Jar Test

Course/Grade Level: 6-8	Experiment Duration: 40 minutes

Website Link to Experiment:
Jar Test | Rowan Research | Rowan University

Expectations:
1. Observe the processes of coagulation and flocculation and how they relate to turbidity.
2. Understand the impact suspended and dissolved solids have in water.
3. Use simple, easy-to-learn lab equipment.
4. Label beakers to ensure proper organization and to avoid confusion.
5. Clearly labeled and neat collection of results.
6. Communication and equal effort contribution as a team.
7. Finding out by graphing and plotting data the optimal concentration of Alum.

Sample Data/Tables if Needed:

Ferric Chloride mg/L	**Alum**	**Ferric Chloride**
Alum, mg/L	**Turbidity NTU**	**Turbidity NTU**
10	12	6
15	6	4.36
20	4	3.29
25	2.63	4
30	5	7
35	9	10

Context for Learning

Objective: Find the dosage of Alum needed to effectively reduce the turbidity of the pond water.

How this experiment relates to wastewater/water treatment:
This experiment relates to water treatment and can be applied in a practical sense because students should gain an understanding of how solids settle in water and how they are dissolved during water filtration/purification in treatment plants. It is also decisive that through the experiment knowledge is given on the economic efficiency of how much Alum should be bought or used such that turbidity is effectively lowered (i.e. too much Alum increases turbidity and thus would be a poor economic choice).

Instructional Delivery

Materials:

1. Jar test apparatus
2. Five 1000 mL beakers
3. Pond water (900 mL per beaker)
4. Pipettes
5. Alum [$Al_2(SO_4)_3 * 18H_2O$]
6. Turbidimeter
7. Small glass vials for turbidimeter
8. Stopwatch/timer
9. Tape (optional)
10. Marker (Optional)

Procedures:

1. Pour 900 mL of pond water into each beaker.
2. Using a pipette, fill one glass vial up to the mark with water from one beaker.
3. Put the vial in the turbidimeter such that the turbidity of the pond water prior to adding Alum may be measured, observed, and recorded.
4. Add the water from the vial back into the beaker it was taken from.
5. Place the 5 beakers in the jar testing apparatus and set the impellers to 30 rpm.
6. Use a pipette to drop 3 mL of Alum into jar number one.
7. Going left to right, repeat step 6 for each beaker but increase the concentration of Alum added by 3 mL each time (for values of 6, 9, 12, and 15 mL).
8. Allow the Alum to be mixed rapidly for 1 to 2 minutes.
9. Change the rpm of the impellers to 10 rpm, and allow the Alum to be stirred at this speed for another 5 minutes.
10. Once time has passed, turn off the jar testing apparatus and take the impellers out of the beakers.
11. Wait an additional 30 minutes without disturbing the beakers.
12. Repeat step 3 for every beaker. This time, five separate values will be found, correlating to how turbidity changes as Alum dosage increases.
13. Graph turbidity values versus the concentration of Alum.

Assessment/Evaluation

Questions:

- Why would the turbidimeter give a lower reading once the Alum distribution process is complete?
  - The water is more clear due to the sediments falling to the bottom of the jar
- What are some common things found in water that make it not clear?
  - Dirt, sediments, rock, natural debris
- Why do we like to drink clear water?
  - It's appealing to drink and gives the impression that the water is clean
- Why do we calculate the proper Alum dosage?
  - So that the treatment center knows how much Alum to put in the water, without spending too much money purchasing the chemical

Notes: