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New England Water Works Association Youth Education Committee
Classroom Module

Water Quality and Laboratory Activity
Star Wars – Water Awakens

Introduction

Water quality is constantly monitored throughout a public drinking water system, from source to tap, to ensure that the water is safe. To determine the water quality, samples are taken throughout the system and a variety of different analyses, or tests, are performed in the laboratory by trained lab technicians, who follow standard procedures to perform the analyses. The results from the lab tests are compared to water quality standards to determine if the water is safe.

In this activity, students work in a team and perform lab analyses to gather quantitative data about the quality of a water sample and compare it to standards to determine if it is safe.

The water quality parameters that will be tested, a description of each parameter, and how to adjust the parameter is presented in the table, below.

Parameter	What is it?	How to adjust parameter in samples?
pH	pH is the acidity or alkalinity of the water. The scale extends from 0 (very acidic) to 14 (very alkaline). Drinking water should be 6.5 to 8.5. Very acidic or alkaline water can cause burns or do other physical damage.	Acids or bases. We will not adjust pH significantly in the classroom setting beyond adjustment by chemicals, below.
Chlorine	Chlorine is a water additive used to control microbes. It should not exceed 4 mg/L. High chlorine levels can be physically harmful.	Household bleach
Hardness	Hardness is the sum of polyvalent cations (mostly calcium and magnesium). The degree of hardness can be interpreted as; 0-50 mg/L = soft 50-150 mg/L = moderately hard 150-300 mg/L = hard 300 up mg/L = very hard Hard water requires more soap to produce foam or lather and can produce scale in hot water pipes, boilers, and heaters.	Calcium chloride or calcium carbonate

Procedure

1. Teacher - Create three samples with varying levels of the parameters. Use tap water and adjust parameters using chemicals as explained in Water Quality Parameters Table, above.

2. Test samples to confirm each parameter for each sample to make sure you are close to the target results for each parameter.

Parameter	Sample 1	Sample 2	Sample 3
pH	7	7	7
Chlorine	1	3	5
Hardness	20	300	40

3. Read the backstory to the students or have them read it individually.

   Backstory: After the First Order's Starkiller Base destroys the Republic's capital star system and attacks the base at Takodana, the Republic fighters flee. Led by Poe Dameron, they search for a new planet to build a new hidden rebel base. They select the desert moon Jedha. Jedha City, the capital of Jedha, is where Rebel Saw Gerrera and his followers used to live before the Death Star was destroyed. The city has a history as a Jedi stronghold. Jedha is a dry and desolate planet but is a great place for a hidden rebel base as it was abandoned after the Death Star destroyed the city. The First Order would never think to look there. The problem with Jedha is that there are few water supplies for the rebel forces. Water is critical for drinking, cleaning, heating, and cooling. Make three (or more) groups. Poe sends out three teams to find water supplies and they come back with three samples.

4. Explain the water quality parameters and the lab procedures they will be performing.

5. Have each group fill out their results in a table similar to the one below.

Group 1 Name: Luke Skywater	
Parameter	**Result**
pH	
Chlorine	
Hardness	

6. Once all of the groups have their results filled out have them all write their results on a board, have the teacher write the parameters for the safe water (which were in an envelope). In this example, group 1 found the safe water!

Parameter	Group 1	Group 2	Group 3	Safe Water
pH	7	7	7	7
Chlorine	1	3	5	1
Hardness	20	300	40	20

Contact the New England Water Works Association with any questions or for more information.