WATER ECOLOGY KIT
Model AL-36B
Cat. No. 1802-02

FREE ACIDITY TEST INSTRUCTIONS

HIGH RANGE

1. Fill the plastic measuring tube level-full of the water to be tested. Pour the contents of the tube into the mixing bottle.
2. Open one Bromcresol Green-Methyl Red Indicator Powder Pillow as shown in Figure 1. Add the contents of the pillow to the mixing bottle.
3. If the water turns grey-blue, blue or green, the free acidity is zero.

WARNING: The chemical in this kit may be hazardous to the health and safety of the user if inappropriately handled. Please read all warnings before performing the tests and use appropriate safety equipment.

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4. If the water turns pink add Sodium Hydroxide Solution drop by drop to the mixing bottle. Swirl the bottle after each drop is added, and count each drop as it is added. Continue to add drops until the water just begins to turn grey-blue.

5. The free acidity of the water, in grains per gallon (gpg) as calcium carbonate ($CaCO_3$) is found by dividing by 3 the number of drops of Sodium Hydroxide Solution needed to bring about the color change in Step 4. To express the results as mg/L, multiply the number of grains per gallon by 17.1.

LOW RANGE

1. Fill the bottle to the 15-mL mark with the water to be tested.

2. Same as Step 2 of High Range Instructions.

3. Same as Step 3 of High Range Instructions.

4. Same as Step 4 of High Range Instructions.

5. The free acidity of the water, in grains per gallon as calcium carbonate ($CaCO_3$), is found by dividing by 7.5 the number of drops of Sodium Hydroxide Solution needed to bring about the color change in Step 4. To express the results in mg/L, multiply the number of grains per gallon by 17.1.

TOTAL ACIDITY TEST INSTRUCTIONS

The instructions for this test are the same as for the Free Acidity Test except one drop of Phenolphthalein Indicator Solution is added to the contents of the mixing bottle in Step 2 rather than the Bromcresol Green-Methyl Red powder. If the sample turns even slightly pink upon the addition of the Phenolphthalein Indicator Solution, the total acidity is zero. If, at that point, the sample does not turn pink the titration is carried from colorless until a light pink color forms and persists for 30 seconds and the results are computed in the Free Acidity Test.

ALKALINITY TEST INSTRUCTIONS

HIGH RANGE

1. Fill the plastic measuring tube level-full of the water to be tested. Pour the contents of the tube into the mixing bottle.
2. Add one drop of Phenolphthalein Indicator Solution to the mixing bottle.
3. If the water remains colorless upon addition of the Phenolphthalein Indicator Solution, the phenolphthalein alkalinity is zero. If this is the case proceed to Step 6.
4. If the water becomes pink upon addition of the Phenolphthalein Indicator Solution, add the Sulfuric Acid Solution drop by drop to the mixing bottle. Hold the dropper vertically above the bottle while dispensing the drops. Swirl the bottle to mix after each drop is added, and count each drop as it is added. Continue to add drops until the water becomes colorless.
5. The phenolphthalein alkalinity of the water in grains per gallon as calcium carbonate ($CaCO_3$) is equal to the number of drops of Sulfuric Acid Standard Solution needed to bring about the color change in Step 4.
6. Open one Bromcresol Green-Methyl Red Indicator Powder Pillowas shown in Figure 1. Add the contents of the pillow to the mixing bottle.
7. Add more Sulfuric Acid Standard Solution drop by drop to the mixing bottle. Swirl to mix after the addition of each drop. Count each drop as it is added, and continue to add drops until the color changes from green to pink. Add the number of drops needed to bring about this color change to the number of drops used to bring about the color change in Step 4.
8. The total (methyl orange) alkalinity in grains per gallon as calcium carbonate ($CaCO_3$) is equal to the TOTAL number of drops of Sulfuric Acid Standard Solution needed in Steps 4 and 7.

LOW RANGE

1. Fill the mixing bottle to the 15-mL mark with the water to be tested.
2. Same as Step 2 of High Range Instructions.
3. Same as Step 3 of High Range Instructions.
4. Same as Step 4 of High Range Instructions.
5. The phenolphthalein alkalinity of the water in grains per gallon as calcium carbonate ($CaCO_3$) if found by dividing by 2.5 the number of drops of Sulfuric Acid Standard Solution used to bring about the color change in Step 4.
6. Same as Step 6 of High Range Instructions.
7. Same as Step 7 of High Range Instructions.
8. The total (methyl orange) alkalinity of the water in grains per gallon as calcium carbonate ($CaCO_3$) is found by dividing 2.5 the TOTAL number of drops of Sulfuric Acid Standard Solution needed in Steps 4 and 7.

CARBON DIOXIDE TEST INSTRUCTIONS

1. Fill the plastic measuring tube level-full with the water to be tested, and transfer the contents of the tube to the mixing bottle by placing the mixing bottle over the tube and turning the bottle right-side up.
2. Add one drop of Phenolphthalein Indicator Solution to the mixing bottle.
3. Add Sodium Hydroxide Solution drop by drop to the mixing bottle. Gently shake the bottle while adding the solution. Count each drop of solution as it is added and continue to add drops until a light pink color forms and persists for 30 seconds. Each drop of Sodium

Hydroxide Solution used to bring about the color change is equal to 5 milligrams per liter (mg/L) carbon dioxide (CO_3).

TOTAL HARDNESS TEST INSTRUCTIONS

1. Fill the plastic measuring tube level-full of the water to be tested. Pour the contents of the tube into the mixing bottle.
2. Add three drops of Buffer Solution, Hardness 1, to the mixing bottle and swirl to mix as shown in Figure 2.
3. Add one or two drops of ManVer® Hardness Indicator, Hardness 2, to the mixing bottle.
4. Add Titrant Reagent, Hardness 3, to the mixing bottle drop by drop. The dropper should be held vertically above the bottle and the drops dispensed at a rate no faster than one per second. The dropper must not touch the sides of the mixing bottle. Swirl the bottle after each drop is added, and continue to add drops until the sample color changes from pink to blue.
5. The hardness in grains per gallon as calcium carbonate ($CaCO_3$) is equal to the number of drops of Titrant Reagent, Hardness 3, needed to bring about the color change in Step 4.

DISSOLVED OXYGEN TEST INSTRUCTIONS

HIGH RANGE (1 Drop = 1 mg/L DO)

1. Fill the glass stoppered DO bottle with the water to be tested by allowing the water to overflow the bottle for two or three minutes. Be certain there are no air bubbles present in the bottle.
2. Use the clippers to open one each Dissolved Oxygen 1 Reagent Powder Pillow and Dissolved Oxygen 2 Reagent Powder Pillow. Add the contents of each of these pillows to the

bottle. Stopper the bottle in the following manner to eliminate trapped air. Incline the DO bottle slightly and insert the stopper with a quick thrust. This will force the air bubbles out of the bottle. If bubbles do become trapped in Steps 2 or 4, the sample should be discarded and the test repeated. Grip the bottle and shake vigorously to mix, holding the stopper in place while shaking. A flocculant precipitate will form. If oxygen is present the precipitate will be brownish-orange.

3. Allow the sample to stand undisturbed until the floc has settled halfway, leaving the upper half of the sample clear. Shake the bottle again and, again, let it stand until the upper half of the sample is clear. A small amount of powdered reagent may remain stuck to the bottom of the bottle. This will not affect the test results. In samples containing high concentrations of chloride, such as sea water, this floc will not settle. No interference will occur as long as the sample is allowed to be in contact with the floc for four or five minutes.

4. Remove the stopper and add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow. Carefully restopper the bottle and shake to mix. The floc will dissolve and a yellow color will develop if oxygen is present. This is the prepared sample.

5. Fill the plastic measuring tube level-full with the prepared sample and pour it into the mixing bottle.

6. Holding the dropper vertically above the mixing bottle, add Sodium Thiosulfate Titrant drop by drop to the bottle. Swirl the bottle constantly while dispensing the drops, and count each drop as it is added. Continue to add drops until the sample color changes from yellow to colorless. Each drop of Sodium Thiosulfate Titrant Solution used to bring about the color change is equal to 1 mg/L dissolved oxygen (DO).

LOW RANGE
(1 drop = 0.2 mg/L DO)

If the result of Step 6 in the High Range Test is very low (i.e. 3 mg/L or less), it is advisable to test a larger sample to obtain a more sensitive result. This may be done by titrating directly in the DO sample bottle as follows:

1. Using the prepared sample left over from Step 4 in the High Range Test, pour off the contents of the DO bottle until the level just reaches the 30-mL mark on the bottle.
2. Add the Sodium Thiosulfate Titrant drop by drop to the DO bottle. Swirl the bottle constantly while dispensing the drops, and count each drop as it is added. Continue to add drops until the sample color changes from yellow to colorless. Each drop of Sodium Thiosulfate Titrant Solution used to bring about the color change is equal to 0.2 mg/L dissolved oxygen (DO).

pH TEST INSTRUCTIONS

To ensure accurate results please read carefully before proceeding. The presence of chlorine in the water sample may cause a slight interference in the test. To remove up to 50 mg/L of chlorine, add one drop of Sodium Thiosulfate Solution, Cat. NO. 323-37, to the water sample before adding the pH indicator in Step 2. Sodium Thiosulfate Solution 0.1 N is not included in this kit but may be ordered from Hach Company. *See Replacements.*

1. Repeatedly rinse the two glass sample tube with the water to be tested. Fill both tubes to the 5-mL mark with the water sample.
2. Add six drops of Wide Range 4 pH Indicator Solution to one of the tubes and swirl to mix.

3. Insert the tube of prepared sample into the right top opening of the color comparator (Prepared Sample Position in Figure 3).
4. Insert the tube of the untreated water sample into the left top opening of the comparator (Untreated Sample Position in Figure 3).
5. Hold the comparator up to a light source such as the sky, a window or lamp and view through the openings in front. Rotate the disc to obtain a color match. Read the pH through the scale window.

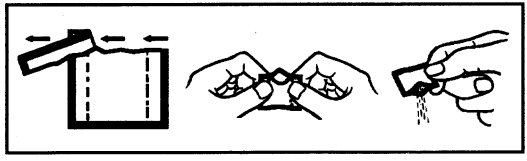

Figure 1

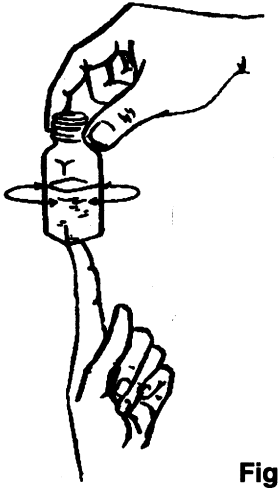

Figure 2

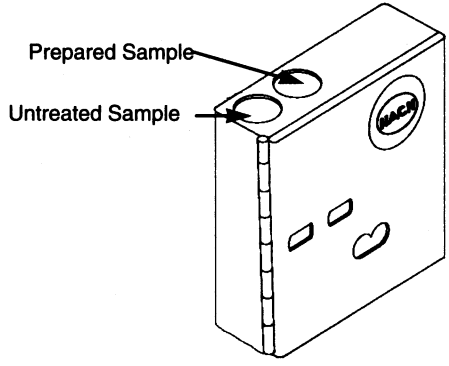

Figure 3

REPLACEMENTS

Cat. No.	Description	Unit
943-99	Bromcresol-Green Methyl Red Indicator Powder Pillows	pk/100
424-37	Buffer Solution, Hardness 1	118 mL (4oz) MDB*
981-99	Dissolved Oxygen 1 Reagent Powder Pillows	pk/100
982-99	Dissolved Oxygen 2 Reagent Powder Pillows	pk/100
987-99	Dissolved Oxygen 3 Reagent Powder Pillows	pk/100
425-37	ManVer Hardness Indicator Solution, Hardness 2	118 mL (4oz) MDB*
24089-37	Sodium Thiosulfate, Stabilized, Standard Solution, 0.0109N	118 mL (40z) MDB*
1897-36	Phenolphthalein Indicator Solution	15 mL (1/2oz) SCDB**
671-37	Sodium Hydroxide Solution	118 mL (4oz) MDB*
413-37	Sulfuric Acid Standard Solution	118 mL (4oz) MDB*
426-37	Titrant Reagent, Hardness 3	118 mL (4oz) MDB*
23293-37	Wide Range 4 pH Indicator Solution	118 mL (4oz) MDB*
1909-02	Bottle, DO, glass stoppered	each
2327-06	Bottle, mixing	pk/6

REPLACEMENTS

Cat. No.	Description	Unit
968-00	Clippers	each
1732-00	Color Comparator	each
1919-00	Color Disc, Wide Range pH	each
46600-04	Color ViewingTubes with caps	pk/4
438-00	Measuring Tube	each
323-37	Sodium Thiosulfate Solution 0.1N (Not included in kit)	118 mL (4oz) MDB*

*Marked dropping bottle
**Self contained dropping bottle

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