

Lesson Plan

Determination of Salinity in Sample by Conductivity Method

Date: 24th June, 2006

2nd Grade of Amaki Super Science High School

Subject: “Environmental Chemistry in English”

Duration: 180 min (3^h)

Objective:

- To provide students the concept on conductivity of aqueous solutions
- To expose students the application of an environmental analysis on salinity and the application of conductimetric titration of HCl(aq) by NaOH(aq) by conductivity method.

Lesson Development:

Time	Key Contents	Teacher’s activity	Students’ activity
10 min	Pre-test	Provide pre-tests to students.	Fill up pre-tests
20 min	Review of previous lesson on water drop method:	Do you remember that in the last year lesson you used water drop method to determine water surface tension? You measured drop weights and drop sizes of water and then you could identify the strength of surface tension, i.e., the large size of drops shows the strong surface tension. Furthermore, you examined the tensions of several water surfaces for actual environmental water. You tried to weigh water drops of several	Recognize what they have learned in previous lesson.

	<p>samples that you collected by each group.</p> <p>☞ Show students' results of this research</p> <p>As you can see your results, several samples give heavy drops even heavier than pure water. We supposed that pure water would give heavier drops than your collected samples, because we thought that pure water has stronger surface tensions in which it can contribute bigger drops.</p> <p>Q1: In your idea, why did your collected water samples give heavier drop than pure water?</p> <p>One main reason is that your samples might have dissolved salts in it that could make sample drops heavier. Here, I show you how drops change when NaCl dissolves in water.</p> <p>☞ Show a graph of water drop sizes versus NaCl concentration: <i>NaCl can increase surface tension</i></p> <p>As you see, water drop sizes are larger when the amount of dissolved NaCl increases. Therefore, it is clear to say that there are dissolved salt in your samples. We need to determine this dissolved salt amount.</p> <p>Q2: What is the appropriate determination method in this case?</p>	<p>Discuss in group and give suggestions.</p> <p>Suggest some methods</p>
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20 min	<p>Introduction of conductivity method</p> <p>Electrical conductivity is the measurement of a material's ability to conduct an electrical current. Absolutely pure water is actually a poor electrical conductor. However, conductivity increases when salts dissolved in the water.</p> <p>The dissolved salts contribute a present of ions in water. An ion is an atom of an element that has negative or positive charge. For example, sodium chloride salt (NaCl) in water it breaks apart in an aqueous solution that consists of Na^+ (aq) and Cl^- (aq) ions in water. This solution will conduct an electrical current because the presented ions in the solution help to carry an electrical current. Pure water has very poor conductivity since it has no other supplemented ions except a very few OH^- and H_3O^+ ions.</p>	<p>We will use conductivity method to determine the amount of dissolved salts, salinity in another word, in sample water.</p> <p>Q3: What is a conductivity of aqueous solution? I am going to give you a demonstration of conductivity, and then I want you to think what conductivity means.</p> <p>☞ Demonstration: Observation a light bulb</p> <ol style="list-style-type: none"> ① Conductivity of pure water ② Add small amount of NaCl salt into pure water and observe light bulb again. ③ Add more amount of NaCl salt, and observe light bulb again. <p>As you have seen, the light bulb was brighter when more salt contained in water. This means the aqueous solution of NaCl can conduct electrical current. Therefore, the ability of aqueous solution to conduct electrical current is called “conductivity” of that aqueous solution.</p> <p>Here, you will measure the conductivity ability of solution by using an improvised conductivity meter that already distributed in front of you.</p> <p>☞ Teach how to make and how to use the</p>	Observe the demonstration
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	<p>-Pure water has no conductivity</p> <p>-Vinegar ($\text{CH}_3\text{COOH}(\text{aq})$) has low conductivity due to it presents partly as CH_3COO^- and H^+ ions in aqueous solution.</p> <p>-$\text{NaCl}(\text{aq})$ has high conductivity due to it presents completely as Na^+ and Cl^- ions in aqueous solution.</p>	<p>improved conductivity meter.</p> <p>You are going to test your improved conductivity meter by measuring the flow of electrical current through solution of vinegar, salt and pure water label A, B and C respectively.</p> <ul style="list-style-type: none"> ☞ Using students' worksheet to explain activity procedures. ☞ Facilitate students' activity <p>According to the amount of current flow, can you say which solution is vinegar, salt or pure water?</p> <p>Q4: Why does aqueous solution have ability to conduct electrical current?</p>	<p>Conduct experiment and identify solution of vinegar, salt and pure water by conductivity.</p> <p>Discuss in group and give answer</p>
10 min	Break		
45 min		<p>Next, you are going to learn how to determine salinity in water sample.</p> <ul style="list-style-type: none"> ☞ Using students' worksheet, explain the procedures of experiment. ☞ Facilitate students' activity 	<p>Conduct experiment by group and record experimental results in worksheets.</p>

	Students' presentation	☞ Ask some groups of students to present their experimental results. ☞ Facilitate students' presentations	Do presentation by each group.
5 min		☞ Give and explain students the assignment task (Homework): <i>Examination of water and soil salinity in actual environment, and how to conduct research for the assignment.</i>	
10 min	Break		
45 min	Conductimetric titration of HCl(aq) by NaOH(aq).	In continue and the last activity for today lesson, I want you to investigate a neutralization reaction between HCl(aq) and NaOH(aq) by using conductivity method. ☞ Using students' worksheet, explain the procedures of experiment. ☞ Facilitate students' activity	Conduct experiment and fill in the worksheet
	Students' presentation	☞ Ask each group of students to present their experimental results. ☞ Facilitate students' presentations	Do presentation by each group.
5 min	Final remark for today lesson	Conclude what students learned for today lesson	