The Palintest® System

Instructions

The Palintest® System

Comparator +Discs

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The Palintest® System

Water testing plays a vital role in our modern society. Moves to improve drinking water quality, heightened environmental concerns and increased use of water for industry and leisure; all create the need for quick accurate water test results.

In each and every case the Palintest system provides the answer. Simple to use test equipment, and reagents in stable tablet form, mean that rapid reliable results can be obtained by all users - with or without formal laboratory training.

This is why the Palintest system is used in laboratories, treatment plants, leisure facilities and industrial premises throughout the world - you can rely on 25 years of Palintest experience for your water testing needs.

Palintest® Comparator and Discs

Palintest Comparator and Discs - the versatile method of water testing. Accurate and reliable for the professional analyst, quick and easy for the casual user.

The Palintest Comparator with interchangeable colour discs is so simple to use - just add the tablet reagent to the test sample, place in the Comparator and match against the appropriate disc. Colour discs are available for a complete range of water test parameters.

Palintest discs are produced by the latest technology which enables the colours to be printed from a pallet of over two million different shades -ensuring a perfect match against the colours produced in each test.

The following pages describe the use of the Palintest Comparator and Discs, and give instructions for the wide range of water tests that can be performed using this equipment.

Comparator Instructions

Booklets supplied with test kits may contain omly the relevent test instruction sheets. Additional sheets describing other tests, test equipment or instruments may also be included.

THE PALINTEST COLOUR SYSTEM

GENERAL INFORMATION ON THE PALINTEST SYSTEM FOR COLOUR STANDARDS

The Palintest colour system is a unique colour matching and printing system used in the manufacture of Palintest discs and other Palintest colour standards. The system is based on the Palintest Colour Scale, a numerically-definable series of colour tint values for each of the primary colours plus black.

Different colour values are formed by a combination of solid and dot matrix patterns printed on a transparent material. The Palintest Colour Scale values are also ascribed standard photometric transmittance and densiometric reflectance values for reference purposes. Master sets for the Palintest colour system, together with the standard transmittance and reflectance values, are held by Palintest Ltd.

Using the Palintest colour system it is possible to print a range of over two million numerically definable colours for the production of colour standards for use in analytical chemistry.

Calibration of Colour Standards

The calibration of colour standards for use in particular tests is carried out in the Palintest laboratories by matching test solutions against master colours from the Palintest Colour Scale. The numerical colour values which define each test solution colour are then used as the basis for printing cotour standards for this test.

The standard solutions used in the calibration of the tests are checked against standard analytical methods to primary standards. Tests used for particular applications are further checked by reference to typical samples analysed by standard laboratory means. Test solution colours are, whenever applicable, also determined by standard photometric means as a further check on colour values.

Printing of Colour Standards

Printing of Palintest colour standards is carried out using the latest technology. The standards are printed by reference to the numerical calibration values which define each standard. Checks are carried out by visual, photometric and densiometric methods at each stage of the printing process. These checks ensure the colour integrity and adherence to calibration values.

Finished colour standards are quality controlled by reference to master colours from the Palintest Colour Scale. In this way it can be assured that the printed colour standards are a true representation of the designated colour values and of the corresponding test solutions.

Permanency of Colour Standards

Palintest colour standards are manufactured using colourfast inks and light resistant materials. There should be no loss of colour integrity of the standards with time.

In a series of trials in which colour standards were subjected to continuous ultra-violet light for a period of one month, and to natural unshaded daylight for a period of one year, no loss of colour was observed. Users

can confidently expect Palintest colour standards to give many years of satisfactory service under the recommended conditions of use and storage.

Palintest
Technical Information

COMPARATOR AND DISCS

INSTRUCTIONS FOR USING PALINTEST COMPARATOR AND COLOUR DISCS

The Palintest Comparator is used in conjunction with a range of interchangeable colour discs. The Comparator and Discs are integrated with the Palintest system of water analysis. The Comparator is used to compare the colour produced in each test against the standard test colours provided on the disc. Colour discs are available for a complete range of water test parameters.

The Palintest Comparator uses 13.5 mm, 10 ml square test tubes. The Palintest Comparator. discs and test tubes conform to international dimensions and are interchangeable with most standard comparator systems.

Instructions for Use

Instructions for carrying out specific tests are given on separate instruction sheets. The instructions below describe the general use of the Comparator in all water tests:

1. Select the correct colour disc for the parameter under test. Insert the disc into the Comparator ensuring the numbers are facing the user.

2. Place the square test tube containing the treated sample in the right-hand side of the tube holder. A square test tube containing sample only should be placed in the Seaside of the tube holder to compensate for any inherent colour in the sample.

3. Hold the Comparator against a source of white light, such as north daylight or use a Palintest Light Unit, and rotate the disc until the colours are seen to match.

4. Take the disc reading which appears in the aperture on the front of the Comparator.

Light Unit

The Palintest Light Unit (PT 522) is a portable lighting device which fits directly onto 0 the Palintest Comparator. The unit produces the optimum white light for matching test solutions against Comparator discs- it eliminates the inconsistencies caused by; variable daylight conditions or artificial light- The Light Unit is available as an iX; optional extra.

The Palintest Light Unit is fitted with rechargeable batteries and has an interna I f photocell to maintain standard light output irrespective of battery condition. A green LED on the top of the unit illuminates to indicate that the light output is satisfactory for colour matching. When this LED goes out, it indicates that the unit needs; recharging.

Care and Maintenance

Palintest Comparators and Discs are suitable for both laboratory and field use and i are designed to give long

and trouble-free operation. The Comparator body arid Disc surfaces should be kept clean by occasionally wiping with a damp cloth and 00:'Q then drying carefully. On no account should solvents or abrasive materials be used. ;l 0

Comparator Discs are colourfast and long-lasting- To ensure maximum life, replace `; discs in the plastic wallet after use. Avoid constant exposure to strong sunlight or exposure to sources of heat.

Palintest square test tubes are made from a high quality grade of crystal polyacrylate. Test tubes should be kept clean by rinsing and drying after use. Tubes which become scratched or discoloured through repeated use should be discarded. 0 r

Order Codes

PT 520T	Palintest Comparator with two Square Test Tubes
PT 521/5	Square Test Tubes, 13.5 mm, 10 ml polyacrylate (pack of 5)
PT 522	Portable Light Unit
CD Codes	Colour Discs (see individual test instructions)

Palintest
Test Instructions

Alkalinity

TEST FOR TOTAL ALKALINITY
NATURAL AND TREATED WATERS

Colour Match Method
USING PALINTEST COMPARATOR
0 - 250 mg/l $CaCO_3$

Natural and treated waters may contain a variety of dissolved alkaline substances such as carbonates, bicarbonates, hydroxides and, to a lesser extent, borates, phosphates and silicates. In water at neutral pH the alkalinity derives mainly from the presence of bicarbonates.

Total alkalinity is an important test in determining the aggressiveness or scale forming tendency of the water. If the total alkalinity is low the water may be aggressive and cause corrosion to pipework and structures; if the total alkalinity is high the water may more readily promote scale formation. Alkalinity control is therefore an important part of many water treatment programmes.

The Palintest Alkavis test uses a colorimetric method and covers the total alkalinity range 0 - 250 mg/l $CaCO_3$. The test is particularly suitable for checking natural and drinking waters, swimming pool water, boiler water etc.

Method

The Palintest Alkavis test is based on a unique colorimetric method and uses a single tablet reagent. The test is simply carried out by adding a tablet to a sample of the water. Under the conditions of the test a distinctive range of colours from yellow, through green, to blue are produced over the alkalinity range 0 - 250 mg/l $CaCO_3$. The colour produced in the test is indicative of the alkalinity of the water and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Alkavis Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 192 Alkalinity
Square Test Tubes, 13.5 mm, 10 ml (PT 521)
Disc CD 192 covers the range 0 - 250 mg/l alkalinity in steps 0, 25, 50, 75, 100, 125, 150, 200, and 250 mg/l as $CaCO_3$.

Test Procedure

1. Fill a square test tube with sample to the m0 ml mark.
2. Add one Alkavis tablet, crush and mix thoroughly to dissolve.
3. Place the test tube in the Comparator and match against the disc in the usual manner (see Comparator Instructions).
4. The disc reading represents the total alkalinity of the sample as milligrams per litre $CaCO_3$.

Palintest
Test Instructions

ALUMINUM

TEST FOR ALUMINUM IN NATURAL AND DRINKING WATERS

Colour Match Method using Palintest Comparator 0 - 0.5 mg/l

Aluminum sulphate is widely used as a coagulant in drinking water treatment. The determination of aluminum (residual alum) is usually required for control of alum coagulation and filtration processes at water works.

Aluminum salts are found in natural waters; levels are reported to be increasing, particularly in areas affected by acid rain. High aluminum levels can be toxic to fish and aquatic life. Aluminum determination is necessary therefore for environmental control and for testing water used for fish farms, etc.

The Palintest Aluminum test provides a simple method of measuring aluminum levels in natural and drinking waters over the range 0 - 0.5 mg/l.

Method

This simplified method for the determination of aluminum is based on the American Standard Method (ref.1). Aluminum reacts with eriochrome cyanine R indicator in acid solution to produce a pink-red coloured complex. The presence of ascorbic acid eliminates interference from iron and manganese. The Palintest Aluminum method features two tablet reagents - an acidifying tablet and a tablet containing the indicator reagent. The test is simply carried out by adding one of each tablet to a sample of the water.

The intensity of the colour produced in the test is proportional to the aluminum concentration. The colour is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Aluminum No 1 Tablets
Palintest Aluminum No 2 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 166 Aluminum
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 166 covers the range 0 - 0.50 mg/l aluminum in steps of 0, 0.05, 1.10, 0.15, 0.20, 0.30, 0.40, and 0.50 mg/l Al.

Sample Collection

Aluminum is readily absorbed onto the surfaces of sample containers, particularly glass containers. To avoid loss of aluminum, collect samples in plastic bottles and test as soon as possible after collection. Sample bottles should be acid-rinsed and thoroughly washed out with deionised water before re-use.

Test Procedure

1. Fill a square test tube with the sample to the 10 ml mark.
2. Add one Aluminum No 1 tablet, crush and mix to dissolve.

3. Add one Aluminum No 2 tablet, crush and mix gently to dissolve. Avoid vigorous agitation.

4. Stand for five minutes to allow full colour development.

5. Place the test tube in the Comparator and match against the disc in the usual manner.

6. The disc reading represents the aluminum concentration present in the sample as milligrams per litre Al.

Interferences

The presence of polyphosphate or fluoride can lead to low aluminum readings. Polyphosphate is unlikely to be present in significant quantities in normal water samples. Fluoride will only be significant for control samples from water works where fluoridation is practised. In such cases samples should preferably be taken before the final fluoridation stage.

For samples taken after fluoridation such as those from water distribution systems, or for samples containing natural fluoride, the disc reading should be corrected. To obtain the correct aluminum concentration, multiply the disc reading by the factor (1 + 0.4 F) where F is the Fluoride concentration as mg/l F. The Fluoride concentration should be determined separately by normal test procedure.

References

1. American Public Health Association, American Water Works Association, and Water Pollution Control Federation, Standard Methods for the Examination of Water and Wastewater (15 edn), Washington, D.C., USA 1980.

Palintest
Test Instructions

AMMONIA

TEST FOR AMMONIA IN NATURAL , DRINKING AND WASTE WATER

Colour Match Method using Palintest Comparator 0 - 1.0 mg/l N

Ammonia occurs as a breakdown product of nitrogenous material in natural waters. It is also found in domestic effluents and certain industrial waste waters. Ammonia is harmful to fish and other forms of aquatic life, and the ammonia level must be carefully controlled in water used for fish farms and aquariums. Ammonia tests are routinely applied for pollution control on effluents and waste waters, and for the monitoring of drinking water supplies.

The Palintest Ammonia Test provides a simple method of measuring ammonia (ammoniacal nitrogen) over the range 0 - 1.0 mg/l N.

Method

The Palintest Ammonia test is based on an indophenol method. Ammonia reacts with alkaline salicylate in the presence of chlorine to form a green-blue indophenol complex. Catalysts are incorporated to ensure complete and rapid colour development. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of the water.

The intensity of the colour produced in the test is proportional to the ammonia concentration. The colour is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Ammonia No 1Tablets
Palintest Ammonia No 2 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 152 Ammonia
Square Test Tubes, 13.5mm, 10 ml (PT 521)

Disc CD 152 covers the range 0 - 1.0 mg/l ammonia in steps 0,0.1, 0.2, 0.2, 0.4, 0.5, 0.6, 0.8 and 1.0 mg/l N.

Test Instructions

1. Fill square test tube with sample to the 10 ml mark.
2. Add one Ammonia No 1 tablet and one Ammonia No 2 tablet, crush and mix to dissolve.
3. Stand for ten minutes to allow colour development.

4. Place the test tube in the Comparator and match against the disc in the usual manner.
5. The disc reading represents the ammonia concentration present in the sample as milligrams per litre N.

Sea Water Samples

Palintest Ammonia Conditioning Reagent is required when testing sea water or brackish water samples to prevent precipitation of salts. The reagent is supplied with a special "spoon pack" to aid measuring out the powder.

Fill the test tube with sample to the 10 ml mark, and add one level spoonful of conditioning reagent. Mix to dissolve reagent then continue the test as described in the above test instructions.

Notes

1. At low temperature the rate of colour development in the test may be slower. If the sample temperature is below 20° C, allow 15 minutes for the colour to develop.

2. Ammonia concentrations can be expressed in a number of different ways. The following factors may be used for the conversion of readings.

   To convert from N to NH_4 multiply by 1.3.
   To convert from N to NH_3 multiply by 1.2.

Palintest
Test Instructions

BROMINE

Colour Match Method using Palintest

TEST FOR FREE, COMBINED AND, TOTAL BROMINE IN WATER

Comparator

0 - 2.0 mg/l
0 - 8.0 mg/l

Bromine and bromine-release compounds are used for the disinfection of swimming pool water, and in many other water treatment systems. Accurate measurement of the bromine residual is an essential aspect of control of these processes.

The bromine level can be expressed in terms of the free bromine, combined bromine or total bromine residuals. However, free and combined bromine are both considered powerful disinfectants and it is not normally necessary to differentiate between these two forms. For the majority of applications therefore the measurement of the total bromine residual is sufficient.

The Palintest DPD bromine method provides a simple means of measuring bromine residuals up to a level of 8 mg/l. A supplementary procedure can be used to differentiate between free and combined bromine if desired.

Method

The Palintest Bromine test uses the DPD method now internationally recognised as the standard method of testing for disinfectant residuals. In the SPS method the reagents are provided in tablet form for maximum convenience and simplicity of use.

Bromine reacts with diethyl-p-phenylene diamine (DPD) in buffered solution to produce a pink colouration. The intensity of the colour is proportional to the total bromine concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

For the separate determination of free and combined bromine, a supplementary procedure using sodium nitrite is used. The nitrite destroys the free bromine in the sample and the colour produced in the DPD test then corresponds to the combined bromine only. The free bromine content is thus obtained by difference between the total bromine and combined bromine readings.

Reagents and Equipment

Palintest DPD 1Tablets
Palintest DPD Nitrite Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 060/8 Bromine (see below)
Square Test Tubes, 13.5mm, 10 ml (PT 521)

Disc CD 062/2 covers the range 0 - 2.0 mg/l bromine in steps 0.2, 0.2, 0.4, 0.6, 0.8, .1.0, 1.2, 1.4, 1.6, 2.0 mg/l BR_2.

Disc CD 060/8 covers the range 0 - 8.0 mg/l bromine in steps 0.5, 1.0, 1.5, 2.0, 3.0, 4.0, 5.0, 6.0 and 9.0 mg/l BR_2.

Test Procedure - Total Bromine

1. Rinse the square test tube with sample leaving 2 to 3 drops of sample in the tube.
2. Add one DPD No 1 tablet and crush.
3. Fill the tube with sample to the 10 ml mark and mix to dissolve the tablet.
4. Place the tube in the Comparator and match against the disc in the usual manner.
5. The disc reading represents the **total bromine** residual as milligrams per litre BR_2.

For most purposes the test can be terminated at this stage. If it is desired to measure free and combined bromine proceed as indicated in the following section.

Test Procedure - Free and Combined Bromine

1. Fill a square test tube with sample to the m0 ml mark. Add one DPD Nitrite tablet, crush and mix to dissolve.

2. Take a second clean square test tube and add 2 or 3 drops of solution from the first tube. Add one DPD No 1 tablet, crush and then add the remainder of the solution to make up to the 10 ml mark. Mix to dissolve tablet.

3. Place the test tube in the Comparator and match in the usual manner. The disc reading represents the **combined bromine** residual as milligrams per litre BR_2.

4. The **free bromine** residual as milligrams per litre is obtained by subtracting the second comparator disc reading from the first.

   i.e. Free Bromine = Total Bromine - Combined Bromine.

Notes

In systems containing both chlorine and bromine it is possible to differentiate between the chlorine and bromine residuals using a supplementary procedure involving Palintest DPD Glycine tablets. Details of this procedure are given on a separate test instruction sheet.

Palintest
Test Instructions

CHLORINE (DPD)

Test for Free, Combined and Total Chlorine in Water

Colour Match Method
0 - 1.0 mg/l
0 - 2.0 mg/l
0 - 5.0 mg/l

Chlorine and chlorine-release compounds are widely used for the disinfection of drinking water and swimming pools, for the control of micro biological growth in cooling water, and in many other water treatment systems. Accurate measurement of the chlorine residual is an essential aspect of the control of these chlorination processes.

The chlorine level can be expressed in terms of the free chlorine, combined chlorine or total chlorine residuals. For the majority of applications measurement of the free chlorine residual is the most important. The Palintest DPD Chlorine method provides a simple method of measuring free, combined and total chlorine residuals for a series of test ranges up to a level of 5 mg/l.

Method

The Palintest Chlorine test uses the DPD method developed by Dr. A. T. Palin and now internationally recognised as the standard method of testing for chlorine and other residuals. In the Palintest method the reagents are provided in tablet form for maximum convenience and simplicity of use.

Free chlorine reacts with diethyl-p-phenylene diamine (DPD) in buffered solution to produce a pink colouration. The intensity of the colour is proportional to the free chlorine concentration. Subsequent addition excess potassium iodide induces further reaction with any combined chlorine present. The colour intensity is now proportional to the total chlorine concentration; the increase in intensity represents the combined chlorine concentration. In this way it is possible to differentiate between free and combined chlorine present in the sample.

Reagents and Equipment

Palintest DPD No 1 Tablets
Palintest DPD No 3 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc - CD 011/1; CD 011/2 or CD 011/5 Chlorine

Square Test Tubes, 13.5 mm (PT 521)

Disc CD 011/1 covers the range 0 - 1 mg/l clorine in steps 0.1; 0.2; 0.3; 0;4; 0.5; 0.6; 0.7; 0.8 and 1.0 mg/l

Disc CD 011/2 covers the range 0 - 2.0 mg/l clorine in steps 0.2; 0;4; 0.6; 0.8; 1.0; 1.2; 1.4; 1.6 and 2.0 mg/l

Disc CD 011/5 covers the range 0 - 5.0 mg/l clorine in steps 0.5; 1.0; 1.5; 2.0; 2.5; 3.0; 3.5; 4.0 and 5.0 mg/l

Test Instructions

1. Rinse a square test tube with sample leaving two or three drops of sample in the tube.

2. Add one DPD No 1 tablet, crush tablet and then fill the test tube with sample to the 10 ml mark. Mix to dissolve tablet.

3. Place the test tube in the Comparator and match immediately against the disc in the usual manner.

4. The disc reading represents the free chlorine residual as milligrams per litre. Stop the test at this stage if only **free chlorine** determination is required.

5. If it is desired to measure combined or total chlorine residual continue the test on the same test portion. Add one DPD No 3 tablet, crush and mix to dissolve.

6. Allow to stand for two minutes for maximum colour development.

7. Place the test tube in the Comparator and match in the usual manner. The disc reading now represents the **total chlorine** residual as milligrams per litre.

8. The **combined chlorine** residual is obtained by subtracting the first comparator disc reading from the second.

   ie Combined Chlorine = Total Chlorine - Free Chlorine

NOTE

A too high chlorine level (above 10 mg/l) can cause bleaching of the pink colouration formed in the DPD test and give a false negative result. If a colourless test solution is obtained when chlorine is known to be present, check for the possibility of bleaching by repeating the test on a sample diluted with chlorine-free water.

Palintest
Test Instructions

CHLORINE/CHLORAMINES (DPD)

Colour Match Method

Test for Free Chlorine, 0 - 1.0 mg/l
Monochloramine and 0 - 2.0 mg/l
Dichloramine in Water 0 - 5.0 mg/l

Chlorine and chlorine-release compounds are widely used for the disinfection of water. When dissolved in water chlorine forms hypochlorous acid and hypochlorite ions. Chlorine remaining in the water in this form is known as the free chlorine residual.

Chlorine does, however, react with ammonia and nitrogen based species to form chloramines. These compounds are poor disinfectants and can also impart a characteristic taste or odour to the water. It is important therefore, in certain applications to be able to distinguish between chlorine residual present as free chlorine and a chloramines.

The Palintest DPD Chlorine/Chloramines method provides a simple means of measuring free chlorine ($HOCl/HOCl^-$), monochloramine (NH_2Cl) and dichloramine ($NHCl_2$).

Method

The Palintest Chlorine/Chloramines test uses the DPD method This method is internationally recognised as the standard method of testing for chlorine and other residuals. In the Palintest method the reagents are provided in tablet form for maximum convenience and simplicity of use.

Free chlorine reacts with diethyl-p-phenylene diamine (DPD) in buffered solution to produce a pink colouration. The intensity of the colour is proportional to the free chlorine concentration. Addition of a trace amount of potassium iodide induces further reaction with any monochloramine present. The increase in colour intensity is therefore proportional to the monochloramine concentration. Subsequent addition of excess potassium iodide causes dichloramine to react in a similar manner. The increase in intensity is now proportional to the dichloramine concentration.

In this way it is possible to differentiate between free chlorine, monochloramine and dichloramine residuals present in the sample. The colour intensities are measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest DPD No 1 Tablets
Palintest DPD No 2 Tablets
Palintest DPD No 3 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc - CD 011/1; CD 011/2 or CD 011/5 Chlorine

Square Test Tubes, 13.5 mm (PT 521)

Disc CD 011/1 covers the range 0 - 1 mg/l chlorine in steps 0.1; 0.2; 0.3; 0;4; 0.5; 0.6; 0.7; 0.8 and 1.0 mg/l

Disc CD 011/2 covers the range 0 - 2.0 mg/l chlorine in steps 0.2; 0;4; 0.6; 0.8; 1.0; 1.2; 1.4; 1.6 and 2.0 mg/l

Disc CD 011/5 covers the range 0 - 5.0 mg/l chlorine in steps 0.5; 1.0; 1.5; 2.0; 2.5; 3.0; 3.5; 4.0 and 5.0 mg/l

Test Instructions

1. Rinse a square test tube with sample leaving two or three drops of sample in the tube.

2. Add one DPD No 1 tablet, crush tablet and then fill the test tube with sample to the 10 ml mark. Mix to dissolve tablet.

3. Place the test tube in the Comparator and match immediately against the disc in the usual manner.

4. The disc reading represents the free chlorine residual as mg/l Cl_2. (Result A)

5. To measure monochloramine, continue the test on the same test portion. Add one DPD No 2 tablet, crush and mix to dissolve.

6. Place the test tube in the Comparator and match in the usual manner. (Result B) Then:

   Monochloramine (mg/l Cl_2) = Result B - Result A

7. To measure dichloramine, continue the test on the same test portion. Add one DPD No 3 tablet, crush and mix to dissolve.

8. Allow to stand for two minutes for maximum colour development.

9. Place the test tube in the Comparator and match against the disc in the usual manner (Result C) then:

   Dichloramine (mg/l Cl_2) = Result C - Result B

NOTE

A too high chlorine level (above 10 mg/l) can cause bleaching of the pink colouration formed in the DPD test and give a false negative result. If a colourless test solution is obtained when chlorine is known to be present, check for the possibility of bleaching by repeating the test on a sample diluted with chlorine-free water.

Palintest
Test Instructions

CHLORINE HR

Colour Match Method

Test for High Levels of Chlorine in Disinfecting and Sterilizing Solutions

0 - 50 mg/l
0 - 250 mg/L

Chlorine and chlorine-release compounds are widely used for the disinfection or sterilization of water distribution systems and pipework, plant and equipment in food processing and pharmaceutical factories, and similar applications. The chlorine levels used in these applications are higher than those normally applied for the simple disinfection of water. Accurate measurement of the chlorine level is necessary to ensure it is sufficient for the intended use. The Palintest Chlorine HR test provides a simple method of measuring the total chlorine residual over two ranges - 0 - 50 mg/l and 0 - 250 mg/l.

Method

The Palintest Chlorine test is based on an iodine release method. Chlorine reacts with potassium iodide in acid solution to release iodine which is brown in coloure. The reagents for the test are provided in the form of two tablets for maximum convenience and simplicity of use..

The intensity of the colour produced is proportional to the chlorine concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Acidifying GP Tablets
Palintest Chlorine HR Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc - CD 162/50 or CD 162/250 Chlorine
Square Test Tubes, 13.5 mm (PT 521)

Disc CD 162/50 covers the range 0 to 50 mg/l clorine in steps 2.5, 5, 10, 15, 20, 25, 30, 40 and 50 mg/l

Disc CD 162/250 covers the range 0 to 250 mg/l clorine in steps 5, 10, 25, 50, 75, 100, 150, 200 and 250 mg/l.

Test Instructions

1. Fill a square test tube with sample to the 10 ml mark.

2. Add one Acidifying GP tablet and one Chlorine HR tablet. Crush tablets and mix to dissolve.

3. Place the test tube in the Comparator and match against the disc in the usual manner.

4. The disc reading represents the total chlorine concentration present in the sample as mg/l.

NOTE

For the determination of lower levels of chlorine, up to 5 mg/l, the Palintest Chlorine DPD Method should be used. (See Comp.7)

Palintest
Test Instructions

COPPER (COPPERCOL)

Colour Match Method

Test for Free, Chelated and Total Copper in Natural and Treated Water

0 - 5.0 mg/l

Copper occurs naturally in many waters and may also result from corrosion of pipes and fittings. The presence of copper in drinking water can give rise to discolouration or an astringent taste.

Chelated copper compounds are extensively used as algicides in swimming pool water, home aquariums and other waters. Electrolytic devices which generate copper and silver ions are used in the purification of swimming pool water.

The Palintest Coppercol method provides a simple means of measuring copper in natural and treated waters over the range 0 - 5 mg/l. The test is particularly useful since it can be used to measure specifically the concentrations of free and chelated copper present in the water.

Method

The Palintest Coppercol method copper salts are reduced to the cuprous form and then reacted with a 2,2 Biquinoline-4,4-dicarboxylic salt to form a purple coloured complex. This provides a measure of the free copper ions present in the sample. In the second stage of the test, a decomplexing agent is introduced and this induces a further reaction with any chelated copper compounds which might be present.

The reagents are provided in tablet form and the test is simply carried out by adding tablets to a sample of water. The intensity of the colour produced in the test is proportional to the copper concentrations and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Coppercol No 1 Tablets
Palintest Coppercol No 2 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 186 Copper
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Test Instructions

1. Fill a test tube with the sample to the 10 ml mark.

2. Add one Coppercol No 1 tablets, crush and mix to dissolve.

3. Place the test tube in the Comparator and match against the disc in the usual manner.

4. The disc reading represents the free copper concentration as milligrams per litre Cu. Stop the test at this stage if only free copper determination is required.

5. If it is desired to measure chelated or total copper, continue the test on the same test portion. Add one

Coppercol No. 2 tablet, crush and mix to dissolve.

6. Place the test tube in the Comparator and match against the disc in the usual manner.

7. The disc reading represents the total copper concentration as milligrams per litre Cu.

8. The **chelated copper** concentration is obtained by subtracting the free copper concentration from the total copper concentration:-

   ie chelated Copper = Total Copper - Free Copper

Palintest
Test Instructions

FLUORIDE

Colour Match Method

Test for Fluoride in Natural and Treated Water

0 - 1.5 mg/l

Fluoride occurs naturally in some ground waters and is often introduced into drinking water for the prevention of tooth decay. Excessive amounts of fluoride are however objectionable and can cause tooth discolouration.

The Palintest fluoride test provides a simple method of monitoring fluorides in natural waters, and for the control of fluoridation plant at water works.

Method

Zirconyl Chloride and Eriochrome Cyanine R are reacted in acid solution to form a red coloured complex. This colour is destroyed by fluoride ions to give the pale yellow colour of the Eriochrome Cyanine. Differing amounts of fluoride thus produce a range of colours from red to yellow.

The particular advantage of this method is that it is substantially free from interferences which normally beset chemical methods of fluoride testing. In particular interference from aluminum and iron is eliminated by making the solution alkaline in the first stage of the test procedure. This breaks down any aluminum-fluoride and iron-fluoride complexes that may be present in the water. Interference from calcium, phosphates and sulphates should not be significant at the levels normally encountered in natural and drinking waters.

In the Palintest Fluoride test, two tablet reagents are used. The test is simply carried out by adding one of each tablet to a sample of the water. The colour produced in the test is indicative of the fluoride concentration and is measured using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Fluoride # 1 Tablets
Palintest Fluoride # 2 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc - CD 179 Fluoride
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 179 covers the range 0 - 1.5 mg/l fluoride in steps 0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4 and 1.5 mg/l F.

Test Instructions

1. Fill a square test tube with a sample to the 10 ml mark.

2. Add one Fluoride #1 tablet, crush and mix to dissolve.

3. Add one Fluoride #2 tablet, crush and mix to dissolve.

4. Stand for five minutes to allow full colour development.

5. Place the test tube in the Comparator and match against the disc in the usual manner.

6. The disc reading represents the fluoride concentration as mg/l F.

Palintest
Test Instructions

HYDROGEN PEROXIDE LR

Colour Match Method

Test for Low Levels of Hydrogen Peroxide in Water

0 - 1.0 mg/l

Hydrogen peroxide is used in various water treatment processes. In such applications it is important to ensure that the hydrogen peroxide level is maintained within the correct range to ensure optimum operation of the water treatment process.

The Palintest Hydrogen Peroxide LR test provides a simple means of measuring Hydrogen Peroxide levels over the range 0 - 1.0 mg/l.

Method

Hydrogen peroxide reacts with potassium iodide under slightly acid conditions, and in the presence of a catalyst, to release iodine into solution. The iodine then reacts with diethyl-p-phenylene diamine (DPD) to produce a pink colouration. In the Palintest method the reagents are combined in the form of a single tablet which also contains a catalyst to ensure rapid and complete colour development.

The intensity of the colour produced is proportional to the hydrogen peroxide concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Hydrogen Peroxide LR Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc - CD 104 Hydrogen Peroxide
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 104 covers the range 0 - 1.0 mg/l Hydrogen Peroxide in steps 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, and 1.0 mg/l H_2O_2.

Test Instructions

1. Fill a square test tube with the sample leaving 2 to 3 drops of the sample in the tube.

2. Add one Hydrogen Peroxide LR #1 tablet, crush and then fill the tube with the sample to the 10 ml mark. Mix to dissolve the tablet.

3. Stand for 2 minutes to allow full colour development.

4. Place the test tube in the Comparator and match against the disc in the usual manner.

5. The disc reading represents the hydrogen peroxide concentration as mg/l H_2O_2.

Notes

1. The sample should be free of other oxidizing agents such as chlorine, bromine etc. as these react in a similar manner and will interfere with the test. It is unlikely that these oxidizing agents will be used in

conjunction with hydrogen peroxide and, under normal circumstances, will not usually coexist in solution.

2. For measuring high levels of hydrogen peroxide used in industrial processes, use the Palintest Hydrogen Peroxide HR test. (See Comp.17)

Palintest
Test Instructions

HYDROGEN PEROXIDE HR

Colour Match Method

Test for High Levels of Hydrogen Peroxide in Water

0 - 100 mg/l

Hydrogen peroxide is used as a bleach and oxidizing agent in a number of industrial processes. Applications include textile bleaching, commercial laundering and paper manufacturing. It is important in such processes to control the hydrogen peroxide level within the correct range in order to achieve the desired bleaching or oxidizing effect without causing damage to the goods under treatment. Hydrogen Peroxide is also used in swimming pool water to control algae and improve clarity.

The Palintest Hydrogen Peroxide HR test provides a simple means of monitoring Hydrogen Peroxide levels in water over the range 0 - 100 mg/l.

Method

Hydrogen peroxide reacts with potassium iodide under slightly acid conditions, to release iodine which gives a yellow solution. A catalyst is used to speed up the rate of reaction. In the Palintest method the reagents are provided in the form of two tablets. The intensity of the colour produced is proportional to the hydrogen peroxide concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Hydrogen Peroxide HR Tablets
Palintest Acidifying PT Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 105 Hydrogen Peroxide
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 105 covers the range 0 - 100 mg/l Hydrogen Peroxide in steps 10, 20, 30, 40, 50, 60, 70, 80 and 100 mg/l H_2O_2.

Test Instructions

1. Fill a square test tube with the sample to the 10 ml mark.

2. Add one Acidifying PT tablet and one Hydrogen Peroxide HR tablet. Crush the tablets and mix to dissolve.

3. Place the test tube in the Comparator and match against the disc in the usual manner.

4. The disc reading represents the hydrogen peroxide concentration present in the sample as mg/l H_2O_2.

Notes

1. The sample should be free of other oxidizing agents such as chlorine, bromine etc. as these react in a similar manner and will interfere with the test. It is unlikely that these oxidizing agents will be used in conjunction with hydrogen peroxide and, under normal circumstances, will not usually coexist in solution.

2. For measuring low levels of hydrogen peroxide, use the Palintest Hydrogen Peroxide HR test. (See Comp.16)

Palintest
Test Instructions

IRON LR

Colour Match Method

Test for Low Levels of Iron in Natural and Treated Water

0 - 1.0 mg/l

Iron occurs widely in nature and is found in many natural and treated waters. Iron is an objectionable constituent in both domestic and industrial water supplies. The presence of iron affects the taste of beverages and causes unsightly staining of laundered clothes, plumbing fittings, swimming pool surfaces and the like. The formation of insoluble iron deposits is troublesome in many industrial applications and in agricultural water uses such as drip feed irrigation. In industry, iron salts occur through corrosion of plant and equipment, and from industrial processes.

Iron is therefore an important test for the monitoring of natural and drinking waters, for corrosion control in industry and for the checking of effluents and waste waters. The Iron LR test provides a simple test for the determination of low levels of iron in water over the range 0 to 1 mg/l Fe. The test responds to both ferrous and ferric iron and thus gives a measure of the total iron content of the water.

Method

The Palintest Iron LR test is based on a single tablet reagent containing 3-(2-Pyridyl)-5, 6-bis (4-phenyl-sulphonic acid)-1, 2, 4-triazine (PPST) formulated with a decomplexing/reducing agent in an acid buffer. The test is simply carried out by adding a tablet to a sample of the water being tested. The decomplexing/reducing agent breaks down weakly complexed forms of iron, and converts the iron from the ferric to the ferrous form. The ferrous iron reacts with PPST to form a pink colouration.

The intensity of the colour produced is proportional to the iron concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Iron LR Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 155 Iron
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 155 covers the range 0 - 1 mg/l Iron in steps 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, and 1.0 mg/l Fe.

Test Instructions

1. Fill a square test tube with sample to the 10 ml mark.

2. Add one Iron LR tablet, crush and mix to dissolve.

3. Stand for 1 minute to allow full colour development.

4. Place the test tube in the Comparator and match against the disc in the usual manner.

5. The disc reading represents the iron concentration present in the sample as mg/l Fe.

Iron Complexes

The test colour development will normally be complete within one minute. Continued colour development after this time is indicative of more strongly bound iron complexes in the water. In such cases the test solution should be stood for a longer period, say 10 to 15 minutes, until the colour development is complete.

In certain industrial applications strong complexing agents are added to act as corrosion inhibitors. Moreover, some samples may contain precipitated iron complexes or particles of metallic iron. These samples will require pre-treatment by a standard laboratory procedure if it is required to determine the total iron content. The usual method of pre-treatment is acidification, with or without boiling, depending on the nature of the sample.

To use the Palintest Iron LR test after such pre-treatment procedures, add the Iron LR tablet to the acidified sample, adjust to pH 3.5 - 4.0 using ammonia or sodium hydroxide, then take the disc reading in the normal manner.

Palintest
Test Instructions

IRON HR

Colour Match Method

Test for High Levels of Iron in Natural and Treated Water

0 - 10 mg/l

Iron occurs widely in nature and is found in many natural and treated waters. Iron is an objectionable constituent in both domestic and industrial water supplies. The presence of iron affects the taste of beverages and causes unsightly staining of laundered clothes, plumbing fittings, swimming pool surfaces and the like. The formation of insoluble iron deposits is troublesome in many industrial applications and in agricultural water uses such as drip feed irrigation. In industry, iron salts occur through corrosion of plant and equipment, and from industrial processes.

Iron is therefore an important test for the monitoring of natural and drinking waters, for corrosion control in industry and for the checking of effluents and waste waters. The Iron HR test provides a simple test for the determination of high levels of iron in water over the range 0 to 10 mg/l Fe. The test responds to both ferrous and ferric iron and thus gives a measure of the total iron content of the water.

Method

The Palintest Iron HR test is based on a single tablet reagent containing an alkaline thioglycollate. The test is simply carried out by adding a tablet to a sample of the water being tested. The thioglycollate reduces ferric iron to ferrous iron and this, together with any ferrous iron already present in the sample, reacts to give a pink colouration

The intensity of the colour produced is proportional to the iron concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Iron HR Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 156 Iron
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 156 covers the range 0 - 1 mg/l Iron in steps 1, 2, 3, 4, 5, 6, 7, 8 and 10 mg/l Fe.

Test Instructions

1. Fill a square test tube with the sample to the 10 ml mark.

2. Add one Iron HR tablet, crush and mix to dissolve.

3. Stand for 1 minute to allow full colour development.

4. Place the test tube in the Comparator and match against the disc in the usual manner.

5. The disc reading represents the iron concentration present in the sample as mg/l Fe.

Iron Complexes

The test colour development will normally be complete within one minute. Continued colour development after this

time is indicative of more strongly bound iron complexes in the water. In such cases the test solution should be stood for a longer period, say 10 to 15 minutes, until the colour development is complete.

In certain industrial applications strong complexing agents are added to act as corrosion inhibitors. Moreover, some samples may contain precipitated iron complexes or particles of metallic iron. These samples will require pre-treatment by a standard laboratory procedure if it is required to determine the total iron content. The usual method of pre-treatment is acidification, with or without boiling, depending on the nature of the sample.

To use the Palintest Iron HR test after such pre-treatment procedures, add the Iron HR tablet to the acidified sample, adjust to pH 6.0 to 9.0 using ammonia or sodium hydroxides, then take the disc reading in the normal manner.

Palintest
Test Instructions

MANGANESE

Test for Soluble Manganese in Water

Colour Match Method
0 - 0.030 mg/l
(0 - 30 μg/l)

Manganese-containing minerals occur widely and manganese salts are commonly found in many natural waters. Manganese is an objectionable constituent in water used for domestic purposes or industrial applications. In domestic situations, manganese will cause brown or black staining to laundry or plumbing fittings even at very low concentrations. In process applications such as paper manufacturing or textile finishing similar staining can occur. Manganese salts may impart an astringent taste to drinking water supplies, and in swimming pool applications can give an aesthetically displeasing brown colouration to the water.

In most cases where manganese salts occur naturally in the water, it will be necessary to apply special methods of removal before the water can be used for domestic or industrial purposes. The Manganese test provides an extremely sensitive method of measuring low concentrations of manganese for the assessment of natural waters and the control of manganese removal plant. The test measurers total manganese over the range 0 - 30 μg/l (0 - 0.03 mg/l).

Method

Manganese may occur in water in various valency states. In the first stage of the Palintest method, manganese in lower valency states is oxidised to form permanganate by the action of an oxidising agent. In the second stage the permanganate formed is further reacted with leucomalachite green to form an intense turquoise coloured complex. Catalysts and inhibitors are incorporated into the tablet reagents to ensure that the colour reaction proceeds correctly and interferences are eliminated.

The intensity of the colour produced is proportional to the manganese concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Manganese No 1 Tablets
Palintest Manganese No 2 Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 173 Manganese
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 1736 covers the range 0 - 30 μg/l Manganese in steps 0, 2.5, 5.0, 7.5, 10, 15, 20, 25 and 30 0 - 30 μg/l Mn

Sample Collection

Manganese is readily absorbed onto the surfaces of sample containers. To avoid loss of manganese, test samples as soon as possible after collection.

It is important, because of the extreme sensitivity of this test, to ensure that glassware used for the sample collection and test procedure is scrupulously clean. For most accurate results in laboratory use, it is recommended that all glassware be acid rinsed and then thoroughly washed out with deionised water before use.

Test Instructions

1. Fill a square test tube with the sample to the 10 ml mark. (See note #1)

2. Add one Manganese No 1 tablet, crush and mix to dissolve.

3. Add one Manganese No 2 tablet, crush and mix to dissolve, then cap the tube.

4. Stand for 20 minutes to allow full colour development. (See note #2)

5. Place the test tube in the Comparator and match against the disc in the usual manner.

6. The disc reading represents the manganese concentration present in the sample as micrograms per litre Mn.

Notes

1. Colour formation is extremely sensitive to temperature. The sample temperature should be 20° ± 1°C for optimum test results.

2. It is important to observe the standing period 20 minutes ± 1 minute for optimum test results. Any continuing colour development or colour change after this period should be ignored.

Palintest
Test Instructions

MOLYBDATE HR

TEST FOR HIGH LEVELS OF MOLYBDATE, IN INDUSTRIAL WATERS AND EFFLUENTS

Colour Match Method using Palintest Comparator 0 - 100 mg/l $Mo0_4$

Formulations containing molybdate are used as corrosion inhibitors in industrial water treatment. In particular, molybdate finds application in closed recirculating systems such as hot water heating systems and chilled water systems. Molybdate-based formulations have replaced older forms of corrosion inhibitors such as chromate.

When using molybdate treatment it is necessary to control the molybdate concentration within specified levels depending on the application involved. Moreover, since molybdates are widely used in water treatment and in industrial processes, molybdate is an increasingly important test for effluents and industrial discharges.

The Palintest Molybdate HR test provides a simple means of measuring high levels of molybdate in industrial waters and effluents and covers the range 0 - 100 mg/l $Mo0_4$.

Method

Molybdates react with thioglycollate under acid conditions to give a yellow coloured complex. Slightly oxidizing conditions are maintained during the acidification stage in order to keep the molybdate in a fully oxidized state. Under the conditions of the test, iron does not interfere and there is no significant interference from other metals at levels likely to be found in industrial water systems. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of water.

The intensity of the colour produced in the test is proportional to the molybdate concentration, and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Molybdate No. 1 HR Tablets
Palintest Molybdate No. 2 HR Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 175 Molybdate
Square Test Tubes, 13.5 mm, 10 ml (PT 521)
Disc CD 175 covers the range 0 - 100 mg/l molybdate in steps 5, 10, 20, 30, 40, 50, 60, 80, and 100, mg/l $Mo0_4$.

Test Procedure

1. Fill a square test tube with the sample to the 10 ml mark.
2. Add one Molybdate No. 1 HR tablet, crush and mix to dissolve.
3. Add one Molybdate No. 2 HR tablet, crush and mix to dissolve.
4. Place the test tube in the Comparator and match against the disc in the usual manner.
5. The disc reading represents the molybdate concentration present in the sample as milligrams per litre $Mo0_4$.

Note

Molybdate concentrations can be expressed in many different ways.

The following factors may be used for the conversion of readings:

To convert from $Mo0_4$ to Na_2Mo0_4 multiply by 1.3

To convert from MoO_4 to M multiply by 0.6

Palintest
Test Instructions

Nitrate

Colour Match Method

Test for Nitrate in Natural, Drinking and Waste Water

0 - 15 mg/l N

Nitrates are normally present in natural, drinking and waste waters. Nitrates enter water supplies from the breakdown of natural vegetation, the use of chemical fertilizers in modern agriculture and from the oxidation of nitrogen compounds in sewage effluents and industrial waters.

Nitrate is an important control test for water supplies. Drinking waters containing excessive amounts of nitrates can cause methaemoglobinaemia in bottle-fed infants (blue babies). The EEC has set a recommended maximum of 5.7 mg/l N (25 mg/l NO_3) and an absolute maximum of 11.3 mg/l N (50 mg/l NO_3) for nitrate in drinking water.

The Palintest Nitratest method provides a simple test for nitrate nitrogen over the range 0 - 15 mg/l N.

Method

In the Palintest Nitratest method nitrate is first reduced to nitrite, the resulting nitrite is then determined by a diazonium reaction to form a reddish dye.

The reduction stage is carried out using the unique zinc-based Nitratest Powder, and Nitratest Tablet which aids rapid flocculation after the one minute contact period. The test is conducted in a special Nitratest Tube - a graduated sample container with hopper bottom to facilitate settlement and decanting of the sample.

The nitrite resulting from the reduction stage is determined by reaction with sulphanilic acid in the presence of N-(1-naphthyl)-ethylene diamine to form a reddish dye. The reagents are provided in a single Nitricol tablet which is simply added to the test solution.

The intensity of the colour produced is proportional to the nitrate concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Nitratest Powder (Spoon Pack)	Measuring Syringe, 1 ml (PT 361)
	Palintest Comparator (PT 520)
Palintest Nitratest Tablets	Palintest Comparator Disc CD 163 Nitrate
Palintest Nitricol Tablets	Square Test Tubes, 13.5 mm, 10 ml (PT 521)
Palintest Nitratest Tube, 20 ml (PT 508)	Deionised Water

Disc CD 163 covers the range 0 - 20 mg/l nitrate in steps 1.0, 2.0, 3.0, 4.0, 6.0, 8.0, 10, 12 and 15 mg/l N.

Test Instructions

1. Take a clean Nitratest Tube and add 1 ml of sample using the measuring syringe. Fill the Nitratest tube to the 20 ml mark with deionised water.

2. Add one level spoonful of Nitratest Powder and one Nitratest tablet. Do not crush the tablet. Replace screw cap and shake the tube well for one minute.

3. Allow the tube to stand for about one minute then gently invert three or four time to aid flocculation. Allow the tube to stand for two minutes or longer to ensure complete settlement.

4. Remove screw cap and wipe around the top of the tube with a clean tissue. Carefully decant the clear solution into a round test tube, filling to the 10 ml mark.

5. Add one Nitricol tablet, crush and mix to dissolve.

6. Stand for 10 minutes to allow full colour development.

7. Place the test tube in the Comparator and match against the disc in the usual manner.

8. The disc reading represents the nitrate nitrogen concentration present in the sample as milligrams per litre N.

To convert mg/l N to mg/l NO_3 *multiply result by 4.4.*

Nitrate Correction

The Nitratest method will also respond to any nitrite present in the sample. In most natural and drinking waters the nitrite will be small in comparison to the nitrate concentration. If it is desired to correct for nitrite, determine nitrite concentration (as mg/l N) in the prescribed manner (see Comp. 24) and deduct from the nitrate concentration (as mg/l N) obtained from the Nitratest procedure.

Palintest
Test Instructions

Nitrite (NITRICOL) — Colour Match Method

Test for Nitrite in Natural, Drinking and Waste Water — 0 - 0.4 mg/l N

Nitrites are found in natural waters as an intermediate product in the nitrogen cycle. Nitrite is harmful to fish and other aquatic life forms. The nitrite level must be carefully controlled in water used for fish farms and aquariums. The nitrite test is also applied for pollution control in waste waters, and for the monitoring of drinking water.

The Palintest Nitricol test provides a simple method of measuring Nitrite Nitrogen levels over the range 0 - 0.4 mg/l . Higher levels can be determined by diluting the sample.

Method

Nitrites in acid solutions react with sulphanilic acid. The resulting diazo compound couples with N-(1-naphthyl)-ethylene diamine to form a reddish dye. The Palintest Nitricol method features a single tablet reagent containing both reagents in an acidic formulation. The test is simply carried out by adding a tablet to a sample of the water being tested.

The intensity of the colour produced is proportional to the nitrite concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Nitricol Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 109 Nitrate
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 109 covers the range 0 - 0.04 mg/l nitrite nitrogen in steps 0.02, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35 and 0.40 mg/l N.

Test Procedure

1. Fill a square test tube with the sample to the 10 ml mark.
2. Add one Nitricol tablet, crush and mix to dissolve.
3. Stand for 10 minutes to allow full colour development.
4. Place the test tube in the Comparator and match against the disc in the usual manner.
5. The disc reading represents the iron concentration present in the sample as mg/l Fe.

To convert Nitrite Nitrogen (N) to Nitrite ion(NO_2) *multiply the result by 3.3*

Palintest
Test Instructions

OZONE

Colour Match Method

TEST FOR OZONE IN WATER

0 - 1.0 mg/l

Ozone is used for the disinfection of swimming pool water, and in many other water treatment systems. In swimming pool water treatment, ozone is normally introduced into the circulation system and then removed before the reentry of the water to the pool. In other water treatment systems an ozone residual may be maintained in the water. In all cases, accurate measurement of ozone residual is essential for the control of the system or to ensure that the ozone has been removed.

The Palintest DPD Ozone method provides a simple means of measuring ozone residuals up to a level of 1 mg/l. Other disinfectants such as chlorine and bromine are frequently used in conjunction with ozone. Supplementary procedures are therefore provided for the separate determination of these residuals.

Method

The Palintest Ozone test uses the DPD method now internationally recognised as the standard method of testing for disinfectant residuals. In the DPD method the reagents are provided in tablet form for maximum convenience and simplicity of use.

Ozone reacts with diethyl-p-phenylene diamine (DPD) in buffered solution in the presence of potassium iodide to produce a pink colouration. The intensity of the colour is proportional to the ozone concentration and is measured using a Palintest Comparator and Disc.

For the determination of ozone in the presence of chlorine or bromine, a supplementary procedure using glycine is used. The glycine destroys the ozone in the sample and the colour produced in the DPD test thus corresponds to the chlorine or bromine only. The ozone content is thus obtained by the difference between the test readings with and without glycine.

Reagents and Equipment

Palintest DPD No 4 Tablets
Palintest DPD Glycine Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc CD 056 Ozone
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 056 covers the range 0 - 1 mg/l Ozone in steps 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, and 1.0 mg/l O_3

Test Procedure

1. Rinse a test tube with sample leaving two or three drops of the sample in the tube.

2. Add one DPD No 4 tablet, crush the tablet and then fill the test tube with the sample to the 10 ml mark. Mix to dissolve tablet.

3. Place the test tube in the Comparator and match immediately against the disc in the usual manner.

4. The disc reading (**Reading A**) represents the ozone residual as mg/l O_3.

The test may be terminated at this stage for systems treated with ozone alone. For waters containing both ozone and chlorine or bromine, a correction should be made as indicated in the following sections.

Correction for Chlorine or Bromine

1. Fill a test tube with the sample to the 10 ml mark. Add one DPD Glycine tablet, crush and mix to dissolve.

2. Take a second clean test tube and add two to three drops of solution from the first tube. Add one DPD No 4 tablet, crush and then add the remainder of the solution to make up to the 10 ml mark. Mix to dissolve tablet.

3. Place the test tube in the Comparator and match immediately against the disc in the usual manner. The disc reading (**Reading B**) represents the chlorine or bromine residual in terms of mg/l O_3.

4. The ozone residual as milligrams per litre is obtained by subtracting the second Comparator disc reading from the first.

   ie Ozone (mg/l) = Reading A - Reading B

Palintest
Test Instructions

pH (PHENOL RED)

Test for pH Value of Water and Aqueous Solutions

Colour Match Method
5.2 - 9.6 (4 Ranges)
4 - 11

pH value is a parameter frequently carried out on water and aqueous solutions. The Palintest pH method provides a simple test for the determination of pH for a variety of applications. The test is available in four narrow ranges covering pH values between 5.2 and 9.6; and one wide range covering pH values from 4 to 11.

Method

The Palintest pH methods use standard pH indicators in tablet form. Different indicators are used to cover different pH ranges. Each tablet contains the precise amount of indicator required for the test. All Palintest pH tablets contain a dechlorinating agent so that the tests can be carried out in water containing chlorine or other disinfectant residuals.

The colour produced when the indicator tablet is added to a sample of the water is indicative of the pH value. The colour is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest pH indicator Tablets (see table)
Palintest Comparator (PT 520)
Palintest Comparator Disc - pH (see table)
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc Code	Range of Standards	Indicator Tablet Required
CD 128	5.2 - 6.8	Bromocresol Purple
CD 129	6.0 - 7.6	Bromothymol Blue
CD 131	6.8 - 8.4	Phenol Red
CD 135	8.0 - 9.6	Thymol Blue
CD 136	4 - 11	Universal pH

Test Procedure

1. Select the appropriate disc and indicator tablets for the pH range under test.
2. Fill a test tube with the sample to the 10 ml mark
3. Add one pH indicator tablet, crush and mix to dissolve.
4. Place the test tube in the Comparator and match against the disc in the usual manner.

5. The disc reading represents the pH value present in the sample.

NOTE

If the colour is outside the range of the disc and cannot be matched, the test should be repeated using a higher or lower range disc with the corresponding indicator tablets.

Palintest
Test Instructions

Phosphate LR

Colour Match Method

Test for Low Levels of Phosphate in Natural, Drinking and Waste Water

0 - 4.0 mg/l

Phosphates are extensively used in detergent formulations and washing powders. Phosphates also find widespread application in the food processing industry and in industrial water treatment processes. Agricultural fertilizers normally contain phosphate minerals and phosphates also arise from the breakdown of plant materials and in animal wastes.

Phosphates can, therefore, enter water courses through a variety of routes - particularly domestic and industrial effluents and run off from agricultural land. Phosphate is an important control test for natural, drinking and waste waters.

While phosphates are not generally considered harmful for human consumption, they do exhibit a complex effect on the natural environment. In particular phosphates are associated with eutrophication of water and with rapid unwanted plant growth in rivers and lakes. Phosphates present in natural water pass through into drinking water supplies.

The Palintest Phosphate LR test provides a simple method of measuring phosphate levels over the range 0 - 4 mg/l PO_4. For drinking water the EEC has set a guide level of 0.5 mg/l PO_4 (0.4 mg/l P_2O_5) and a maximum admissible concentration of 6.7 mg/l PO_4 (5 mg/l P_2O_5).

Method

In the Palintest Phosphate LR method, the phosphate reacts under acid conditions with ammonium molybdate to form phospho-molybdic acid. This compound is reduced by ascorbic acid to form the intensely coloured “molybdenum blue” complex. A catalyst is incorporated to ensure complete and rapid colour development, and an inhibitor is used to prevent interference from silica. The reagents are provided in the form of two tablets for maximum convenience. The test is simply carried out by adding one of each tablet to a sample of the water.

The colour produced when the indicator tablet is added to a sample of the water is indicative of the phosphate value. The colour is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment

Palintest Phosphate No 1 LR tablets
Palintest Phosphate No 2 LR tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc -CD 177 Phosphate
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 177 covers the range 4.0 mg/l Phosphate in steps 0, 0.25, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0 and 4.0 mg/l PO_4.

Test Procedure

1. Fill a test tube with the sample to the 10 ml mark.

2. Add one Phosphate No 1 LR tablet, crush and mix to dissolve.

3. Add one Phosphate No 2 LR tablet, crush and mix to dissolve.

4. Stand for 10 minutes to allow full colour development.

5. Place the test tube in the Comparator and match against the disc in the usual manner.

6. The disc reading represents the Phosphate concentrations present in the sample as milligrams per litre PO_4.

Note

Phosphate concentrations can be expressed in a number of different ways.
The following factors may be used for the conversion of readings: -

To convert from PO_4 to P_2O_5	multiply by 0.75.
To convert from PO_4 to P	multiply by 0.33.

Palintest
Test Instructions

Phosphate HR

Colour Match Method

Test for High Levels of Phosphate in Boiler Water

0 - 100 mg/l

Phosphates are extensively used for treating water in boilers and steam plants. Phosphates are added to control the deposition of sediment and deposits within the boiler. It is an essential part of the treatment programme to monitor the phosphate level to ensure this is within the correct range of deposition control.

The Palintest Phosphate HR test provides a simple method of measuring phosphate levels in boiler waters over the range 0 - 100 mg/l PO_4.

Method

The Palintest Phosphate HR test is based on the vanadomolybdate method. The distinct advantage of the Palintest method is that all reagents required are provided in the form of a test tablet. The test is carried out simply by adding a single tablet to a sample of the boiler water. .

In the test phosphates react with ammonium molybdate, in the presence of ammonium vanadate, to form the yellow phosphovanadomolybdate. The intensity of the colour produced in the test is proportional to the phosphate concentration and is measured using a Palintest Comparator and Disc.

Sample Collection

Samples drawn from boiler sampling points may be hot and contain particulate matter. Before analysis, samples should be cooled to below 25°C and filtered through a Whatman No. 42 filter paper.

Reagents and Equipment

Palintest Phosphate HR tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc -CD 114 Phosphate
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 114 covers the range 0 - 100 mg/l Phosphate in steps 0, 15, 30, 40, 50, 60, 70, 80 and 100 mg/l PO_4.

Test Procedure

1. Fill a test tube with the sample to the 10 ml mark.

2. Add one Phosphate HR tablet, crush and mix to dissolve.

3. Stand for 10 minutes to allow full colour development.

4. Place the test tube in the Comparator and match against the disc in the usual manner.

5. The disc reading represents the phosphate concentration present in the sample as milligrams per litre PO_4.

Palintest
Test Instructions

SILICA

Colour Match Method

Test for Silica in Natural, Treated and Industrial Water

0 - 4.0 mg/l SiO_2

Silicon, in the form of silica, is one of the earth's most abundant elements. Silicon is found widely in natural waters as colloidal silica or soluble silicates.

Silica and silicates do not normally cause any problems in water intended for domestic consumption. However, their presence is undesirable in water used in a variety of industrial applications. This is because of the tenancy of such water to form a hard scale on equipment. Silica and silicate containing waters are particularly troublesome in steam plants such as high pressure boilers since silica scale can build up on turbine blades.

The Palintest Silica test provides a simple method of measuring silica and silicate levels in natural, treated and industrial waters over the range 0 - 4 mg/l SiO_2.

Method

Ammonium molybdate reacts with silica under acid conditions to produce molybdosilicic acid. In the presence of a reducing agent, this compound is reduced to form an intense blue complex. Phosphate reacts in a similar manner. Interference by phosphate is prevented by introducing a reagent which destroys any molybdophosphoric acid which may form.

The reagents for the method are provided in tablet form and the test is carried out simply by adding tablets to a sample of water. The colour produced when the indicator tablet is added to a sample of the water is indicative of the silica concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Reagents and Equipment
Palintest Silica No 1 tablets
Palintest Silica No 2 tablets
Palintest Silica PR tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc -CD 181 Silica
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 181 covers the range 0 - 4.0 mg/l silica in steps 0.25, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5 and 4.0 mg/l SiO_2.

Test Procedure

1. Fill a test tube with the sample to the 10 ml mark.

2. Add one Silica No 1 tablet, crush and mix to dissolve. Stand for 5 minutes to allow the silica to react.

3. Add one Silica PR tablet, crush and mix to dissolve. (This stage may be omitted if the sample is known to be completely free of phosphate).

4. Add one Silica No 2 tablet, crush and mix to dissolve. Stand for one minute to allow full colour development.

5. Place the test tube in the Comparator and match against the disc in the usual manner.

6. The disc reading represents the silica concentrations present in the sample as milligrams per litre SiO_2.

Palintest
Test Instructions

SULPHIDE

Colour Match Method

Test for Sulphide in Natural and Treated Waters

0 - 0.5 mg/l

Natural waters containing dissolved hydrogen sulphide and other sulphide are found in certain parts of the world, particularly in areas having hot springs. Sulphides are constituents of many industrial wastes such as those from tanneries, gas plants and chemical works. Sulphides can be toxic to fish and aquatic life; and their presence in water supplies gives rise to undesirable tastes and odours. Sulphide also causes problems with odour in well water.

The Sulphide Test provides a simple method of measuring total available sulphide over the range 0 - 0.5 mg/l and is particularly applicable to natural and drinking waters. Higher levels, such as those found in effluents and waste waters, can be determined by diluting the sample.

Method

This simplified method for the determination of sulphide is based on a reagent containing diethyl-p-phenylene diamine (DPD) and potassium dichromate. Sulphide reacts with this reagent in acid solution to produce a blue coloured complex. In the absence of sulphide the reagent produces a pink colour. Chlorine, and other oxidizing agents which normally react with DPD, do not interfere with the test. The reagents are provided in the form of two tablets and the test is simply carried out by adding one of each tablet to a sample of the water.

Reagents and Equipment

Palintest Sulphide No 1 tablets
Palintest Sulphide No 2 tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc -CD 168 Sulphide
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc 3/128 covers the range 0 to 0.50 mg/l sulphide in steps 0, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.40 and 0.50 mg/l S.

Sample Collection

To prevent loss of sulphide collect the sample carefully with a minimum of agitation or aeration. Test the sample as soon as possible after collection.

Test Procedure

1. Fill a test tube with the sample to the 10 ml mark.

2. Add one Sulphide No 1 tablet and one Sulphide No 2 tablet. Crush and mix gently to dissolve the tablets. Gentle mixing is essential to avoid loss of sulphide.

3. Stand for 10 minutes to allow full colour development.

4. Place the test tube in the Comparator and match against the disc in the usual manner.

5. The disc reading represents the sulphide concentrations present in the sample as milligrams per litre S.

Palintest
Test Instructions

ZINC

Colour Match Method

Test for Zinc in
Natural and Treated Water

0 - 4.0 mg/l

Zinc compounds are used as corrosion inhibitors in industrial cooling water system and similar applications. Control of the zinc level is an important aspect of corrosion control in such systems. Zinc and zinc containing alloys are widely used in industry and zinc salts are commonly found in industrial effluents.

The Zinc Test provides a simple means of testing zinc levels over the range 0 to 4 mg/l and is suitable for testing cooling waters and industrial effluents, and for the monitoring of natural drinking waters.

Method

Zinc reacts with 5-(o-carboxyphenyl)-1-(2-hydroxy-5-sulphophenyl)-3-phenyl-formazan (Zincon) in alkaline solution to give an intense blue colour. The reagent itself is orange in the solution. At different zinc levels, a distinctive colour range from orange through purple to blue is produced. In the Palintest Zinc test a tablet reagent containing both Zincon and an alkaline buffer is used for maximum convenience. The test is simply carried out by adding a tablet to a sample of the water. Samples containing high chlorine residuals are pre treated with a special dechlorinating tablet to prevent bleaching of the test colours.

The colour produced in the test is indicative of the zinc concentration and is measured by comparison against colour standards using a Palintest Comparator and Disc.

Copper reacts in a similar manner to zinc and a correction procedure using EDTA is applied to those samples that contain both zinc and copper. EDTA destroys the colour complex formed with zinc.

Reagents and Equipment

Palintest Zinc tablets
Palintest Zinc-Dechlor tablets
Palintest EDTA Tablets
Palintest Comparator (PT 520)
Palintest Comparator Disc - CD 148 Zinc
Square Test Tubes, 13.5 mm, 10 ml (PT 521)

Disc CD 148 covers the range 4 mg/l Zinc in steps 0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5 and 4.0 mg/l Zn.

Test Procedure

1. Fill a test tube with the sample to the 10 ml mark.

2. IN THE CASE OF CHLORINE CONTAINING SAMPLE ONLY, add one Zinc-Dechlor tablet. Crush and mix to dissolve the tablet.

3. Add one Zinc tablet. Crush and mix to dissolve the tablet.

4. Allow the sample to stand for five minutes and then mix again to ensure the complete dissolution of the indicator.

5. Place the test tube in the Comparator and match against the disc in the usual manner.

6. The disc reading represents the Zinc concentrations present in the sample as milligrams per litre Zn. Stop the test at this stage unless the sample is suspected of containing Copper.

7. FOR COPPER CONTAINING SAMPLES ONLY. Continue the test on the same test portion. Add one EDTA tablet, crush and mix to dissolve.

8. Place the test tube in the Comparator and take a second reading against the disc.

9. Subtract this second reading from that originally obtained. This gives the corrected zinc concentration as milligrams per litre Zn.

SAMPLE DILUTION

INSTRUCTIONS FOR USE OF THE PALINTEST DILUTION TUBE AND DILUTION SYRINGES

Palintest tests are usually carried out directly on the sample collected. In some situations however it is desirable to dilute the sample in order to bring it within the correct test range. Indeed dilution of samples is a very useful technique in that it enables the range of the test to be greatly extended.

Whilst dilution is a simple operation, it often causes confusion to test kit users. The Palintest Dilution Tube (PT 512) has been developed to provide simple means of sample dilution for water and aqueous extracts. The dilution tube can be used to dilute the sample by a factor of 2, 3, 4, 5, or 10 times.

Palintest Dilution Syringes are used in those situations where a greater degree of dilution is required. Dilution syringes are available in two sizes and are used in conjunction with the dilution tube. Dilution syringe 10/100 (PT 375) can be used to dilute the sample by a factor of 10, 20, 25, 50 or 100 times. Dilution syringe 100/1000 (PT 376) can be used to dilute the sample by a factor of 100, 200, 250, 500 or 1000 times.

Using the Dilution Tube

1. Decide on the degree of sample dilution required. For example, if the solution is about 5 times too strong for the test range being used, then the sample should be diluted by a factor of five.

2. Fill the tube with the sample to one of the sample marks as appropriate. For example, if a 5 times dilution is required, fill to the x5 mark.

3. Fill the tube with demonized water to the line marked ‘Demonized Water’.

4. Cap the tube and mix the solution.

5. Use the diluted sample in the test being carried out in the normal manner.

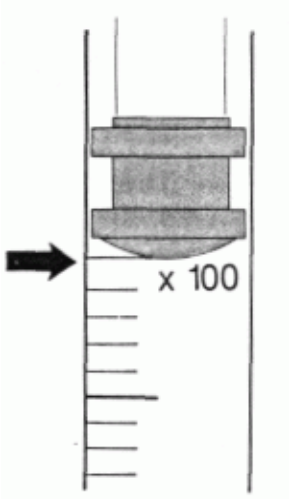
6. Multiply the test result obtained by the dilution factor used. For example, if the tube was originally filled to the x5 mark, then the kit result should be multiplied by 5 to give the concentration in the original sample.

Using the Dilution Syringe

1. Decide on the degree of sample dilution required. For example, if the solution is about 100 times too strong for the test range being used, then the sample should be diluted by a factor of 100.

2. Dip the tip of the syringe into the sample and draw up the sample into the syringe. Adjust the level of the sample in the syringe until it corresponds to the appropriate mark (see figure).

3. Discharge the solution from the syringe into a clean dilution tube. Fill the tube with demonized water to the line marked ‘Demonized Water’.



4. Cap the tube and mix the solution.

5. Use the diluted sample in the test being carried out in the normal manner.

6. Multiply the test result obtained by the dilution factor used. For example, if the syringe was originally filled to the x100 mark, then the test kit result should be multiplied by 100 to give the concentration in the original sample.

Demonized Water

Demonized water is required for sample dilution and for the general rinsing of test tubes, etc. The Palintest De-Ion pack has been specially developed to provide demonized water with test kits both in the field and in the laboratory.

The Palintest De-Ion pack produces approximately 5 litres of demonized water in 2-5 minutes from mains water or from clean natural water sources. Instructions for using the De-Ion pack are given on the product label and carton.

Notes

1. In certain Palintest methods the dilution stage is written into the test procedure. It is not necessary to multiply by the dilution factor if the test kit or calibration chart is already calibrated for a similarly diluted sample.

2. When using the Palintest Interface Photometer 7000, it is possible to key in the dilution factor at the start of the test. In this way the instrument can be used to get a direct reading of the test result for the original sample.

3. Dilution tubes and syringes should be rinsed thoroughly after use with demonized water. For accurate results it is most important to ensure that diluted solutions are not contaminated with undiluted samples.