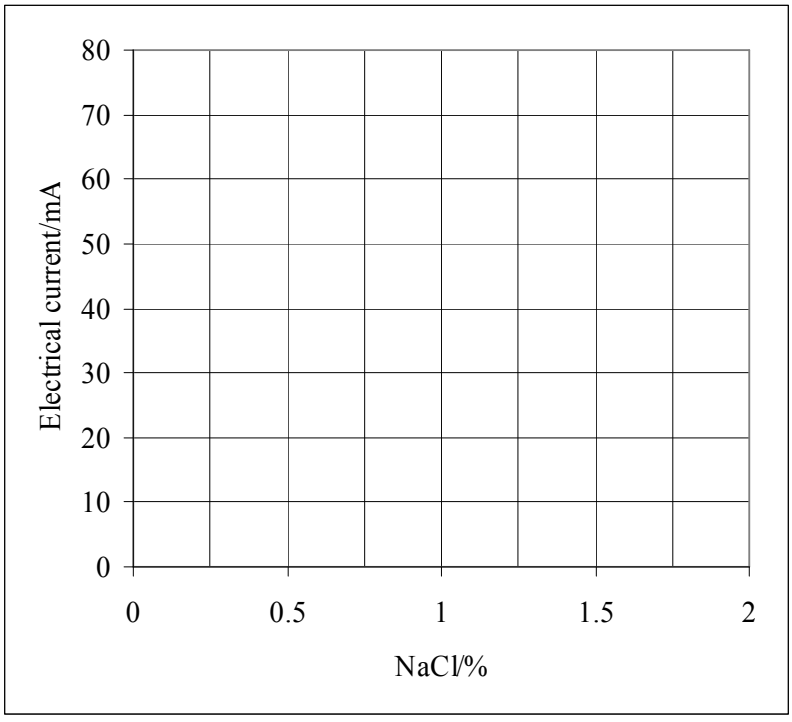
Result and discussion

Table 1

NaCl/%	Current /mA
0 (water)	
0.25	
0.5	
1	
1.5	
2	

Table 2

	Current /mA
Unknown sample	



1. By using the results in Table 1, plot calibration line on the above graph.
2. By using the calibration line and the result in Table 2, determine the amount of salt (%) in the unknown sample.

Salt amount in unknown sample = _____ %

Application of Conductivity in Environment

Conductivity and Water Quality

The quality of irrigation water is one of the most critical factors influencing our growing operation. It is important to have a complete water analysis performed on a regular basis. Environmental conditions such as drought, changing seasons, heavy rainfall, etc. can cause the concentration of dissolved salts in your water to vary significantly. These dissolved salts (i.e. sodium, calcium, iron, etc.) can directly affect your plants health and over time, they render even the best soil useless.

You can monitor your overall water quality by testing its electrical conductivity. The higher the conductivity, the more salts are dissolved in your water. By comparing your conductivity reading you can tell if any dramatic changes have occurred. Nutrient deficiencies are also possible when water is too pure or low conductivity.

Conductivity and Soil Salinity

Salt from irrigation water and fertilizers tend to accumulate in your soil or growing media. High soil salinity disrupts the normal osmotic balance in plant roots. In severe cases a plant will become dehydrated even when the soil is wet. Symptoms of high soil salinity include: leaf chlorosis and necrosis, leaf drop, root death, wilting, etc. Sampling your soil and testing the conductivity of an extract can reveal important information about a soil's suitability and your crop's health. Samples of soil should be representative of different depths and locations.

Conductivity and Fertilizer Concentration

You know how important fertilizer is to your plants, but do you know how accurate your fertilizer dosage is? Relying on traditional proportional methods is risky to plants and can waste expensive fertilizer. Improperly mixed fertilizer can lead to less than optimal results or even a disastrous loss of crops. Many fertilizer companies now recommend using a simple conductivity test to verify correct fertilizer concentrations. Fertilizer companies and suppliers often can provide a chart relating conductivity to concentrations of their various fertilizers.

Assignment Task

Groups of students are devised to conduct a research project to determine the approximate amount of dissolved salt (salinity) in water sample and soil sample. Each group of students will do presentation of research results in the next coming lesson.

<u>Students in groups 1 to 5</u>: Water Quality / Determination of salinity in water sample

Procedure and method

1. Collect water samples from three different places.
2. Measure the electrical current flows in each sample.
3. By using your group calibration line, determine the amount of salt consists in each sample.

Research data

Sample name/place/river/lake…	Electrical Current/mA	Amount of salt/%

<u>Students in groups 6 to 10</u>: Soil Salinity / Determination of salinity in soil sample

Procedure and method

1. Collect soil samples from three different places.
2. Dissolve 10 g of each soil sample into 100 mL pure water in a 200 mL beaker. Mix the soil solution well.
3. Let settle and decant the soil solution into a separate beaker.
4. Measure the electrical current flows in each soil solution.
5. By using your group calibration line, determine the amount of salt (C_1/%) consists in each soil solution.
6. Calculate the amount of salt (C_2/%) consists in each soil sample.

$$C_2 = C_1 \times 10$$

Research data

Sample name/place	Electrical Current/mA	Salt in soil solution (C_1) /%	Salt in soil sample (C_2)/%

Group Report for Presentation

(Sample)

Date:……*2007*……/……*7*……/……*1*…….

Group Number…….

Group members' names:……..

In our group, we have been assigned to conduct a research dealing with water quality to determine the amount of dissolved salt in water sample by conductivity method. In our research, we examined the electrical current flows in each water sample collected from three different places. By comparing the results to the calibration line constructed by our group, the amount of dissolved salt in each water sample is showed as following table:

Sample name/place/river/lake…	Electrical current/mA	Amount of salt/%
A	10	0.25
B	3	0.025
C	20	0.5

(*You can use the same result table in the assignment task*)

Discussion

As seen in the result table, Sample C has highest concentration of dissolved salt following by Sample A and B respectively. It is a clear evidence that Sample C that collected from a river near to the city is more polluted than Sample A and B. It must to say that there are a lot of wastes dump in Sample C. Contrarily, Sample B that we collected from a river close to mountainside is clearest water among the three since there is only very small amount of salt dissolved in it.

Command

We should pay attention on water pollution in the city, because there are many people living in the city and it might affect to not only people health but also ecosystem in water. We should not drop any waste into water.