COMPLETE TEST KIT (WO17-0)

TEST PROCEDURES

PREPARATION OF SAMPLE

To avoid accidental splashing, gather samples in a clean, large-mouth container. Allow sample to cool to room temperature. If sample is turbid or dirty, allow time for settling before pouring clear water into the sample tube. Rinse sample tube well with water being tested and then fill to the top of the tube mark.

CORRECT USE OF EQUIPMENT

Hold dropper bottle in a vertical position. If held at another angle, the size of the drops vary and will affect the result. Mix sample after each drop by swirling the test tube.

HARDNESS TEST

1. Fill sample container to top of the 25 ml mark of the test tube #9198.
2. Add 5 drops of Hardness Buffer (#619) and a dipperful of Hardness Indicator Powder (#620). If hardness is present, the sample will be purple; if absent, the sample will be blue.
3. If purple add Hardness Reagent (#683) one drop at a time, mixing well after each drop. Continue until sample is entirely blue. Each drop of #683 equals 10 ppm Hardness.

CALCIUM HARDNESS TEST

1. Rinse the marked tube (#9198) with the sample water to be tested and fill it to the 25ml mark (bottom of the curved surface or meniscus should be level with the 25ml mark).
2. Add 10 drops of Calcium Buffer (#653-2), mix and add 1 dipper of Calcium indicator (#011P), mixing gently to dissolve the powder. If Calcium is present, the sample will be purple; if absent, the sample will be blue.
3. If purple, add Hardness Reagent (#683) drop by drop (keeping count of drops used) while mixing after each addition until the sample turns from purple to blue.
4. Each drop of reagent #683 required to effect the change represents 10 ppm of Hardness (calcium carbonate).

"P" ALKALINITY TEST

1. Fill sample container to top of the 25ml mark of test tube #9198
2. Add 3 drops of Phenolphthalein (#638). If "P" Alkalinity is present, sample will turn pink/red.
3. Add Hydrochloric Acid (#724) one drop at a time, missing the sample after each drop, counting the number of drops until sample is colorless. Each drop of #724 equals 10 ppm "P" Alkalinity.

"M" ALKALINITY TEST

1. Fill sample container to top of the 25ml mark of test tube #9198.
2. Add 3 drops of Total Alkalinity Indicator (#645) Sample will turn green.
3. Add Hydrochloric Acid (#724) one drop at a time agitating sample after each drop, counting the number of drops until sample turns pink/red. each drop of #724 equals 10 ppm "M" Alkalinity.

NOTE: The "P" and "M" Alkalinity tests can be run simultaneously. First find the end point of the "P" Alkalinity test. Then add the Total Alkalinity Indicator (#645) to the same container and proceeding with the "M" Alkalinity test by adding Hydrochloric Acid (#724) until the end point is reached (the sample turns pink). Add the number of drops of Hydrochloric Acid needed to reach the end points of both tests together, and then multiply by 10 to get the ppm of "M"" Total Alkalinity in the sample of water.

HYDROXYL ALKALINITY

1. Rinse the sample tube (#9198) well with the water being tested and to the 25ml mark (bottom of curved surface or meniscus should be level with the 25ml mark).
2. Add a dropperful (as much as can be drawn up by means of the bulb) of Barium Chloride Solution (#711) and mix by swirling.
3. Add 2 drops of Phenolphthalein Indicator Solution (#638) If Hydroxyl Alkalinity is present, the sample will turn pink/red.
4. Add the Standard Hydrochloric Acid (#724) drop by drop swirling the sample tube constantly until pink color disappears. Record the number of drops. Each drop of Standard Hydrochloric Acid (#724) is equal to 10 ppm of Hydroxyl Alkalinity in terms Calcium Carbonate.

CHLORIDE TEST TO CALCULATE CYCLES OF CONCENTRATION

1. Fill sample container to top the 25ml mark test tube #9198.
2. Add 2 drops of Phenolphthalein (#638). If sample turns pink/red, continue with Step 3. If test sample is colorless, omit Step 3.
3. Add Normal Sulfuric Acid (#686) drop by drop, until test sample is colorless.
4. Place 5 drops of Chromate Indicator (#630) in the sample. Add Silver Nitrate (#706), drop by drop, until sample turns orange/red and loses all clarity. Each drop of #706 equals 10 ppm Chloride.
5. When low Chlorides are encountered, double the sample size used and use a factor of 5 ppm Chloride per drop. This increases the accuracy on low Chloride samples. Divide this number by the make-up chlorides number to get Cc's; i.e.

$$\frac{\text{Boiler Cl}}{\text{M.U. Cl}} = \text{Cc's}$$

NOTE Some boiler samples may turn black upon addition of the Silver Nitrate, interfering with the titration. The interference is caused by excess sulfite. The sulfite interference can be eliminated by adding 2 drops of 6% Hydrogen Peroxide (from drug store) after Step 1, waiting one minute, and again waiting one minute after Step 3, before titrating.

CHLORIDE TEST TO CALCULATE THE % OF BOILER MAKE-UP

(This is not an average—applies only to each testing instance)

1. Fill sample container to top of the 50ml mark of test tube #9198 with feedwater.
2. Add 2 drops of Phenolphthalein (#638). If sample turns pink/red, continue with Step 3. If test sample is colorless, omit Step 3.
3. Add Normal Sulfuric Acid (#686) drop by drop, until test sample is colorless.
4. Place 5 drops of Chromate Indicator (#630) in the sample. Add Silver Nitrate (#807) drop by drop until a permanent orange color first appears. Each drop of #807 equals 1 ppm Chloride. Divide this number by make-up chloride number to get percent, i.e.

$$\frac{\text{M.U. Cl}}{\text{F.W. Cl}} \times 100 = \%$$

SULFITE TEST

NOTE— Cap sample immediately and cool to room temperature under cold lap water.

1. Fill sample container (#9198) to top of the 25ml mark.
2. Add one drop of Phenolphthalein (#638)
3. Add 2 dipperfuls of Acid Starch Powder (#725), gently mixing until pink/red color is gone. If pink/red color is still present, add another dipper of Acid Starch and mix again until pink/red color is gone.
4. Add Iodate (#808) a drop at a time, mixing gently. Count drops until a vivid blue color appears. Each drop equals 2 ppm Sulfite.

NITRITE TEST

1. Fill special Nitrite Test Tube (#4035) to the top of 5ml mark. Cool sample if it is hot. If cooling is necessary, cap sample before testing.
2. Add 4 drops of Ferroin Indicator (#819). Solution will be burnt orange at this point.
3. Rapidly add CAN Solution (#820) counting drops and mix until the solution changes to vivid blue. Each drop of CAN Solution equals 40 ppm Nitrite calculated as Sodium Nitrite.

NEUTRALIZED CONDUCTIVITY FOR BOILER TESTING

1. Fill Ehrlenmeyer flask to the 100ml mark with the water to be tested.
2. Add 2 drops of Phenolphthalein (#638). If sample turns red, go to step 3. If no color change occurs, go to step 4.
3. Pulverize one aspirin* tablet and add to flask. Swirl to dissolve or until water returns to its original color.
   NOTE--Aspirin does not need to be completely dissolved to run conductivity.
4. Run conductivity per instructions provided with your conductivity meter.
5. Conductivity of boiler water divided by conductivity of make-up water equals cycles of concentration; i.e.,

$$\frac{\text{UHMOS Boiler Water}}{\text{UHMOS M.U. Water}} = \text{Cc's}$$

6. The cycles of concentration based upon conductivity do not necessarily correspond to the cycles based on chlorides because of the chemicals in the boiler.
7. To convert UHMO's to TDS, multiply the UHMO's by 0.85.

*** Use only generic aspirin tablets. Do not use buffered aspirin Tylenol (acetaminophen), etc.**