Lesson Plan

Determination of Water Surface Tension

Lesson 2, Date: 13th October, 2005

1st Grade of Amaki Super Science High School

"Environmental Chemistry in English"

Duration: 50 nm

Objective: - To give the definition of *surface tension of water*

- To realize the effect of detergent on surface tension of water in the daily life

Time	Key Contents	Teacher's activity	Students' activity
5 mn	Surface tension of water can be measured by weighing water drops. Within same number of water sample drops, it will give different weights if those water samples have different surface tension. The one has higher surface tension, the one give higher weight of drops. Another way to say is that the size of water drops becomes bigger. Detergent can decrease the surface tension of water. In this case, the weight (or the size) of water drops becomes smaller if detergent presented in water sample.	**Revision the previous lesson** In the previous lesson you learnt how water important? Moreover, you observed one properties of water that is the surface tension of water. In the observation, you tried to weight water drops and you weighed 10 drops of each sample which presented different concentration of detergent. - Show the result of experiment on previous lesson.	

		Can you interpret your graph result? - Use word cards to facilitate students' answer: When the amount of detergent increases, the weight (size) of water drop: 1. increases 2. decreases 3. no changes	Interpret their graph result.
5 mn	"ppm" means **p**art **p**er **m**illion $ppm = \frac{1}{1{,}000{,}000}$ *or* $ppm \approx mg / L$	In the experiment, we express the amount of detergent in "ppm". **What does "ppm" concentration means?** - Explain the meaning of ppm *Example:* If you drop one drop of detergent which equals about 0.02 g into 1 L of water, How much the concentration of detergent in "ppm" would be?	Discuss in group to solve the problem
5 mn		According to your result, the weight (or size) of water drops decreases while the detergent concentration increases. Can you explain why?	Discuss in group and answer

10 mn	**What is *surface tension of water*?** -Surface tension of water is caused by "cohesion" which is the force that causes water molecules to be attracted from one to another. Water molecules on the surface are pulled on by molecules on the sides and below the surface strongly by hydrogen bonds which results in a continuous tension. This tension acts like a thin film on the top of the water. This can help water strider, paper clip or 1 yen coin to float on water. Same reason causes drops of water to be spherical.	The weight or the size of sample drops decreases while the concentration of detergent increases. This because of surface tension of water decreases in the present of detergent. So, in the previous lesson, the *first assessment* is that *"what is the surface tension of water?"* Can you give the answer right now? -Facilitate the students' answers, and then explain what *surface tension of water* means.	Discuss in group and give the answer.
25 mn	**Analysis of assessment results by group** The different samples would give the drop weights or drop sizes similarly or differently according to the strength of surface tension of those water samples which influenced by their surrounding environments. The cleaner sample may give the heavier weights or the bigger size of drops compared to the less clean one. The drained water from the city may be polluted by various contaminants	The *second assessment*, you were required to measure the surface tension of water in three samples and to determine the amount of detergent presented in those samples by using the calibration curve. Therefore, today I want you to show your results by group. And then we will discuss those results together.	Students come to blackboard with their *results and map* by group. Students are required to present their research results and to show the places that they took their samples on the map. (Each group has 2 minutes to present.)

	such as detergent, and other organic and inorganic wastes which could be affected on the surface tension of water. Therefore, the water near to the city may give the lighter weights or smaller drop sizes compared to the one far from the city.	Facilitate and help students to analyze the results.	