Lingering Acid **Chemical Toxicity in the Animas, and San Juan Rivers after the Gold King Spill**

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Project ID#

Q1: Research Question/Engineering Goal

RESEARCH QUESTION

If I test the concentration (molarity) and pH of the Animas, San Juan, and Durango rivers after the Gold King mine spill, will it be more basic or acidic?

RESEARCH HYPOTHESIS

If I use titration method to test the concentration of the river water samples then the pH will decrease, causing the river water to be highly concentrated (molarity).

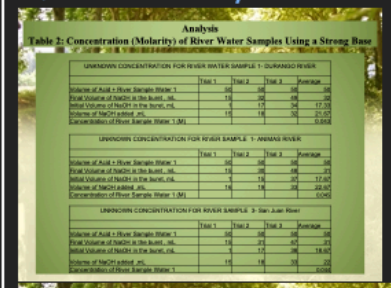
VARIABLES

Independent Variables:
River water Samples: Animas River, Durango River, San Juan River

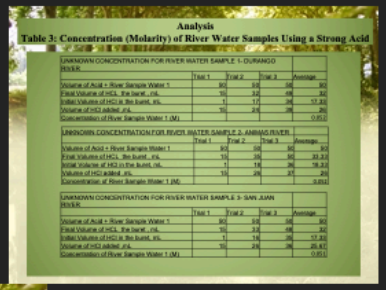
Dependent Variables:
pH, molarity (concentration)

Control:
Distilled Water

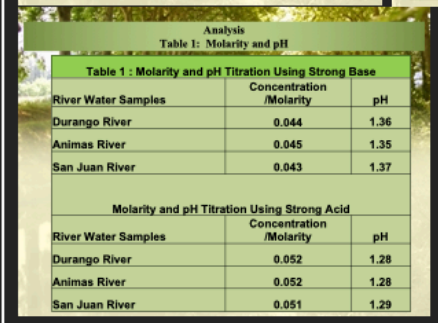
Q3: Data Analysis & Results



Analysis
Table 2: Concentration (Molarity) of River Water Samples Using a Strong Base



Analysis
Table 3: Concentration (Molarity) of River Water Samples Using a Strong Acid



Analysis
Table 1: Molarity and pH

Table 1 : Molarity and pH Titration Using Strong Base

River Water Samples	Concentration /Molarity	pH
Durango River	0.044	1.36
Animas River	0.045	1.35
San Juan River	0.043	1.37

Molarity and pH Titration Using Strong Acid

River Water Samples	Concentration /Molarity	pH
Durango River	0.052	1.28
Animas River	0.052	1.28
San Juan River	0.051	1.29

Q 2: Methodology/Project Design

1. Place 50mL of the river water sample in a clean 250-mL beaker
2. Use a clean pipet, transfer 25.0 mL of the river water sample to a clean 150-mL beaker.
3. Obtain 100mL of the 0.10 M NaOH solution in a clean, 250-ml beaker.
4. Clean 50-mL burette through with tap water, then rinse it with several small portions of the standard NaOH solution, being sure to rune some through the tip.
5. Attach the burette clamp to the ring stand, Place the burette in the burette clamp.
6. Fill the burette to above the 0-mL mark, then lower the meniscus back to the 0-mL mark
7. **Set up the pH meter on the ring stand and calibrate the pH with a buffer solution of pH 7.00**
8. Once the pH has stabilized, record the initial pH of the solution.
9. Add three drops of the indicator solution for the titration. Record the color change.
10. Add 1-mL of sodium hydroxide solution to the beaker. Record findings.
11. **Record the pH and the color of the solution.**
12. Continue adding sodium hydroxide in 1-mL portions. Record the burette reading and color.
13. Stop when the titration when the pH of the solution is greater than 12.
14. Repeat the titration with the other samples of river water. Retest with Hydrochloric Acid (HCl) 0.10 M in place of the Sodium Hydroxide (NaOH) 0.10 M solution.

Q4: Interpretation & Conclusions

Tables 1, 2, and 3, demonstrates that the concentration/molarity and pH of the three river water samples were very low whether using titration with a strong base or a strong acid. This indicates that the three river water samples are very acidic and highly concentrated with acid. This indicated that the gold King mine spill in 2015 continues to affect the leaching of acids into the Animas, San Juan, and Durango rivers. This causes concerns for the communities surrounding the river water such as the Navajo Nation.

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