• Dissolved Oxygen Test Kit
• Trousse d'analyse oxygène dissous
• Test Kit für gelösten Sauerstoff
• Kit para contenido en oxígeno disuelto

0.2–4 and 1–20 mg/L O_2
• Mod. OX-2P
• # 1469-00

- To ensure accurate results, read carefully before proceeding.
- Pour obtenir des résultats exacts, lire attentivement le mode d'emploi avant d'utiliser la trousse.
- Um genaue Ergebnisse zu gewährleisten, lesen Sie das Folgende bitte aufmerksam durch, bevor Sie fortfahren.
- Para obtener resultados precisos, lea detenidamente las instrucciones antes de proceder al análisis.

WARNING

Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

ATTENTION

La manipulation des échantillons chimiques, étalons et réactifs peut être dangereuse. Lire les fiches de données de sécurité des produits avant de manipuler tout produit chimique.

WARNUNG

Die Handhabung chemischer Proben, Standards und Reagenzien kann gefährlich sein. Bitte gehen Sie die Materialsicherheitsdatenblätter durch, bevor Sie Chemikalien handhaben.

ADVERTENCIA

El manejo de sustancias químicas, patrones y reactivos, puede resultar peligroso. Lea las fichas de informaciones de seguridad de materiales antes de manipular cualquier producto químico.

HACH®

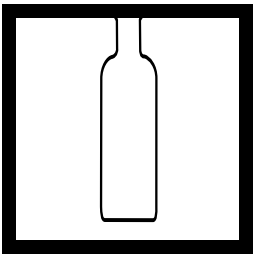
Measuring Hints and General Test Information

- Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).
- When titrating, count each drop of titrant. Hold the dropper vertically. Swirl the mixing bottle after each drop is added.
- Use clippers to open powder pillows.
- Use the Copper Sulfate-Sulfamic Acid Solution listed under *OPTIONAL REAGENTS AND EQUIPMENT* with the 500-mL graduated cylinder, siphon tube and latex tubing to remove interferences from activated sludge samples. See the *Water Analysis Handbook* or call Hach Company for more information.
- Perform a more sensitive test using Starch Indicator Solution, Cat. No. 349-32 (not included in kit). After Step 1 of the low-range test, titrate the sample until the color just begins to turn from yellow-brown to light yellow. Add two drops of Starch Indicator Solution. Continue with Step 2.
- Hach strongly recommends that, for optimum test results, reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit or listed in the *OPTIONAL REAGENTS AND EQUIPMENT* section. Follow the instructions included with each standard solution.

Conseils pour les mesures et informations générales sur l'analyse

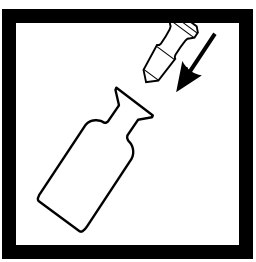
- Laver toute la verrerie entre les analyses. La contamination peut fausser les résultats d'analyses. Laver avec un détergent non abrasif ou un solvant tel que l'isopropanol. Utiliser un tissu doux pour essuyer ou sécher. Ne pas utiliser de tissu ou papier d'essuyage sur les tubes en plastique pour ne pas les rayer. Rincer à l'eau propre de préférence de l'eau désionisée.
- Lors du titrage, compter chaque goutte de titrant. Tenir le compte-gouttes verticalement. Agiter le flacon carré après chaque goutte.
- Utiliser la pince coupante pour ouvrir les gélules.
- Utiliser la solution de sulfate de cuivre-acide sulfamique listée sous *REACTIFS ET EQUIPEMENTS OPTIONNELS* avec l'éprouvette graduée de 500 mL, le tube siphon et le tuyau latex pour éliminer les interférences des échantillons de boues activées. Voir le *Water Analysis Handbook* ou appeler Hach pour information complémentaire.
- Une plus grande sensibilité est obtenue en utilisant la solution d'amidon, Réf. No. 349-32 (non fournie dans la trousse). Après l'étape 1 de l'analyse pour la gamme basse, titrer l'échantillon jusqu'à ce que la couleur vire du jaune-brun au jaune clair. Ajouter 2 gouttes de solution d'amidon. Continuer à l'étape 2.

• High Range Test (1–20 mg/L) • Technique gamme haute • Test für den hohen Bereich • Determinación de valores altos



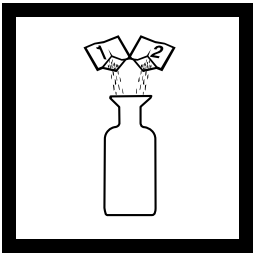
1. Fill the Dissolved Oxygen bottle (round bottle with glass stopper) with sample water by allowing the sample water to overflow the bottle for 2–3 minutes. Avoid turbulence and bubbles in the sample while filling.

- Remplir le flacon pour oxygène dissous (flacon avec bouchon rôdé) avec l'échantillon d'eau en laissant l'eau déborder pendant 2 à 3 minutes. Eviter la turbulence et les bulles dans l'échantillon pendant le remplissage.
- Füllen Sie die gelöster Sauerstoff-Flasche (runde Flasche mit Glasstöpsel) mit Probenwasser. Lassen Sie dabei das Probenwasser 2–3 Minuten lang aus der Flasche überfließen. Vermeiden Sie Turbulenz und Bläschen in der Probe, während Sie einfüllen.
- Llene el matraz para oxígeno (matraz con tapón de vidrio esmerilado) con la muestra de agua, dejando resbalar la muestra por el matraz suavemente durante 2 ó 3 minutos. Evite la formación de turbulencias y burbujas en la muestra al llenar.



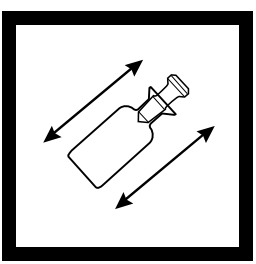
2. Incline the bottle slightly and insert the stopper with a quick thrust to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.

- Incliner légèrement le flacon et introduire le bouchon d'un mouvement rapide pour éviter de piéger des bulles d'air. Si des bulles d'air sont piégées, éliminer l'échantillon et recommencer l'analyse.
- Neigen Sie die Flasche leicht und setzen Sie den Stopfen mit einem schnellen Druck ein, um den Einschluß von Luftbläschen zu vermeiden. Wenn Bläschen eingefangen werden, verwerfen Sie die Probe und wiederholen Sie den Test.
- Incline ligeramente el matraz y coloque el tapón de un golpe para evitar atrapar burbujas de aire. Si las burbujas de aire quedan bloqueadas, desechar la muestra y reiniciar el análisis.



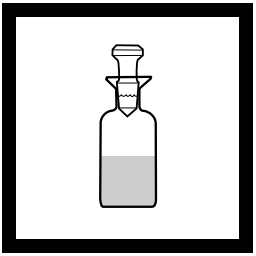
3. Remove the stopper and add the contents of one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.

- Retirer le bouchon et ajouter le contenu d'une gélule de réactif Oxygène Dissous 1 et d'une gélule de réactif Oxygène Dissous 2. Boucher le flacon avec précaution pour éviter de piéger des bulles d'air. Si des bulles d'air sont piégées, éliminer l'échantillon et recommencer l'analyse.
- Nehmen Sie den Stopfen heraus und geben Sie den Inhalt eines Gelöster Sauerstoff 1 Reagenz Rulverkissens und eines Gelöster Sauerstoff 2 Reagenz Rulverkissens in die Flasche. Verschließen Sie die Flasche sorgfältig mit dem Stopfen, um den Einschluß von Luftbläschen zu vermeiden. Wenn Bläschen eingefangen werden, verwerfen Sie die Probe und wiederholen Sie den Test.
- Quite el tapón y añada el contenido de una cápsula de reactivo para oxígeno disuelto 1 y de una cápsula de reactivo para oxígeno disuelto 2 al matraz. Tape el matraz suavemente para evitar atrapar burbujas de aire. Si las burbujas de aire quedan bloqueadas, desechar la muestra y reiniciar el análisis.



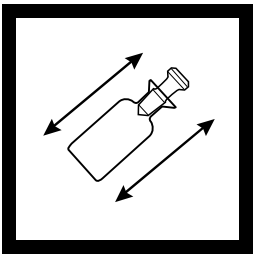
4. Shake the bottle vigorously to mix. Flocculant (floc) precipitate will form. Brownish-orange precipitate indicates oxygen is present.

- Secouer vigoureusement le flacon pour mélanger. Un précipité floculé (floc) se forme. Un précipité brun-orange indique la présence d'oxygène.
- Schütteln Sie die Flasche kräftig zum Mischen. Flockiger Niederschlag (Flocken) wird sich bilden. Braun-oranger Niederschlag zeigt die Anwesenheit von Sauerstoff an.
- Sacuda vigorosamente el matraz para mezclar. Se formarán flóculos de precipitado. Si se forma un precipitado naranja-marrón indica que hay oxígeno disuelto en la muestra.



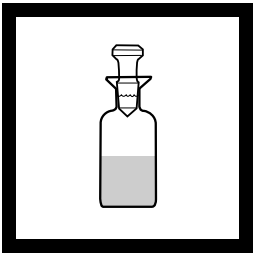
5. Wait for floc to settle to approximately half the bottle volume. Floc will not settle if high concentrations of chloride are present. In this case, wait 4–5 minutes before proceeding.

- ♦ Attendre la décantation du floc jusqu'à environ la moitié du volume du flacon. Le floc ne décante pas en présence de fortes concentrations de chlorure. Dans ce cas, attendre 4 à 5 minutes avant de continuer.
- ♦ Warten Sie, bis sich die Flocken bis auf ungefähr das halbe Volumen der Flasche abgesetzt haben. Die Flocken werden sich nicht absetzen, wenn hohe Chloridkonzentrationen vorherrschen. Warten Sie in diesem Falle 4–5 Minuten, bevor Sie fortfahren.
- ♦ Espere a que el precipitado se deposite aproximadamente hasta la mitad del volumen del matraz.Los flóculos no se depositarán si existen altas concentraciones de cloro. En este caso, aguarde 4–5 minutos antes de continuar.



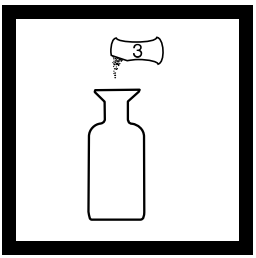
6. Shake the bottle vigorously again.

- ♦ Secouer de nouveau vigoureusement le flacon.
- ♦ Schütteln Sie die Flasche erneut kräftig.
- ♦ Sacuda de nuevo el matraz vigorosamente.



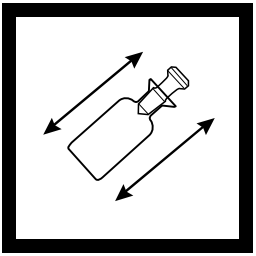
7. Wait for floc to settle halfway. Floc will not settle if high concentrations of chloride are present. In this case, wait 4–5 minutes before proceeding.

- Attendre la décantation du floc à mi-hauteur. Le floc ne décante pas en présence de fortes concentrations de chlorure. Dans ce cas, attendre 4 à 5 minutes avant de continuer.
- Warten Sie, bis sich die Flocken halbwegs gesetzt haben. Die Flocken werden sich nicht absetzen, wenn hohe Chloridkonzentrationen vorherrschen. Warten Sie in diesem Falle 4–5 Minuten, bevor Sie fortfahren.
- Espere hasta que los flóculos se depositen a mitad de camino. Los flóculos no se depositarán si existen altas concentraciones de cloro. En este caso, aguarde 4–5 minutos antes de continuar.



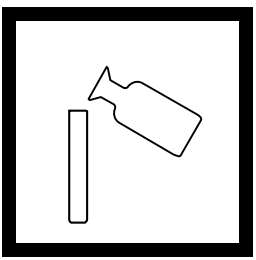
8. Remove the stopper and add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.

- Retirer le bouchon et ajouter le contenu d'une gélule de réactif Oxygène Dissous 3. Boucher le flacon avec précaution pour éviter de piéger des bulles d'air. Si des bulles d'air sont piégées, éliminer l'échantillon et recommencer l'analyse.
- Nehmen Sie den Stopfen heraus und geben Sie den Inhalt eines Gelöster Sauerstoff 3 Reagenz Rulverkissen dazu. Verschließen Sie die Flasche sorgfältig mit dem Stopfen, um den Einschluß von Luftblasen zu vermeiden. Wenn Bläschen eingefangen werden, verwerfen Sie die Probe und wiederholen Sie den Test.
- Quite el tapón y añada el contenido de una cápsula de reactivo para oxígeno disuelto 3. Tape el matraz suavemente para evitar atrapar burbujas de aire. Si las burbujas de aire quedan bloqueadas, desechar la muestra y reiniciar el análisis.



9. Shake the bottle vigorously to mix. Floc will dissolve and the sample will turn yellow if oxygen is present.

- Secouer vigoureusement le flacon pour mélanger. Le floc se dissout et la solution vire au jaune en présence d'oxygène.
- Schütteln Sie die Flasche kräftig zum Mischen. Der flockige Niederschlag wird sich auflösen und die Farbe der Probe wird in Gelb umschlagen, wenn Sauerstoff vorhanden ist.
- Sacuda vigorosamente el matraz. Los flóculos se disolverán y la muestra se volverá amarilla si contiene oxígeno disuelto.



10. Fill plastic tube full (to the top) with prepared sample.

Note: *Save the rest of the prepared sample for the Low Range Test, if necessary.*

- Remplir le petit tube plastique à ras bord avec l'échantillon préparé.

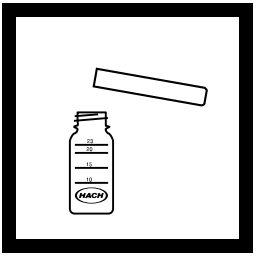
  Note: *Conserver le reste de l'échantillon préparé pour l'analyse gamme basse si nécessaire.*

- Füllen Sie das Plastikröhrchen mit vorbereiteter Probe (bis oben hin).

  Anmerkung: *Heben Sie den Rest der aufbereiteten Probe für den Test im niedrigen Bereich auf, falls erforderlich.*

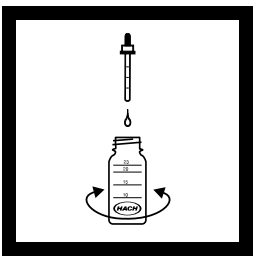
- Llene hasta el máximo la probeta de plástico con la muestra hasta aquí preparada.

  Nota: *De ser necesario, conserve el resto de la muestra preparada para la prueba de gama baja.*



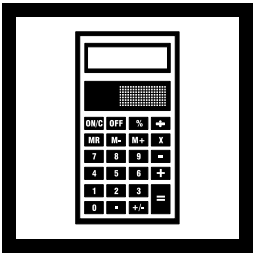
11. Pour the contents of the tube into a square mixing bottle.

- ♦ Verser le contenu du tube dans le flacon carré.
- ♦ Gießen Sie den Inhalt des Röhrchens in eine viereckige Mischflasche.
- ♦ Vierta el contenido de la probeta en el matraz para mezclar.



12. Add Sodium Thiosulfate Standard Solution one drop at a time to the mixing bottle. Count each drop. Swirl to mix after each drop. Add drops until the sample becomes colorless.

- ♦ Ajouter la solution de thiosulfate de sodium goutte à goutte au flacon carré. Compter chaque goutte. Agiter pour mélanger entre chaque goutte. Continuer à titrer jusqu'à virage à l'incolore.
- ♦ Geben Sie einen Tropfen Natriumthiosulfat Standardlösung zur Zeit in die Mischflasche. Zählen Sie jeden Tropfen. Schwenken Sie sie zum Vermischen nach jedem Tropfen. Geben Sie Tropfen dazu, bis die Probe farblos wird.
- ♦ Añada gota a gota la solución patrón de tiosulfato sódico al matraz. Cuente cada gota añadida. Agite hasta mezclar tras añadir cada gota. Continúe añadiendo gotas hasta que la muestra se vuelva incolora.



13. The total number of drops of titrant used in Step 12 equals the total mg/L Dissolved Oxygen.

mg/L Dissolved Oxygen = number of drops

Note: *If the result of Step 13 is 3 mg/L or less, it is advisable to perform a more sensitive test. Follow Low Range Test instructions.*

♦ Le nombre total de gouttes de titrant utilisées à l'étape 12 est égal à la concentration d'oxygène dissous en mg/L.

mg/L Oxygène dissous = nombre de gouttes

Note: *Si le résultat de l'étape 13 est 3 mg/L ou moins, il est conseillé d'effectuer une analyse plus sensible. Suivre les instructions pour la gamme basse.*

♦ Die Gesamtzahl der in Schritt 12 verbrauchten Tropfen Titersubstanz ist gleich den gesamten mg/L gelöster Sauerstoff (DO, Dissolved Oxygen).

mg/L gelöster Sauerstoff = Tropfenzahl

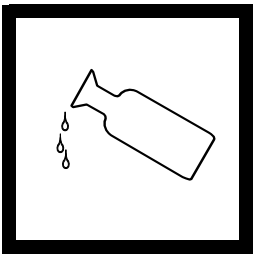
Anmerkung: *Beträgt das Ergebnis von Schritt 13 3 mg/L oder weniger, so ist es empfehlenswert, einen empfindlicheren Test durchzuführen. Befolgen Sie dafür die Anweisungen für den Test für den niedrigen Bereich.*

♦ El número total de gotas de solución valoradora empleadas en el punto 12 equivale al total de oxígeno disuelto expresado en mg/L.

mg/L de oxígeno disuelto = número de gotas

Nota: *Si el resultado obtenido en el paso anterior es 3mg/L o inferior, se aconseja realizar un análisis más sensible. Siga las instrucciones para experimentos con valores bajos.*

• Low Range Test (0.2 – 4 mg/L) • Technique gamme basse
• Test für den niedrigen Bereich
• Determinación de valores bajos

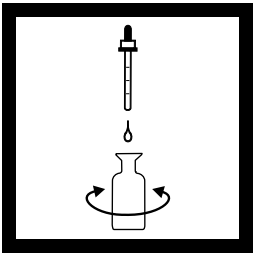


1. Use the prepared sample left from Step 10 of the High Range Test. Pour off the contents of the Dissolved Oxygen bottle until the level reaches the 30-mL mark on the bottle.

♦ Utiliser l'échantillon préparé restant à l'étape 10 de la technique pour gamme haute. Vider le contenu du flacon oxygène dissous jusqu'à ce que le niveau atteigne le niveau du trait 30 mL sur le flacon.

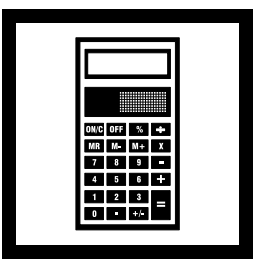
♦ Verwenden Sie die vorbereitete Probe, die aus Schritt 10 des Tests für den hohen Bereich übriggeblieben ist. Gießen Sie den Inhalt der Flasche für den gelösten Sauerstoff ab, bis der Stand die 30 mL-Markierung auf der Flasche erreicht.

♦ Utilice la muestra preparada a partir del punto 10 de la determinación para valores altos. Vierta parte del contenido del matraz DBO hasta alcanzar la marca de 30mL.



2. Add Sodium Thiosulfate Standard Solution one drop at a time to the Dissolved Oxygen bottle. Count each drop. Swirl the bottle after each drop is added. Add drops until the sample becomes colorless.

- Ajouter la solution de thiosulfate de sodium goutte à goutte au flacon carré. Compter chaque goutte. Agiter pour mélanger entre chaque goutte. Continuer à titrer jusqu'à virage à l'incolore.
- Geben Sie jeweils immer einen Tropfen Natriumthiosulfat Standardlösung in die Flasche für den gelösten Sauerstoff. Zählen Sie jeden Tropfen. Schwenken Sie die Flasche nach jedem Tropfen. Geben Sie Tropfen zu, bis die Probe farblos wird.
- Añada gota a gota la solución patrón de tiosulfato sódico directamente al matraz para oxígeno disuelto. Cuente cada gota añadida. Agite para mezclar tras añadir cada gota. Continúe añadiendo gotas hasta que la muestra se vuelva incolora.



3. Multiply by 0.2 the number of drops of titrant used. This is the total mg/L Dissolved Oxygen.

mg/L Dissolved Oxygen = number of drops x 0.2

- Multiplier par 0,2 le nombre de gouttes de titrant utilisées pour obtenir la concentration d'oxygène dissous en mg/L.

mg/L Oxygène dissous = nombre de gouttes x 0,2

- Multiplizieren Sie die Anzahl der verbrauchten Tropfen Titersubstanz mit 0,2. Das sind die gesamten mg/L gelöster Sauerstoff (DO, Dissolved Oygen).

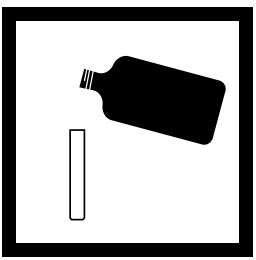
mg/L gelöster Sauerstoff = Tropfenzahl x 0,2

- Multiplique el número total de gotas de solución valoradora gastadas por 0,2. para obtener la concentración de oxígeno disuelto expresado en mg/L.

mg/L oxígeno disuelto = número de gotas x 0,2

• Accuracy Check • Vérification d'exactitude
• Genauigkeitstest • Controlar la precisión

Check the strength of the Sodium Thiosulfate Standard Solution with Potassium Iodide-Iodate Standard Solution:
Vérifier le titre de la solution titrée de thiosulfate de sodium avec la solution titrée d'iodure-iodate de potassium:
Überprüfen Sie die Stärke der Natriumthiosulfat-Standardlösung mit der Kaliumiodid-iodat-Standardlösung:
Verificar la fuerza de la Solución patrón de tiosulfato de sodio con la solución patrón de yoduro-yodato potásico:



1. Fill plastic tube with 0.00125 N Potassium Iodide-Iodate Standard Solution.

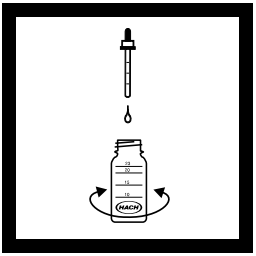
- ♦ Remplir le tube plastique avec la solution d'iodure-iodate de potassium.
- ♦ Füllen Sie das Kunststoffröhrchen mit 0,00125 N Natriumthiosulfat-Standardlösung auf.
- ♦ Llenar el tubo de plástico con 0.00125 N de Solución patrón de yoduro-yodato potásico.

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

- ♦ Verser le contenu du tube dans un flacon carré.
- ♦ Schütten Sie den Röhrcheninhalt in eine viereckige Mischflasche.
- ♦ Verter el contenido del tubo en una botella mezcladora cuadrada.

3. Add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow to the bottle and swirl to mix.

- ♦ Ajouter le contenu d'un sachet de réactif Oxygène dissous 3 au flacon et agiter pour mélanger.
- ♦ Geben Sie den Inhalt eines Pulverkissens mit gelöstem Sauerstoff 3 Reagenz in die Flasche und schwenken Sie sie zum Vermischen.
- ♦ Agregar a la botella el contenido de una bolsa de polvo reactivo 3 para oxígeno disuelto. Agitar la botella para mezclar la solución.



4. Add Sodium Thiosulfate Standard Solution one drop at a time to the mixing bottle. Count each drop. Swirl to mix after each drop. Add drops until the sample becomes colorless. It should take 10 drops of 0.0109 N Sodium Thiosulfate Standard Solution for the titration end point.

Note: *If fewer than 10 drops Sodium Thiosulfate Standard Solution are required, repeat the test carefully. If more than 10 drops are required, replace the standard solution.*

♦ Ajouter la solution de thiosulfate de sodium goutte à goutte au flacon carré. Compter chaque goutte. Agiter pour mélanger après chaque goutte. Ajouter des gouttes jusqu'à virage de l'échantillon à l'incolore. Dix gouttes de solution de thiosulfate de sodium 0,0109 N doivent être nécessaires pour atteindre le virage du titrage.

Note: *Si moins de dix gouttes sont nécessaires, recommencer l'essai avec soin. Si plus de dix gouttes sont nécessaires, remplacer la solution de thiosulfate.*

♦ Geben Sie die Natriumthiosulfat-Standardlösung tropfenweise in die Mischflasche. Zählen Sie dabei jeden Tropfen. Schwenken Sie die Flasche nach jedem Tropfen. Geben Sie solange Tropfen hinzu, bis die Probe farblos wird. Bis zum Umschlagpunkt sollten 10 Tropfen 0,0109 N Natriumthiosulfat-Standardlösung genügen.

Anmerkung: *Werden weniger als 10 Tropfen Natriumthiosulfat-Standardlösung benötigt, ist der Test sorgsam zu wiederholen. Werden mehr als 10 Tropfen benötigt, so ist die Standardlösung auszuwechseln.*

♦ Agregar gota a gota la solución patrón de tiosulfato de sodio a la botella mezcladora. Contar cada una de las gotas y agitar la mezcla cada vez que se agrega una gota. Agregar gotas hasta que la muestra resulte incolora. Se requieren normalmente 10 gotas de 0.0109 de Solución patrón de tiosulfato de sodio para completar la valoración.

Nota: *Si se necesitasen menos de 10 gotas de Solución patrón de tiosulfato de sodio, repetir cuidadosamente la prueba. Si fuesen necesarias más de 10 gotas, cambiar la solución patrón.*

REPLACEMENTS

Description	Unit	Cat. No.
Bottle, BOD, 60-mL w/ 30 mL mark, glass w/ stopper	each	1909-02
Bottle, square, glass	6/pkg	439-06
Clippers for medium powder pillows	each	968-00
Dissolved Oxygen 1 Reagent Powder Pillows	100/pkg	981-99
Dissolved Oxygen 2 Reagent Powder Pillows	100/pkg	982-99
Dissolved Oxygen 3 Reagent Powder Pillows	100/pkg	987-99
Instruction Card, OX-2P Test Kit	each	1469-88
Measuring Tube, plastic, 5.83 mL	each	438-00
Sodium Thiosulfate Standard Solution, stabilized, 0.0109 N	100 mL MDB*	24089-32

REACTIFS ET PIECES DE RECHANGE

Désignation	Unité	Réf. Nº
Flacon DBO 60 mL avec trait 30 mL, en verre avec bouchon	1	1909-02
Flacon carré en verre	6/paq	439-06
Pince coupante pour gélules moyennes	1	968-00
Réactif Oxygène dissous 1 en sachets	100/paq	981-99
Réactif Oxygène dissous 2 en sachets	100/paq	982-99
Réactif Oxygène dissous 3 en gélules	100/paq	987-99
Mode d'emploi de la trousse OX-2P	1	1469-88
Tube de mesure en plastique, 5,83 mL	1	438-00
Sodium thiosulfate, solution titrée stabilisée 0,0109 N	100 mL CGG*	24089-32

VERBRAUCHSMATERIAL UND ERSATZTEILE

Beschreibung	Einheit	Kat. Nr.
Flasche, BOD (=BSB), 60 mL mit 30 mL-Markierung, Glas mit Stopfen	1	1909-02
Flasche, viereckig, Glas	6/Stck	439-06
Scheren für Pulverkissen mittlerer Größe	1	968-00
Gelöster Sauerstoff 1 Reagenz-Pulverkissen	100/Stck	981-99
Gelöster Sauerstoff 2 Reagenz-Pulverkissen	100/Stck	982-99
Gelöster Sauerstoff 3 Reagenz-Pulverkissen	100/Stck	987-99
Anleitungskarte, OX-2P Test Kit	1	1469-88
Meßröhrchen, Plastik, 5,83 mL	1	438-00
Natriumthiosulfat Standardlösung, stabilisiert, 0,0109 N	100 mL MT*	24089-32

* Marked Dropping Bottle • Compte-gouttes gradué • Markierte Tropfflasche

OPTIONAL REAGENTS AND EQUIPMENT

Description	Unit	Cat. No.
Copper Sulfate-Sulfamic Acid Solution, APHA	100 mL MDB*	357-32
Cylinder, plastic graduated, 500 mL	each	1081-49
Potassium Iodide-Iodate Standard Solution, 0.00125 N	500 mL	401-49
Siphon tube, copper	each	1864-41
Starch Indicator Solution	100 mL MDB*	349-32
Stopper, for dissolved oxygen bottle	each	1909-01
Tubing, latex, 6", for siphon	each	7134-00

REACTIFS ET EQUIPEMENTS OPTIONNELS

Désignation	Unité	Réf. Nº
Cuivre sulfate-acide sulfamique en solution, APHA	100 mL CGG*	357-32
Eprouvette graduée en plastique, 500 mL	1	1081-49
Potassium iodure-iodate, Solution 0,00125 N	500 mL	401-49
Tube siphon en cuivre	1	1864-41
Amidon en solution	100 mL CGG*	349-32
Bouchon pour flacon oxygène dissous	1	1909-01
Tuyau latex 15 cm (6"), pour siphon	1	7134-00

ZUSÄTZLICHE REAGENZIEN UND ZUBEHÖR

Beschreibung	Einheit	Kat. Nr.
Kupfersulfat-Sulfaminsäurelösung, APHA	100 mL MT*	357-32
Zylinder, Plastik-, kalibriert, 500 mL	1	1081-49
KaliumIodid-Iodat-Standardlösung, 0,00125 N	500 mL	401-49
Heberrohr, Kupfer	1	1864-41
Stärke-Indikatorlösung	100 mL MT*	349-32
Stopfen, für Flasche für gelösten Sauerstoff	1	1909-01
Latexschlauchleitung, 6", für Heber	1	7134-00

REACTIVOS Y EQUIPAMIENTO OPCIONALES

Descripción	Unidad	Nº Ref.
Solución de ácido, sulfato-sulfámico de cobre, APHA	100 mL BG*	357-32
Cilindro de plástico graduado, 500mL	1	1081-49
Solución patrón de ioduro-iodato potásico, 0,00125	500 mL	401-49
Sifón de cobre	1	1864-41
Solución indicadora de almidón	100 mL BG*	349-32
Tapón para el matraz DBO	1	1909-01
Tubo de látex para el sifón, 6"	1	7134-00

* Marked Dropping Bottle • Compte-gouttes gradué • Markierte Tropfflasche • Botella vertedora graduada

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HACH COMPANY
WORLD HEADQUARTERS
P.O. Box 389
Loveland, Colorado 80539-0389
Telephone : (970) 669-3050
FAX : (970) 669-2932
Telex : 160840

HACH EUROPE
Chaussée de Namur, 1
B-5150 Floriffoux (Namur), Belgium
Telephone : (32) (81) 44.71.71
FAX : (32) (81) 44.13.00

FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:
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Outside the U.S.A. - **Contact the HACH office or distributor serving you.**

te/cth 7/97 1ed

TOTAL PHOSPHATE TEST KIT
Model PO-24
Cat. No. 2250-01

HACH

ORTHOPHOSPHATE
Low Range, 0-1 mg/L Phosphate

1. Fill the square mixing bottle to the 20-mL mark with the water to be tested.
2. Open one PhosVer® 3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle, and swirl to mix as shown in Figure 1. Allow at least two but not more than 10 minutes for color development. If phosphate is present, a blue violet color will develop.
3. Insert the lengthwise viewing adapter into the comparator as illustrated in Figure 2.
4. Fill one sample tube to the line underlining "Cat. 1730-00" with the prepared sample. If not

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.

HACH COMPANY, P.O. BOX 389, LOVELAND, COLORADO 80359
TELEPHONE: WITHIN U.S. 800-227-4224, OUTSIDE U.S. 970-669-3050, TELEX: 160840

using 1730-00 tubes, this will be the line found approximately 1 inch below the top of the tube.

5. Place the tube containing the prepared water sample into the comparator opening labelled "Prepared Sample Position" in Figure 2..
6. Fill the other sample tube with untreated water or a reagent blank to the line as described in Step 4. Insert this tube into the comparator opening labelled "Clear Sample Position" in Figure 2.
7. Orient the comparator with the tube tops pointing to a window or light source as in Figure 2a. View through the openings in the front of the comparator. When viewing, use care to not spill samples from unstoppered tubes.
8. Rotate the disc to obtain a color match. Read the concentration of the measured parameter through the scale window.
9. Divide the reading from the scale window by 50 to obtain the mg/L phosphate (PO_4). To obtain the value as mg/L phosphorus (P), divide by three.

Medium Range, 0-5 mg/L Phosphate

1. Perform Steps 1 and 2 of the Low Range Procedure.
2. Fill one of the color viewing tubes to the lowest mark with the prepared sample (approx. 5 mL). Insert it into the right top opening of the color comparator (Prepared Sample Position in Figure 4).
3. Fill the other tube to the lowest mark with the untreated sample (approx. 5 mL). Insert this

tube into the left top opening of the color comparator (Untreated Sample Position in Figure 4).

4. Hold the comparator up to a light such as the sky, a window, or lamp and view through the openings in front. Rotate the disc to obtain a color match. Divide the reading from the scale window by 10 in order to obtain the mg/L phosphate.
5. To obtain the value as mg/L phosphorus (P), divide by 3 the value obtained in Step 4.

High Range 0-50 mg/L Phosphate

1. Rinse the square mixing bottle with demineralized water.
2. Add 2.0 mL of the water to be tested by twice filling the dropper to the 1 mL mark with the sample and discharging the contents into the mixing bottle.
3. Add demineralized water to the mixing bottle to the 20-mL mark. Swirl to mix as shown in Figure 1.
4. Open one PhosVer® 3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle and swirl to mix. Allow at least two minutes but no more than 10 minutes for color development. If phosphate is present a blue-violet color will develop.
5. Follow Steps 2 and 3 of the Medium Range Procedure.
6. 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 mg/L phosphate (PO_4) from the scale window.
7. To obtain the value as mg/L phosphorus (P), divide by 3 the value obtained in Step 6.

META (POLY) PHOSPHATE

In the test for orthophosphate, meta (or poly) phosphate will not register. To determine the amount of meta (or poly) phosphate, one test is made for total inorganic phosphate (ortho plus meta) and another for orthophosphate alone. The orthophosphate value is subtracted from the total inorganic phosphate value, and the difference is the mg/L meta (or poly) phosphate.

The meta (or poly) phosphate is hydrolyzed to orthophosphate by heating with acid and then is determined as orthophosphate (PO_4).

1. Fill the mixing bottle to the 20-mL mark with the water to be tested. Pour the sample into a clean 50-mL erlenmeyer flask.
2. Add 2.0 mL of 5.25N Sulfuric Acid Solution by twice filling the dropper exactly to the 1.0 mL mark and discharging into the flask. Swirl to mix.
3. Set up the boiling apparatus as shown in Figure 3. The use of a boiling aid is recommended to prevent violent boiling of the sample. *See replacements.*
4. Boil the sample for 10 minutes, adding a little demineralized water occasionally to keep the volume near 20 mL. Do not bring the volume above the 20-mL mark near the end of the 10 minute period. Do not boil to dryness.
5. Allow to cool.
6. Add 2.0 mL of 5.0N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging into the flask. Swirl to mix.
7. Return the sample to the square mixing bottle with the 20-mL mark. If the volume is less than 20 mL, add demineralized water to return the volume to 20 mL.

8. Proceed with the orthophosphate test of the appropriate range, except read the mg/L phosphate as total inorganic phosphate (PO_4).

9. If only the mg/L meta (poly) phosphate is required, subtract the value obtained in the orthophosphate test from the value obtained for total inorganic phosphate.

PHOSPHATE, ORGANIC

The total phosphate (inorganic and organic) in a sample is determined by an acid oxidation to orthophosphate. It has been determined that mere acid treatment of organic phosphates does not give a quantitative determination, so the acid-persulfate method is used. The organic phosphate is determined by the difference and the total inorganic determination.

TOTAL PHOSPHATE

1. Fill the square mixing bottle to the 20 mL mark with the water to be tested. Pour the sample into a clean 50 mL erlenmeyer flask.

2. Open one Potassium Persulfate Powder Pillow. Add the contents of the pillow to the flask. Swirl to mix.

3. Add 2.0 mL of 5.25N Sulfuric Acid Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask. Swirl to mix.

4. Set up the boiling apparatus as shown in Figure 3. The use of a boiling aid is recommended to prevent boiling of the sample. *See replacements.*

5. Boil the sample for 30 minutes. Add a little demineralized water occasionally to keep the

volume near 20 mL. Do not bring the volume above the 20 mL mark near the conclusion of the 30 minute period. Do not boil to dryness.

6. Allow the sample to cool.
7. Add 2.0 mL of 5.0N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask.
8. Return the sample to the square mixing bottle. If the volume is less than 20 mL, add demineralized water to return the volume to 20 mL.
9. Proceed with the orthophosphate test of the appropriate range, except read the mg/L phosphate as total phosphate (PO_4).
10. At this point three values are known: ortho, total inorganic, and total phosphate. Other values may be obtained as follows: total phosphate less total inorganic phosphate equals organic phosphate; total inorganic phosphate less orthophosphate equals meta (poly) phosphate.

TESTING BOILER OR OTHER TURBID WATERS

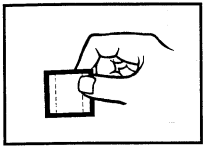
A considerable amount of turbidity often is present in the sample when testing boiler water. This must be removed to obtain accurate test results for soluble phosphate.

A funnel, filter paper and two square bottles are provided for filtering the sample. Often the turbidity in the sample is so fine that it cannot be removed by direct filtration. If this is the case, a bottle of Filtration Aid Solution is included in this kit.

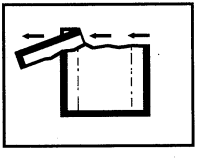
One exception to the above comments is the organic phosphate determination because much organic phosphate may be insoluble.

FILTRATION PROCEDURE

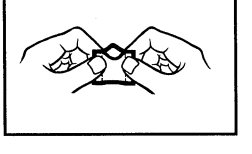
1. Fill a square mixing bottle with the water to be tested.
2. Add one Drop of Filtration Aid Solution to the bottle and swirl to mix.
3. Set up the funnel on the other square mixing bottle. Insert a piece of folded filter paper into the funnel.
4. Pour the water sample into the filter paper. As the sample filters, collect it in the other square mixing bottle. The resulting clear sample should be used as the sample to be tested.



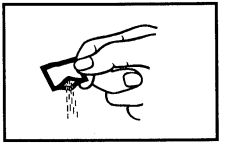
1. Tap



2. Tear



3. Push



4. Pour

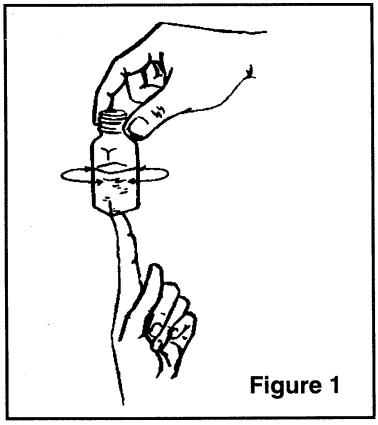


Figure 1

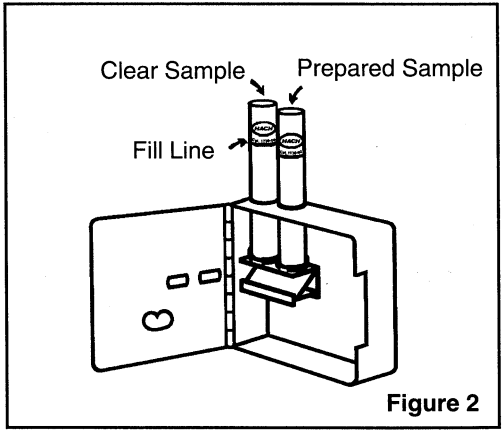


Figure 2

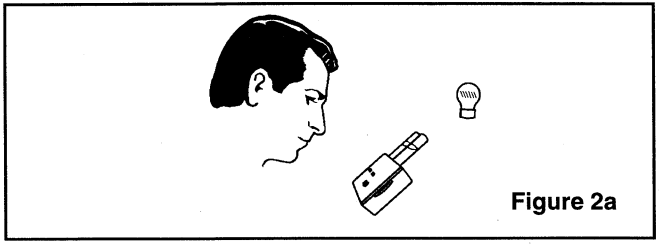


Figure 2a

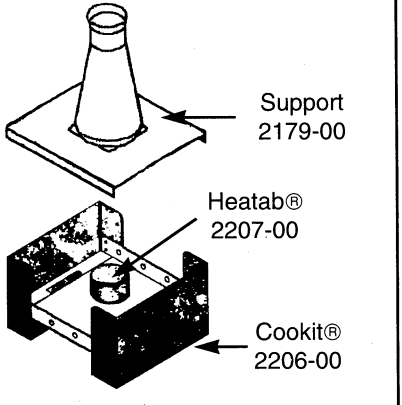


Figure 3

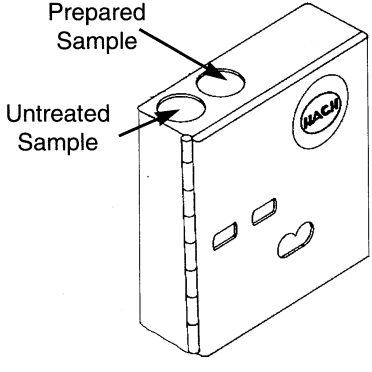


Figure 4

REPLACEMENTS

Cat. No.	Description	Unit
272-28	Demineralized Water	118 mL (4oz)
2125-99	PhosVer® 3 Phosphate Reagent Powder Pillows for 25 mL sample	pk/100
2451-66	Potassium Persulfate Powder Pillows	pk/50
2450-37	Sodium Hydroxide Solution 5.0N	118 mL (4oz) MDB*
2449-37	Sulfuric Acid Solution, 5.25N	118 mL (4oz) MDB*
2327-06	Bottle, mixing	pk/6
439-06	Bottle, mixing, unmarked	pk/6
968-00	Clippers	each
1732-00	Color Comparator	each
1730-00	Color Viewing Tube	each
14197-00	Dropper, Plastic, 0.5 and 1 mL marks	each
1046-33	Filter Aid Solution	29 mL (1oz) DB**
1894-57	Filter Paper	box of 100
505-41	Flask, erlenmeyer, 50 mL	each
1083-67	Funnel, 65 mm, plastic	each
2206-00	Heatab® Cookit, complete with 1 box of Heatabs	each
2207-00	Heatab replacements	pk/9
2414-00	Holder for dropper	each
634-00	Holder for test tube	each

Cat. No.	Description	Unit
24122-00	Lengthwise Viewing Adapter	each
21084-00	Phosphate Color Disc, 0-50 mg/L	each
14480-00	Stopper, hollow, No. 0	pk/6
2179-00	Support for Cookit	each
2569-11	Phosphate Standard Solution, 1 mg/L as PO4 (not included in kit)	473 mL (pt)
14835-31	Boiling Chips	pk/227 g

*Marked Dropping Bottle
**Dropping Bottle

10/92

LOW RANGE NITRATE TEST KIT

0-1 and 0-10 mg/L as Nitrate Nitrogen

Model NI-14

Cat. No. 14161-00

HACH

TO ENSURE ACCURATE RESULTS PLEASE READ CAREFULLY BEFORE PROCEEDING. If nitrite is present, pretreatment of the sample is necessary prior to conducting the nitrate test. This will ensure consistent results expressed as total nitrate nitrogen. The pretreatment package, Pretreatment Kit, Model PT-1, is not included in this kit but may be ordered from Hach Company. *See Replacements.*

Chloride will act as an interferent with this procedure. If you wish to analyze for nitrate in saltwater, please refer to the Salt Water Master Test Kit (Cat. No. 20686-00)

For best results, this test should be performed with a sample temperature of 20-25°C (69-77°F).

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.

NITRATE NITROGEN (0-1 mg/L)

1. Fill one of the color viewing tubes to the mark with the sample to be tested. Stopper the tube and shake vigorously. Empty the tube and repeat this procedure.

2. Fill the color viewing tube to the mark with the sample (if nitrite is not present) or with the pretreated sample (if nitrite is present).

3. Use the clippers to open one NitraVer® 6 Nitrate Reagent Powder Pillow. Add the contents of the pillow to the sample to be tested. Stopper the tube and shake for three minutes. Allow the sample to stand undisturbed for an additional 30 seconds. Unoxidized particles of cadmium metal will remain in the sample and settle to the bottom of the viewing tube.

4. Pour the prepared sample into a second color viewing tube carefully so that the cadmium particles remain in the first tube.

5. Use the clippers to open one NitriVer® 3 Nitrite Reagent Powder Pillow. Add the contents of the pillow to the sample. Stopper the tube and shake for 30 seconds. A red color will develop if nitrate is present. Allow at least 10 minutes, but not more than 20 minutes, before completing Steps 6 through 8.

6. Insert the tube of prepared sample into the right top opening of the color comparator (Prepared Sample Position in Figure 1).

7. Rinse the unoxidized cadmium metal from the color viewing tube used in Step 2. Fill to the mark with the original water sample and place in the left top opening of the comparator (Untreated Sample Position in Figure 1).

8. 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 mg/L nitrate nitrogen (N) through the scale window. To obtain the results as mg/L nitrate (NO_3) multiply the reading on the scale by 4.4.

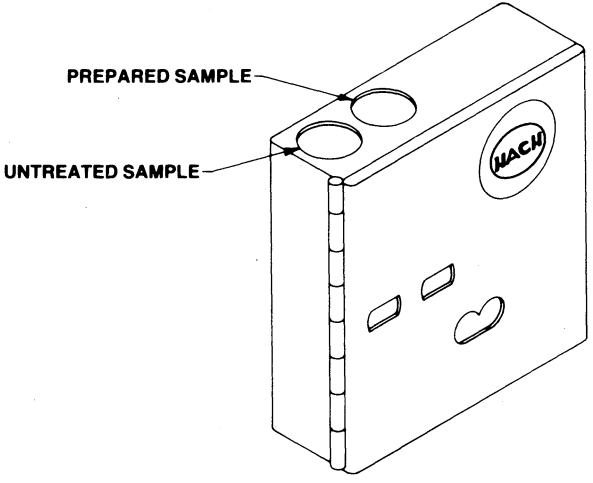


Figure 1.

NITRATE NITROGEN (0-10 mg/L)

1. Fill one of the color viewing tubes to the mark with demineralized water. Stopper the tube and shake vigorously. Empty the tube and repeat this procedure.
2. Rinse the plastic dropper with the sample or with the pretreated sample. Fill to the 0.5-mL mark. Add contents of the dropper to the rinsed color viewing tube.
3. Fill the color viewing tube to the mark with demineralized water.
4. Use the clippers to open one NitraVer 6 Nitrate Reagent Powder Pillow. Add the contents of the pillow to the sample to be tested. Stopper the tube and shake for three minutes. Allow the sample to stand undisturbed for an additional 30 seconds. Unoxidized particles of cadmium metal will remain in the sample and settle to the bottom of the viewing tube.
5. Pour the prepared sample into a second color viewing tube carefully so that the cadmium particles remain in the first tube.
6. Use the clippers to open one NitriVer 3 Nitrite Reagent Powder Pillow. Add the contents of the pillow to the sample. Stopper the tube and shake for 30 seconds. A red color will develop if nitrate is present. Allow at least 10 minutes, but not more than 20 minutes, before completing Steps 7 through 9.
7. Insert the tube containing the prepared sample into the right top opening of the color comparator (Prepared Sample Position in Figure 1).

8. Rinse the unoxidized cadmium from the color viewing tube used in Step 2. Fill to the mark with the original water sample. Place this tube in the left top opening of the comparator (Untreated Sample Position in Figure 1).

9. 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 mg/L nitrate nitrogen (N) through the scale window. Multiply that reading by 10 to obtain the mg/L nitrate nitrogen (N) present in the sample. To obtain the results as mg/L nitrate (NO_3) multiply the mg/L nitrate nitrogen (N) by 4.4.

The results obtained in the nitrate tests above are actually the sum of both the nitrate and nitrite nitrogen present in the sample. If the amount of nitrite nitrogen is considerable, it may be determined separately using the following procedure.

1. Rinse a color viewing tube and stopper several times with the water to be tested. Fill the tube to the mark with the water sample.

2. Use the clippers to open one NitriVer 3 Nitrite Reagent Powder Pillow. Add the contents of the pillow to the sample. Stopper the tube and shake for 30 seconds. Allow at least 10 minutes, but not more than 15 minutes, for proper color development.

3. Insert the tube containing the prepared sample into the right top opening of the comparator (Prepared Sample Position in Figure 1).

4. Fill a second viewing tube to the mark with the original water sample. Insert this tube into the left top opening of the comparator (Untreated Sample Position in Figure 1).

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. Multiply the scale reading by 0.53 to obtain the mg/L nitrite nitrogen (N).

6. Subtract the mg/L nitrite nitrogen (N) from the total mg/L nitrate nitrogen (N) value to obtain the exact mg/L nitrate nitrogen present in the sample.

REPLACEMENTS

Cat. No.	Description	Unit
14120-99	NitraVer 6 Nitrate Reagent Powder Pillows	pk/100
14078-99	NitriVer 3 Nitrite Reagent Powder Pillows	pk/100
936-00	Clippers	each
1732-00	Color Comparator	each
14171-00	Color Disc (Low Range Nitrate Nitrogen)	each
1730-00	Color Viewing Tube	each
14197-00	Dropper, 0.5 and 1.0-mL marks	each
2118-02	Rubber Stopper	pk/12
272-28	Demineralized Water (not included in kit)	118 mL (4 oz)
2268-00	Pretreatment Kit, Model PT-1 (not included in kit)	each

2/95
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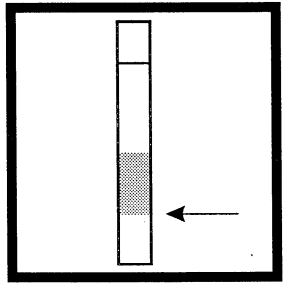
NI - 14 Test Kit
0 - 1 and 0 - 10 mg/L as Nitrate Nitrogen
Cat. No. 14161-00

Use the 5 mL mark, the lowest mark on tubes and as indicated in the drawing, for all tests.



Clippers are no longer included in the kit since they are not needed to open foil powder pillows. To open foil powder pillows, first tap the bottom of the foil packets on a counter or other horizontal surface then tear the top of the packet open along the tear line. Push the sides of the packet inward to open. Pour reagent from the powder pillow into sample in tubes as instructed in kit instructions.

AMMONIA NITROGEN TEST KIT

Range 0-3.0 mg/L as Ammonia Nitrogen

Model NI-SA

Cat. No. 24287-00

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

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

HACH COMPANY, P.O. BOX 389, LOVELAND, COLORADO 80359
TELEPHONE: WITHIN U.S. 800-227-4224, OUTSIDE U.S. 970-669-3050, TELEX: 160840

TABLE 1: PERCENTAGE UN-IONIZED AMMONIA IN AQUEOUS SOLUTION AT DIFFERENT pH VALUES AND TEMPERATURES

	Temperature °C								
pH	**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**	**32**
7.0	0.30	0.34	0.40	0.46	0.52	0.60	0.70	0.81	0.95
7.2	0.47	0.54	0.63	0.72	0.82	0.95	1.10	1.27	1.50
7.4	0.74	0.86	0.99	1.14	1.30	1.50	1.73	2.00	2.36
7.6	1.17	1.35	1.56	1.79	2.05	2.35	2.72	3.13	3.69
7.8	1.84	2.12	2.45	2.80	3.21	3.68	4.24	4.88	5.72
8.0	2.88	3.32	3.83	4.37	4.99	5.71	6.55	7.52	8.77
8.2	4.49	5.16	5.94	6.76	7.68	8.75	10.00	11.41	13.22
8.4	6.93	7.94	9.09	10.30	11.65	13.20	14.98	16.96	19.46
8.6	10.56	12.03	13.68	15.40	17.28	19.42	21.83	24.45	27.68
8.8	15.76	17.82	20.08	22.38	24.88	27.64	30.68	33.90	37.76
9.0	22.87	25.57	28.47	31.37	34.42	37.71	41.23	44.84	49.02
9.2	31.97	35.25	38.69	42.01	45.41	48.96	52.65	56.30	60.38
9.4	42.68	46.32	50.00	53.45	56.86	60.33	63.79	67.12	70.72
9.6	54.14	57.77	61.31	64.54	67.63	70.67	73.63	76.39	79.29
9.8	65.17	68.43	71.53	74.25	76.81	79.25	81.57	83.68	85.85
10.0	74.78	77.46	79.92	82.05	84.00	85.82	87.52	89.05	90.58
10.2	82.45	84.48	86.32	87.87	89.27	90.56	91.75	92.80	93.84

Test Procedure

1. Rinse the two glass sample tubes with the water to be tested and fill to the 5-mL mark with the water sample.
2. Use the clippers to open an Ammonia Salicylate Reagent Powder Pillow. Add the contents of the pillow to the sample in one of the tubes, cap the tube and shake until all the powder is dissolved. Wait three minutes.
3. Add the contents of one Ammonia Cyanurate Reagent Powder Pillow to the tube containing the salicylate-treated sample. Recap the tube and shake until all the powder is dissolved. Allow at least 15 minutes for the color to develop fully. The color is stable for several hours if the tube is kept capped. **See Note A.**
4. Clean the outsides of both tubes with a dry cloth or tissue.
5. Insert the color-developed sample into the right-hand opening on the top of the color comparator as shown in Figure 1.
6. Insert the tube without reagents into the left-hand opening of the color comparator as shown in Figure 1.
7. Hold the comparator up to a light such as the sky, a window, or a lamp and view through the two openings in the front. Rotate the color disc until a color match is obtained.
8. Read the concentration of ammonia nitrogen, in mg/L (N), through the scale window. **See Note B.**

Notes

A. If the test yields unexpectedly high readings, the glassware may be contaminated. Because of the sensitivity of this test, the glassware must be kept extremely clean. If contamination is suspected, continue the test procedure, then rinse the tubes with the water to be analyzed and run the test again. This will allow the test reagents to clean the tubes and eliminate any contamination. Comparing the results of the two analyses should indicate if any interference was present.

B. To express test results as toxic ammonia (NH_3), use the following equation:

$$\frac{\text{mg/L } NH_3 \text{ as N} \times \text{value from Table 1}}{100} \times 1.2 = \text{mg/L } NH_3$$

To express results as ammonium Ion (NH_4^+), use the following equation:

$$\frac{\text{mg/L } NH_3 \text{ as N} \times (100 - \text{value from table 1})}{100} \times 1.3 = \text{mg/L } NH_4^+$$

C. The limits of this test can be increased to 5 mg NH_3-N/L by diluting the sample. Using the 3-mL syring, deliver a 2.5 mL sample into the tube, then add 2.5 mL demineralized water. Mulitply the color wheel reading by two to compensate for the dilution.

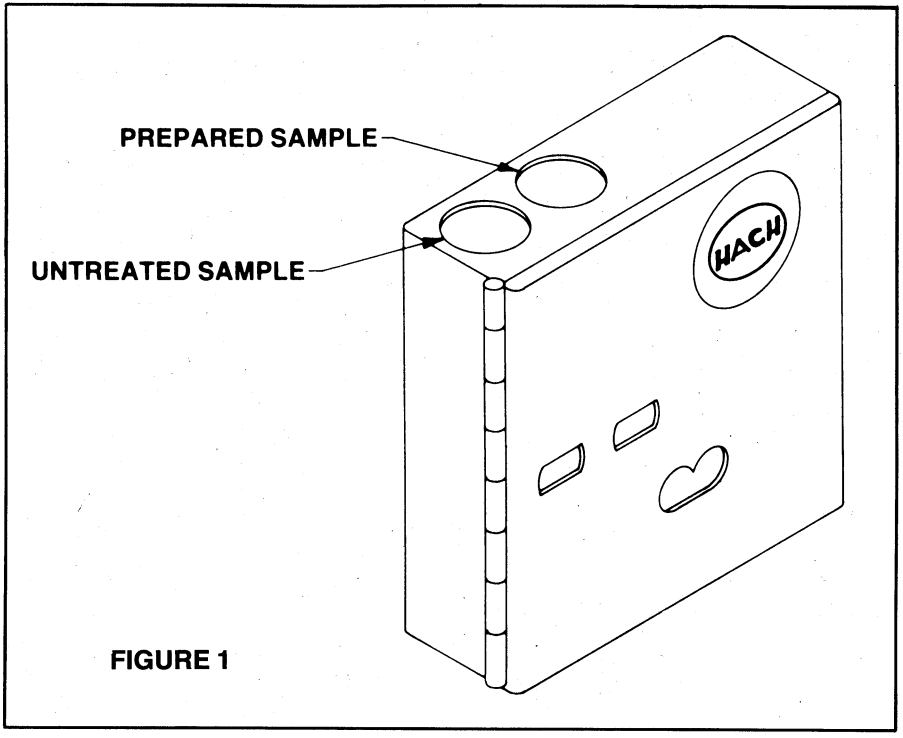


FIGURE 1

Replacements

Cat. No.	Description	Unit
23952-66	Ammonia Salicylate Reagent Powder Pillows	pk/50
23954-66	Ammonia Cyanurate Reagent Powder Pillows	pk/50
23938-00	Color Disc, Ammonia Salicylate	each
1732-00	Color Comparator	each
1730-00	Color Viewing Tube	each
1731-00	Stopper for color viewing tube	each
968-00	Clippers	each

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