# Jar Test Analytical Procedure

## 1. Jar Test for Raw Water

1. Take a raw water sample and determine the turbidity, temperature, and TOC. Note ambient conditions. Record the results.  
2. Measure equal raw water sample volumes (6 × 500 ml) into 1000 ml glass beakers using a measuring cylinder.  
3. Position the beakers so that the stirrer paddles are off-center but clear the beaker wall slightly.  
4. Select the flocculant and coagulant concentration ranges to be dosed. Determine the volumes using the formula: C₁V₁ = C₂V₂.  
5. Using syringes, measure the determined volumes from the prepared 100 ppm flocculant and 1000 ppm coagulant stock.  
6. Keep one reagent (flocculant/coagulant) concentration constant in all beakers, while the other reagent is varied throughout the beakers.  
7. Start the multiple stirrer operating at flash mix speed (200 rpm).  
8. Using syringes, add coagulant at predetermined dosage levels and give samples a 3-minute flash mix time.  
9. After three minutes, add measured volumes of predetermined concentration levels of flocculant from syringes and give samples a further 2-minute flash mix (total flash mix time is 5 minutes).  
10. After the flash mix, reduce mixing speed to 80 rpm to keep floc particles uniformly suspended during the slow mix period. Slow mix at 80 rpm for 10 minutes.  
 Note: Excessive stirring tends to break up early floc formation and may redispose reagents.  
11. After the slow mix period, withdraw paddles to allow floc settlement.

## 2. Post-Settlement Procedure

1. After 30 minutes of settlement, collect supernatant samples from each beaker using a syringe.  
2. Measure turbidity, TOC,.  
3. Record the results and compare with original raw water values.  
4. Determine the percentage removal of TOC.

## 3. Jar Test for Concentrated Cooling Water

Jar Test for Concentrated Cooling Water

1. Collect a sample of concentrated cooling water.
2. Measure and record the turbidity, temperature, and m-Alkalinity. Note the ambient conditions. Record all results.
3. Pre-determine the point where 2p = m and adjust the pH using lime. This typically occurs around pH 10 but may vary.
4. Measure 6 x 500 ml of the concentrated cooling water into 1000 ml glass beakers using a measuring cylinder. Position the beakers so that the stirrer paddles are off-centre but slightly clear the beaker walls.
5. Select the flocculant and coagulant concentration ranges to be dosed. Determine the required volumes using the formula:  
   C1V1=C2V2
6. Use syringes to measure the determined volumes from the prepared 100 ppm flocculant and 1000 ppm coagulant stock solutions. Keep one reagent concentration constant across all beakers, while varying the other.
7. Start the stirrers at flash mix speed (200 rpm). Add coagulant at predetermined dosage levels and mix for 3 minutes. Add flocculant at predetermined concentrations and mix for an additional 2 minutes (total flash mix time: 5 minutes).
8. Reduce mixing speed to 80 rpm to keep floc particles uniformly suspended. Continue slow mixing for 10 minutes.  
   *Note: Excessive stirring may break up early floc formation and redisperse reagents.*
9. After slow mixing, withdraw paddles to allow floc settlement. After 15 minutes of settling, use a 50 ml syringe to withdraw a sample for turbidity measurement and m-Alkalinity determination.

## 4. Calculations

**Equation 1: C₁V₁ = C₂V₂**

This equation is used to determine the volume of stock solution required to achieve a desired concentration in the test beaker.  
Where:  
C₁ = Concentration of stock solution  
V₁ = Volume of stock solution to be added  
C₂ = Desired concentration in the beaker  
V₂ = Volume of water in the beaker

**Equation 2: Percentage of TOC removed**

Percentage of TOC removed (%) = [1 − (TOC of the treated sample / TOC of the original untreated sample)] × 100

**Equation 3: Percentage of m-Alkalinity removed**

Percentage of m-Alkalinity removed (%) = [1 − (m-Alkalinity of the treated sample / m-Alkalinity of the original untreated sample)] × 100