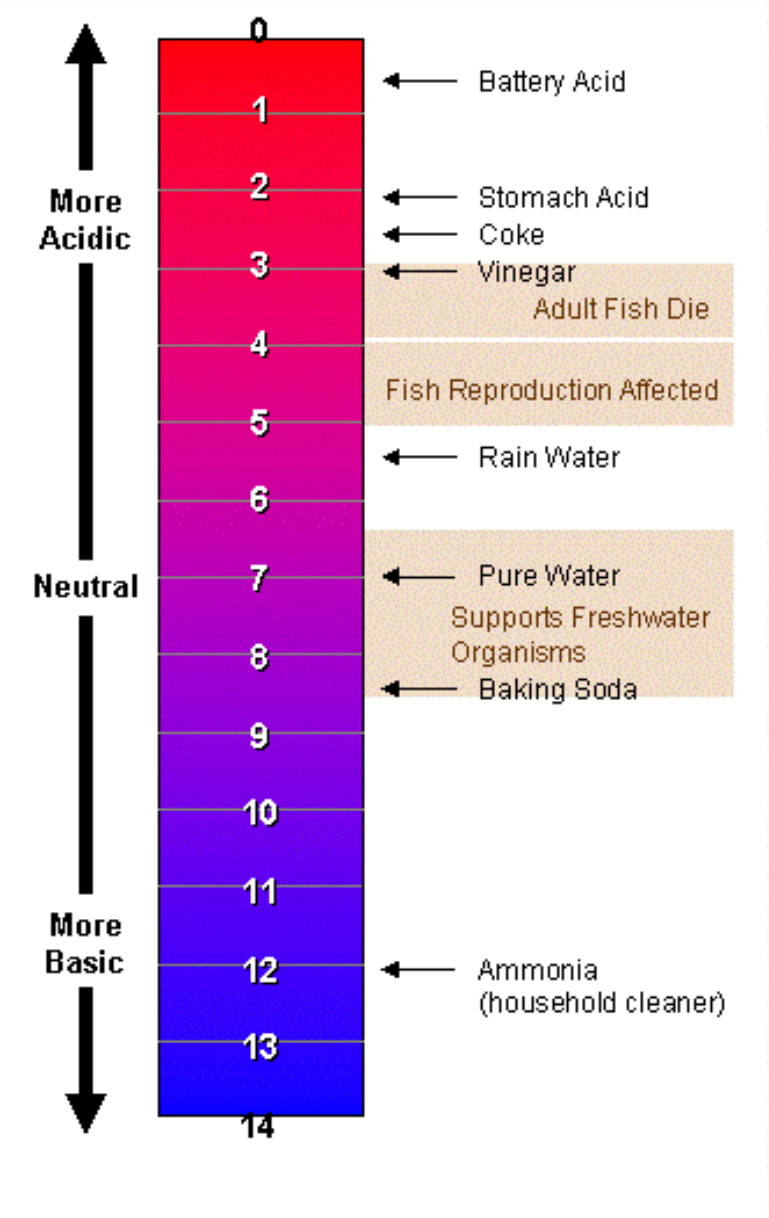
THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
OHIO STATE UNIVERSITY EXTENSION

Aquaculture Water Quality

Module 7

pH



The pH of water is a measure of the hydrogen ion concentration on a scale of 0 (very acidic) to 14 very basic), with pH 7 being the neutral point.

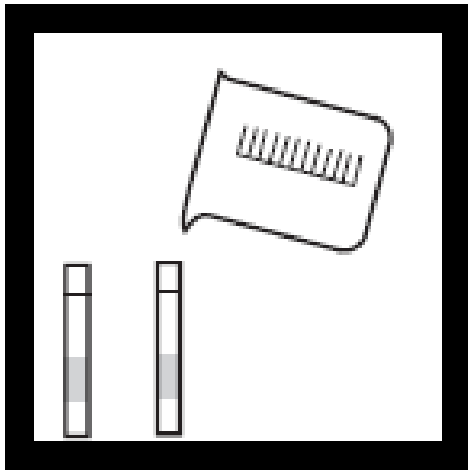
pH

REAGENTS AND APPARATUS

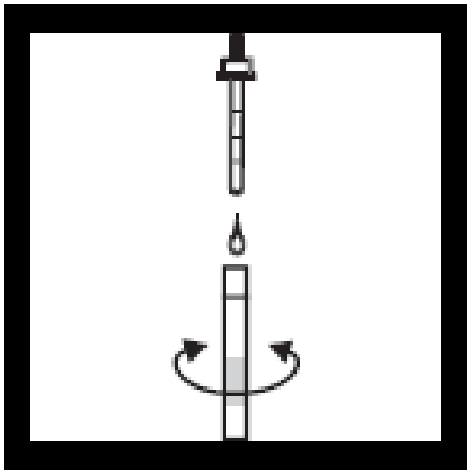
Description

Color Comparator Box .....
Color Disc, wide range pH .....
Color Viewing Tubes, plastic (4/pkg).....
Wide Range 4 pH Indicator Solution, 100 mL

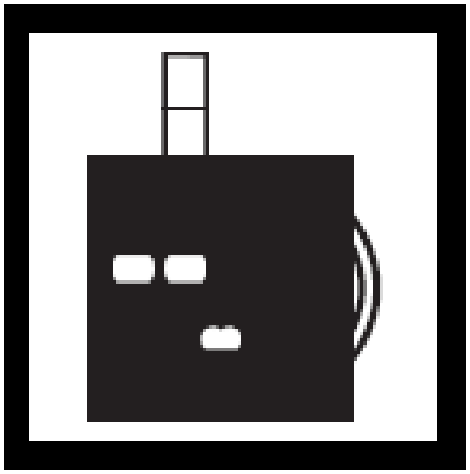
pH



1. Thoroughly rinse two viewing tubes with sample and fill to the 5-mL marks.



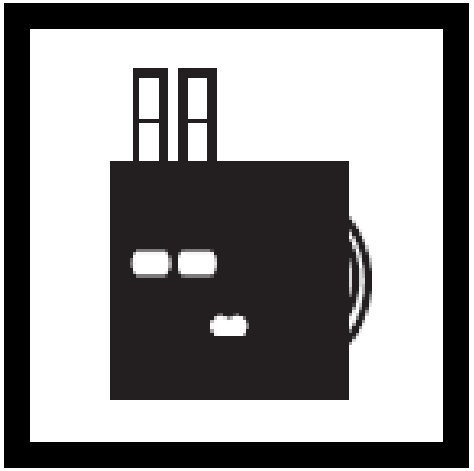
2. Add 6 drops of Wide Range 4 pH Indicator Solution to one of the tubes and swirl to mix.



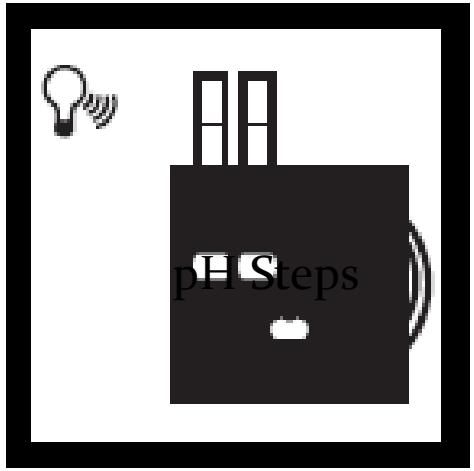
3. Insert the tube containing Indicator into the right-hand opening of the Color Comparator.

Note: *Ensure the Wide Range pH Color Disc is in place.*

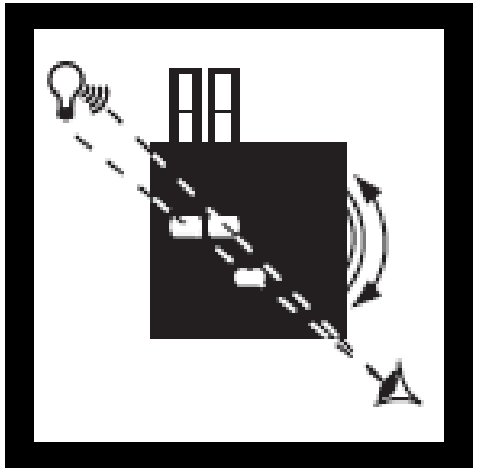
pH



4. Insert the tube of untreated sample into the left-hand opening of the Comparator.

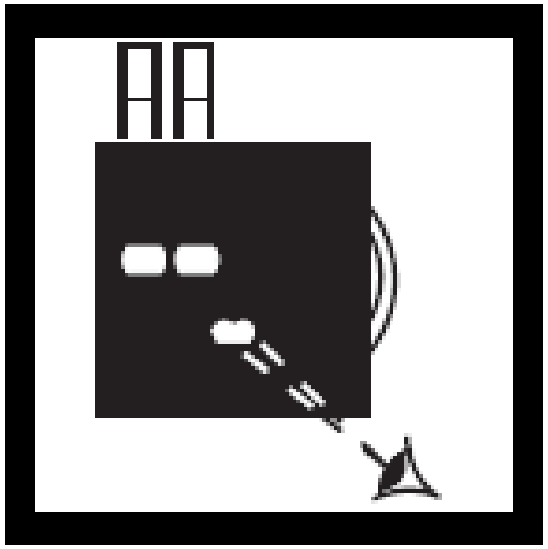


5. Hold the Comparator up to light.



6. View through the two openings in the front. Rotate the color disc until a color match is obtained.

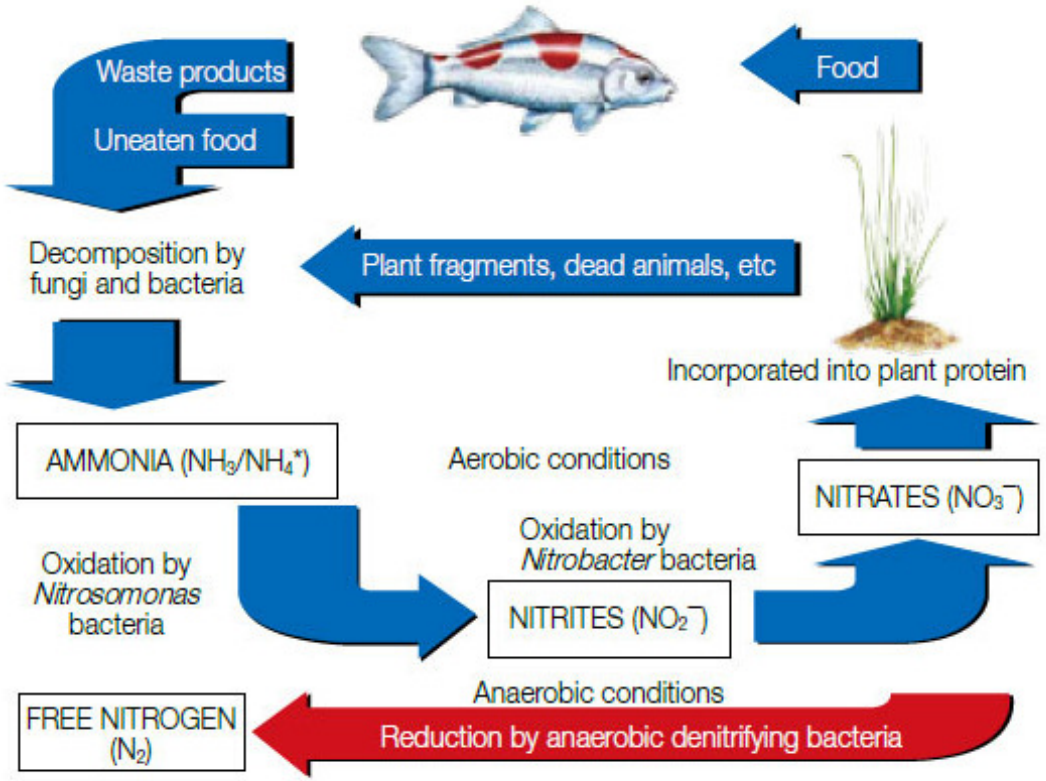
pH



7. Read the pH through the scale window.

Nitrogen Cycle

The cycle begins when fish eat and then excrete ammonia. Bacteria in the biological filter eats the ammonia and excretes nitrite. Nitrite is also toxic to fish and needs to be removed. Another type of bacteria in the filter eats nitrite and excretes nitrate. Nitrate is non-toxic to fish in small quantities and is used by plants as fertilizer. The entire cycle then repeats itself upon completion.



Ammonia

The presence of ammonia in fish waters is normal due to natural fish metabolism and microbiological decay of organic matter. In water, ammonia nitrogen can exist in two forms, un-ionized ammonia (NH_3) and ammonium ion (NH_4^+). Un-ionized ammonia is toxic to fish, while the ammonium ion is non-toxic except at extremely high levels. The pH and temperature of water regulate the proportion of each form.

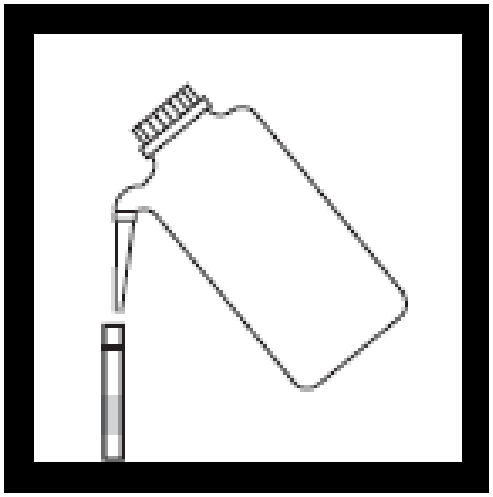
Ammonia

REAGENTS AND APPARATUS

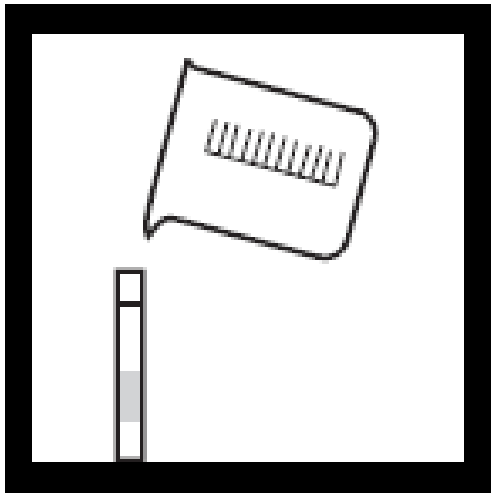
Description

Color Comparator Box .....
Color Disc, Ammonia Nitrogen .....
Color Viewing Tubes, plastic (4/pkg)....
Nessler Reagent, 100 mL .....
Rochelle Salt Solution, 29 mL .....
Water, deionized, 100 mL*.....

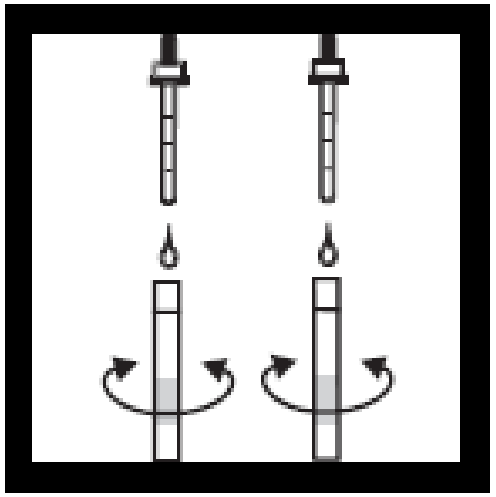
Ammonia



1. Fill one viewing tube to the 5-mL mark with deionized water. This will be the reagent blank.

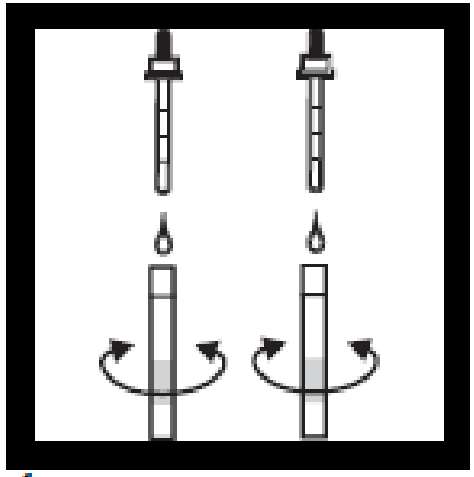


2. Fill the second viewing tube to the 5-mL mark with sample. This will be the prepared sample.



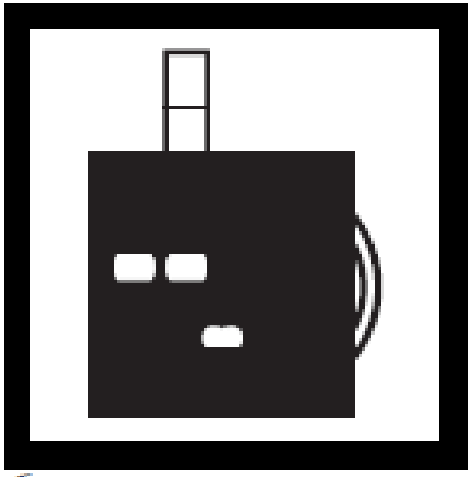
3. Add 1 drop of Rochelle Salt Solution to each viewing tube and swirl to mix.

Ammonia



4. Add 3 drops of Nessler Reagent to each viewing tube and swirl to mix. Stopper both tubes.

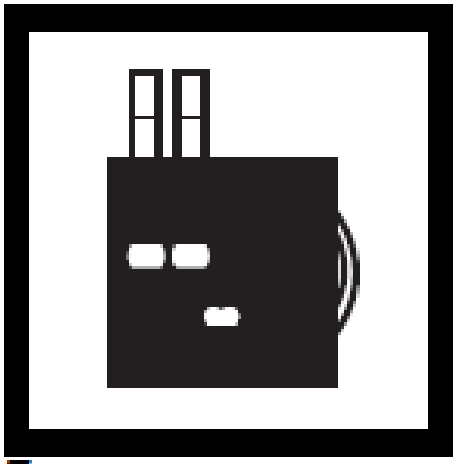
5. Allow 10 minutes for color development.



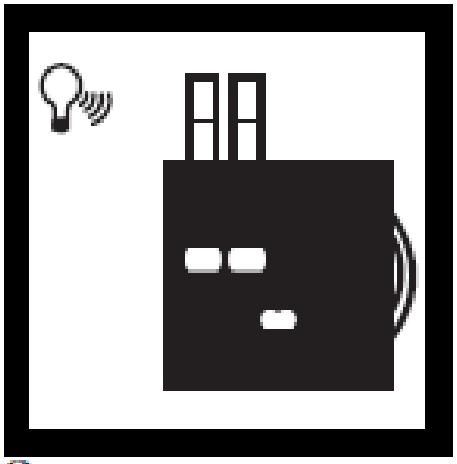
6. Insert the prepared sample into the right-hand opening of the Color Comparator.

Note: *Ensure the Ammonia Color Disc is in the Comparator.*

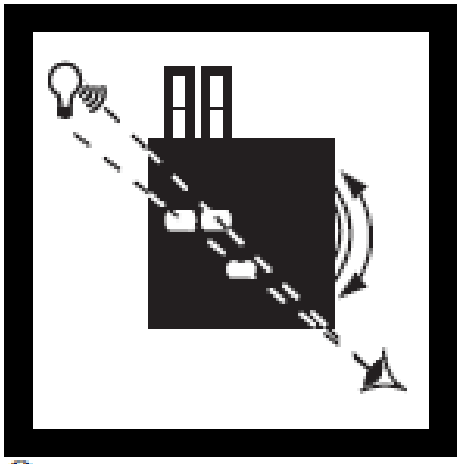
Ammonia



7. Insert the reagent blank into the left-hand opening.

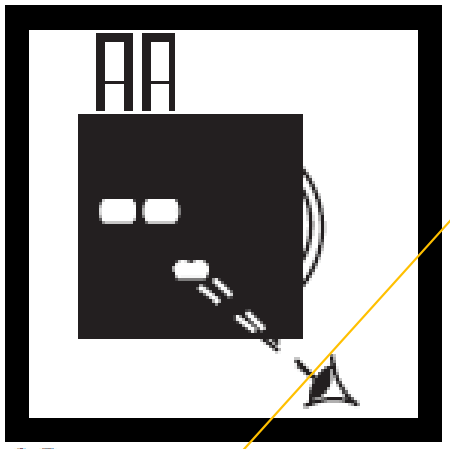


8. Hold the Comparator up to a light source.



9. Rotate the disc until the colors in the left and right windows match.

Ammonia



10. Read the concentration of ammonia nitrogen in mg/L (N) through the scale window.

mg/L = ppm

mg/L stands for milligrams per Liter, ppm stands for parts per million

By definition, a Liter of water weighs 1 kg (1 kilogram or 1000 grams).

An 1 mg (1 milligram or 1/1000 of a gram)

Therefore 1 mg = 1/1,000,000 of a kg.

So: 1 mg/L = 1 mg/kg = 1 mg/million mg = ppm.

mg/L = ppm

Nitrite

Nitrite nitrogen occurs as an intermediate stage in the biological decomposition of compounds containing organic nitrogen. Nitrites are not often found in surface waters because in aerobic conditions they are readily oxidized to nitrates. Levels of nitrites greater than natural residual amounts can be acutely toxic to fish.

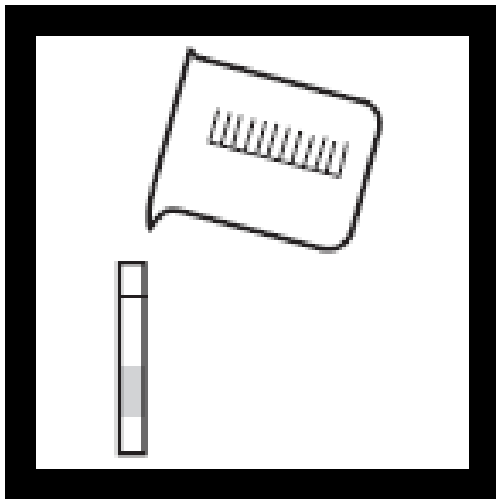
Nitrite

REAGENTS AND APPARATUS

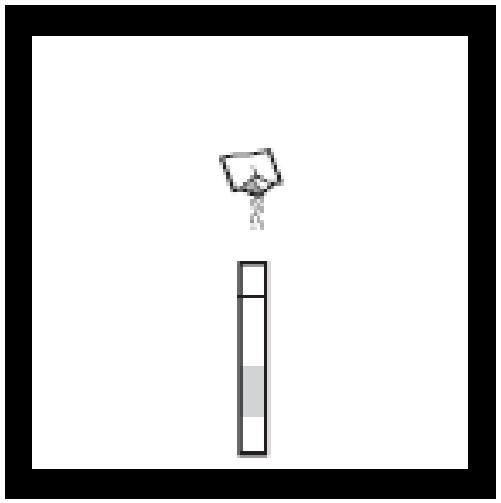
Description

Color Comparator Box .....
Color Disc, nitrite–nitrogen.....
Color Viewing Tubes, plastic (4/pkg).....
NitriVer® 3 Powder Pillows for 5-mL Sample (100/pkg)

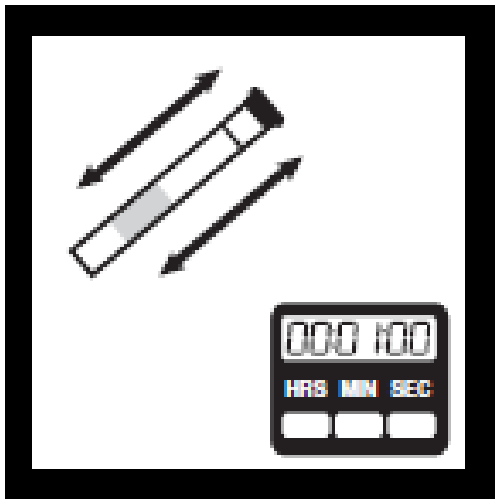
Nitrite



1. Rinse a viewing tube several times with sample, then fill to the 5-mL mark.



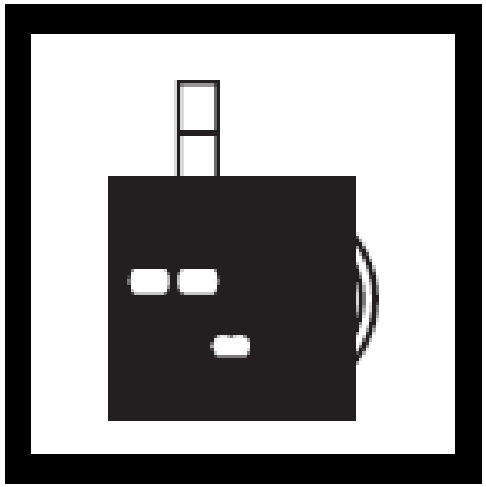
2. Add the contents of one NitriVer®* 3 Powder Pillow for 5-mL Sample.



3. Stopper the tube and shake vigorously for exactly one minute. A pink color will develop if nitrite is present.

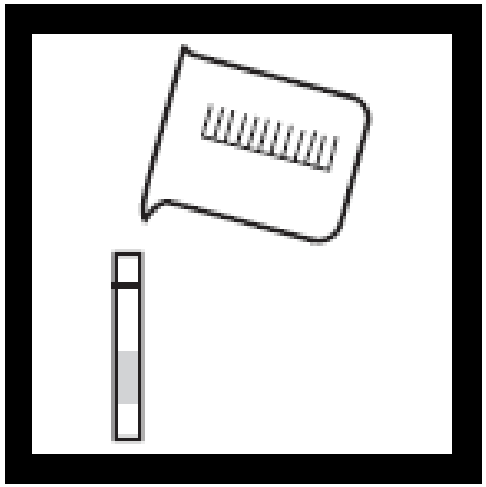
Nitrite

4. Allow this prepared sample to sit undisturbed for 10, but not more than 15 minutes.



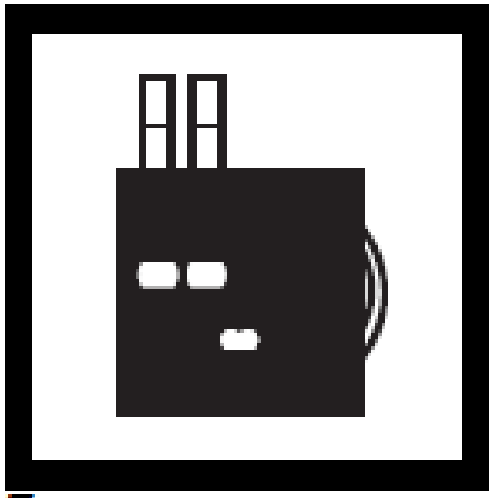
5. Place the tube into the right opening of the Color Comparator.

Note: *Ensure that the Nitrite–Nitrogen Color Disc is in place.*

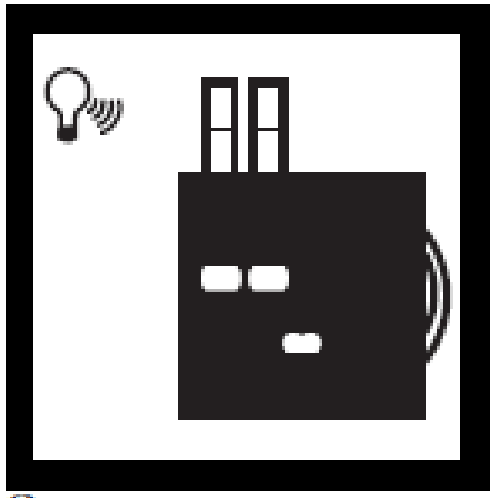


6. Fill another tube to the 5-mL mark with untreated sample.

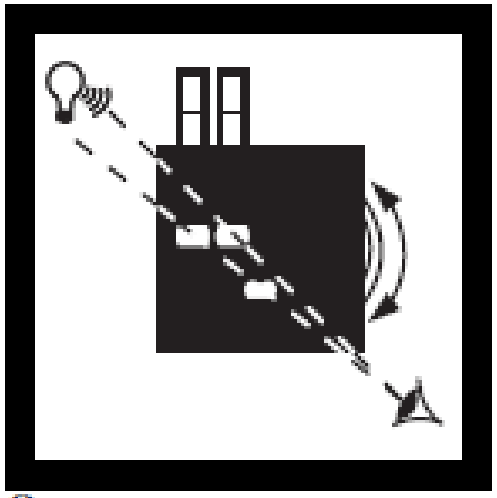
Nitrite



7. Place it into the left opening.

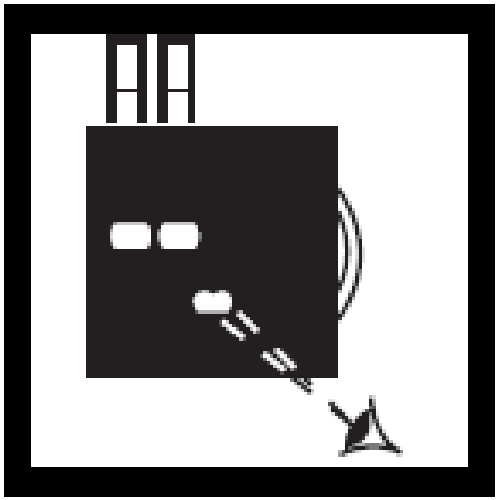


8. Hold the Comparator up to a light source.

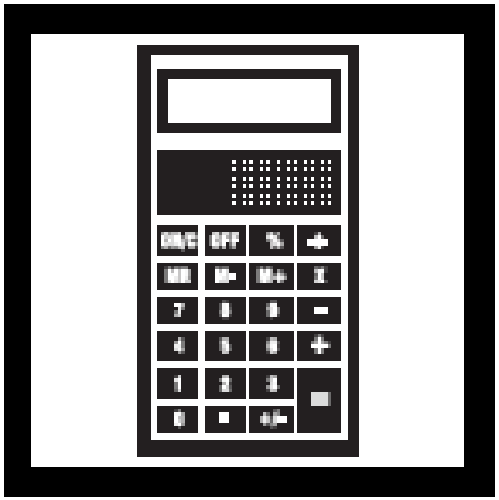


9. Rotate the color disc until the colors in the left and right windows match.

Nitrite

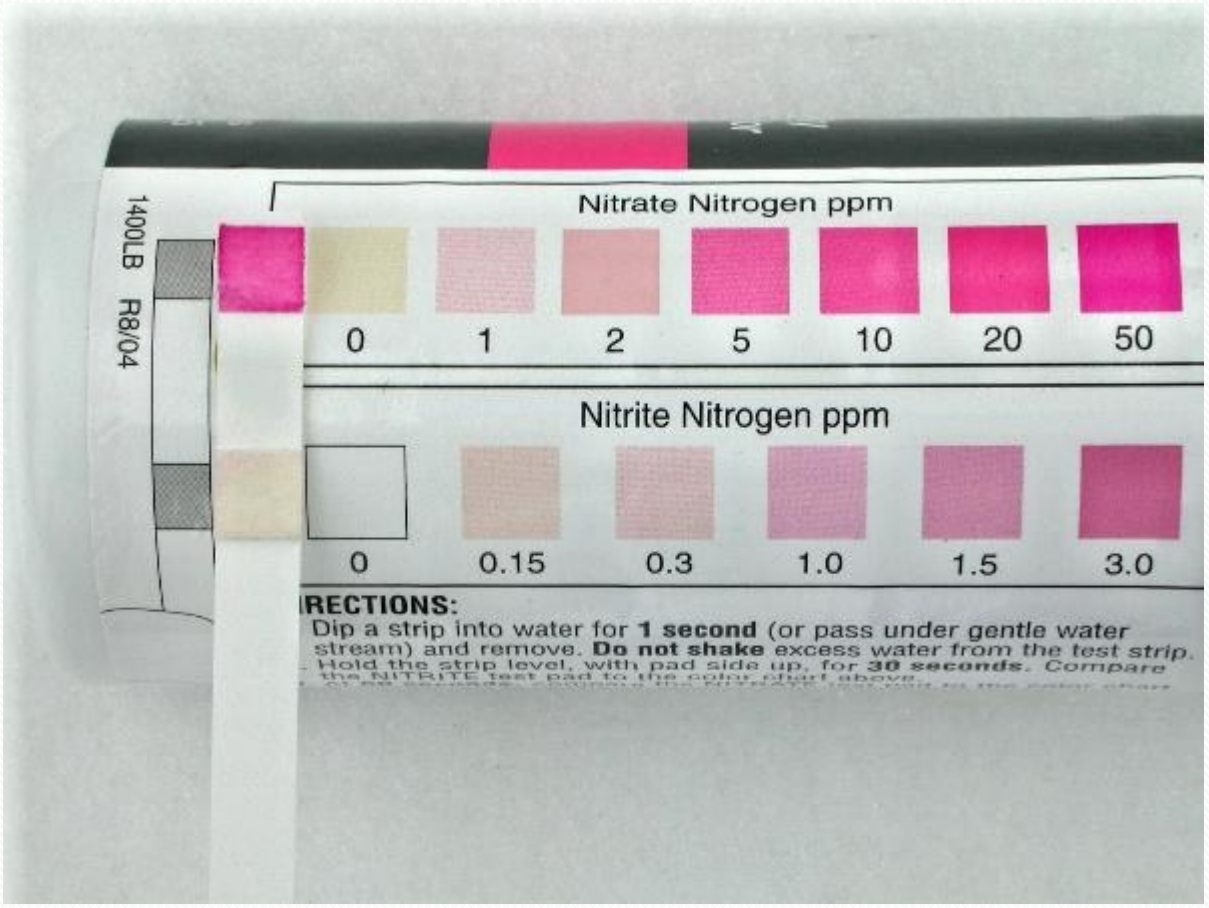


10. Read the mg/L nitrite–nitrogen (N) through the scale window.



11. mg/L nitrite–nitrogen x 3.3 = mg/L nitrite (NO_2^-).

Nitrate


1400LB R8/04
Nitrate Nitrogen ppm
0
1
2
5
10
20
50
Nitrite Nitrogen ppm
0
0.15
0.3
1.0
1.5
3.0
RECTIONS:
Dip a strip into water for 1 second (or pass under gentle water stream) and remove. Do not shake excess water from the test strip.
Hold the strip level, with pad side up, for 30 seconds. Compare


HACH
Water Quality Test Strips for
Nitrate
Nitrite
25 Test Strips
Cat. 27454-25

Alkalinity

Alkalinity is the name given to the quantitative capacity of water to neutralize an acid

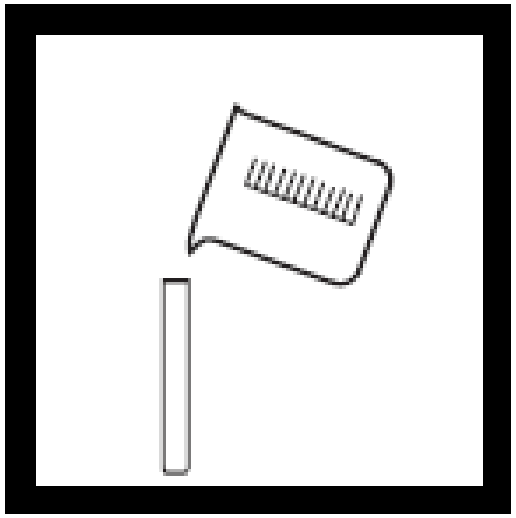
Alkalinity

REAGENTS AND APPARATUS

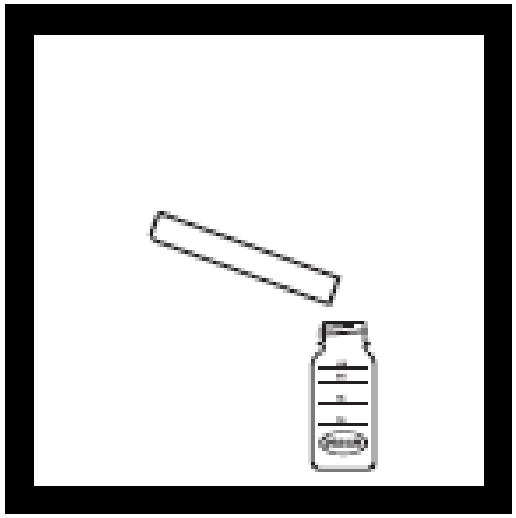
Description

Bottle, mixing (6/pkg) .....
Bromcresol Green-Methyl Red Indicator
Powder Pillows (100/pkg) .....
Measuring Tube, plastic.....
Phenolphthalein Indicator Solution, 15 mL
Sulfuric Acid Standard Solution, 100 mL ..

Alkalinity



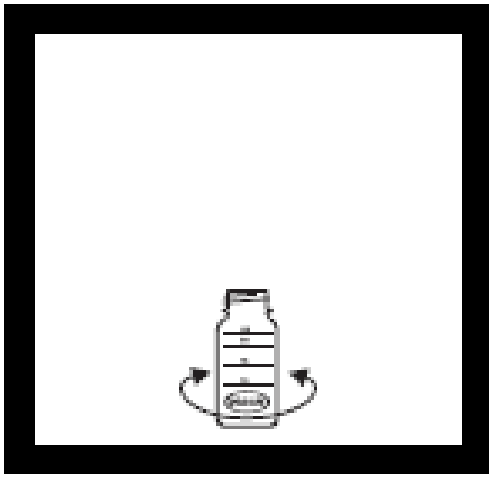
1. Fill the plastic measuring tube to the top with sample.



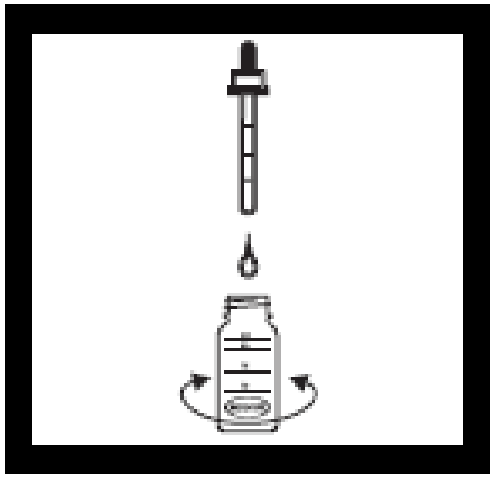
2. Pour the contents of the tube into the mixing bottle.

3. Add one drop of Phenolphthalein Indicator Solution.

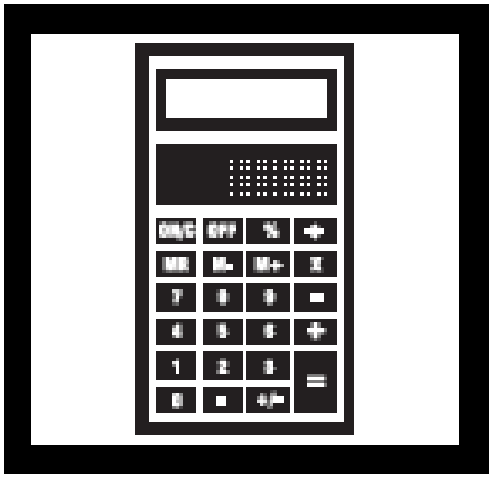
Alkalinity



4. Swirl to mix. If the water remains colorless, the phenolphthalein alkalinity is zero. If it is, skip to *step 7*.



5. If the sample turns pink, add Sulfuric Acid Standard Solution one drop at a time. Count each drop. Swirl the mixing bottle after each drop. Add drops until the sample turns colorless.



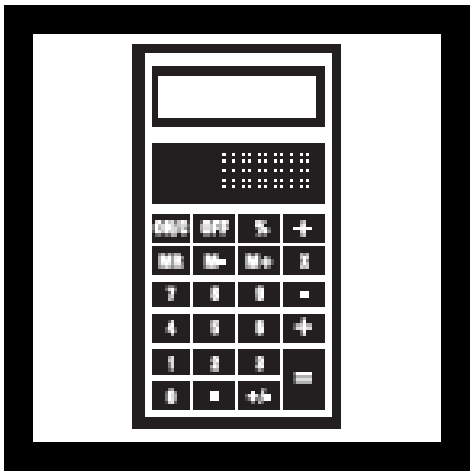
6. The number of drops = phenolphthalein alkalinity in grains per gallon calcium carbonate (gpg $CaCO_3$).

gpg x 17.1 = mg/L.

Alkalinity

7. Add the contents of one Bromcresol Green-Methyl Red Indicator Powder Pillow. Swirl to mix.

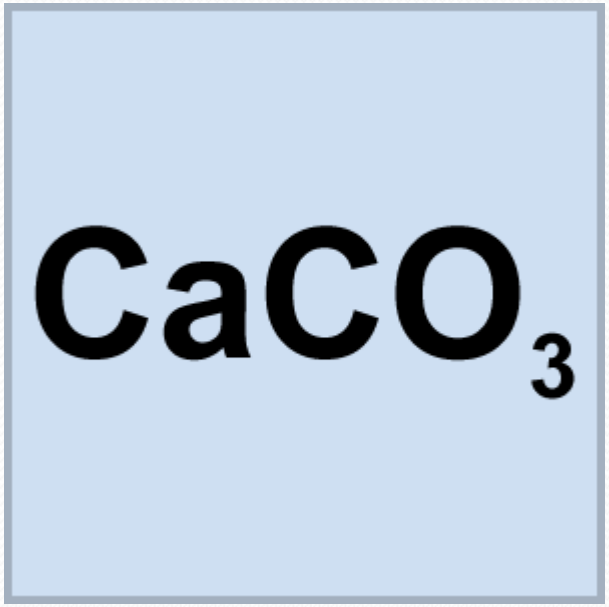
8. Add more Sulfuric Acid Standard Solution one drop at a time. Count each drop. Swirl the mixing bottle after each drop is added. Add drops until the sample changes from blue-green to pink.



9. The total number of drops in both steps 5 and 8 = total alkalinity in gpg $CaCO_3$.

gpg x 17.1 = mg/L.

Total Hardness



The sum of all hardness constituents in a water, expressed as the equivalent concentration of calcium carbonate. Primarily due to calcium and magnesium in solution, but may include small amounts of metals such as iron which can act like calcium and magnesium in certain reactions

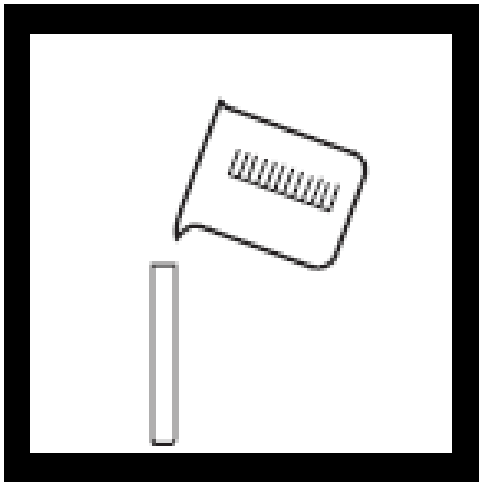
Total Hardness

REAGENTS AND APPARATUS

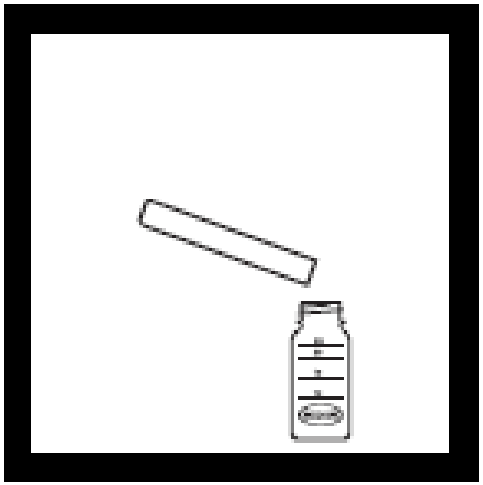
Description

Bottle, mixing (6/pkg).....
Hardness 1 Buffer Solution, 100 mL ..
Hardness 2 Test Solution, 100 mL .....
Hardness 3 Titrant Reagent, 100 mL ..
Measuring Tube, plastic.....

Total Hardness



1. Fill the plastic measuring tube to the top with sample.



2. Pour the contents of the tube into the mixing bottle.

3. Add three drops of Hardness 1 Buffer Solution and swirl to mix.

Total Hardness

4. Add one or two drops of Hardness 2 Test Solution and swirl to mix.

5. Add Hardness 3 Titrant Reagent one drop at a time. Dispense the solution no faster than one drop per second. Do not allow the dropper to contact the side of the mixing bottle. Swirl the mixing bottle after each drop. Count each drop. Continue until the solution color changes from pink to blue.

6. Each drop = 1 grain per gallon (gpg) hardness as calcium carbonate.

gpg x 17.1 = mg/L hardness.

Thank you