1.00796.0001

Spectroquant®
Iron Test

Fe

1. Method

All iron ions are reduced to iron(II) ions by ascorbic acid. In a buffered medium these react with 1,10-phenanthroline to form a red complex that is determined photometrically.
Without the addition of ascorbic acid (reagent Fe-3), the test measures only iron(II).
The method is analogous to APHA 3500-Fe B and DIN 38406-1.

2. Measuring range and number of determinations

Cell mm	Measuring range mg/l Fe	Number of determinations
50	**0.010** - 1.000	150
20	0.05 - 2.50	
10	0.10 - **5.00**	

For programming data for selected photometers / spectrophotometers see www.service-test-kits.com.

3. Applications

This test measures bivalent and trivalent iron in its dissolved form as well as fresh colloidal iron(III) hydroxide.
A differentiation between iron(II) and iron(III) is possible.
Samples must be decomposed by digestion before iron oxides, aged iron hydroxide, and complex-bound iron can be measured (see section 6).

Sample material:
Groundwater and surface water, seawater
Drinking water
Industrial water, wastewater and percolating water
Food

4. Influence of foreign substances

This was checked in solutions containing 2.5 and 0 mg/l Fe. The determination is not yet interfered with up to the concentrations of foreign substances given in the table.

Concentrations of foreign substances in mg/l or %							
Al^{3+}	100	**Cu^{2+}**	**5 (500[1])**	**Ni^{2+}**	**10**	EDTA	50
Ca^{2+}	1000	F^-	1000	NO_2^-	250	Surfactants[2]	1000
Cd^{2+}	100	Hg^{2+}	50	Pb^{2+}	1000	Na-acetate	5 %
CN^-	25	Mg^{2+}	1000	PO_4^{3-}	50	NaCl	20 %
Co^{2+}	**10**	Mn^{2+}	1000	SiO_3^{2-}	1000	$NaNO_3$	20 %
Cr^{3+}	100	MoO_4^{2-}	25	Zn^{2+}	25	Na_2SO_4	20 %
$Cr_2O_7^{2-}$	100	NH_4^+	1000				

[1] when approx. 100 mg of thiourea is added following the addition of reagent Fe-3
[2] tested with nonionic, cationic, and anionic surfactants

5. Reagents and auxiliaries

Please note the warnings on the packaging materials!

The test reagents are stable up to the date stated on the pack when stored closed at +15 to +25 °C.

Package contents:
1 bottle of reagent Fe-1
1 bottle of reagent Fe-2
1 bottle of reagent Fe-3
3 blue dose-metering caps (each can be used for 50 dosages)
1 AutoSelector

Other reagents and accessories:
Spectroquant® Crack Set 10C, Cat. No. 114688
+ thermoreactor
or
Spectroquant® Crack Set 10, Cat. No. 114687
+ empty cells 16 mm with screw caps (25 pcs), Cat. No. 114724
+ thermoreactor
MQuant™ Iron Test, Cat. No. 110004,
measuring range 3 - 500 mg/l Fe^{2+}
MColorpHast™ Universal indicator strips pH 0 -14, Cat. No. 109535
Sodium hydroxide solution 1 mol/l TitriPUR®, Cat. No. 109137
Nitric acid Titrisol® for 1 mol/l, Cat. No. 109966
Thiourea GR for analysis, Cat. No. 107979
Spectroquant® CombiCheck 30, Cat. No. 114677

Pipettes for pipetting volumes of 0.50 and 8.0 ml
Rectangular cells 10, 20, and 50 mm (2 of each), Cat. Nos. 114946, 114947, and 114944

6. Preparation

At the first use **replace the screw cap of the reagent bottle Fe-3 by the blue dose-metering cap**.

Hold the reagent bottle **vertically** and, at each dosage, press the slide **all the way** into the dose-metering cap. **Before each dosage** ensure that the slide is **completely retracted**.

Reclose the reagent bottle with the screw cap at the end of the measurement series, since the function of the reagent is impaired by the absorption of atmospheric moisture.

- Analyze immediately after sampling.
- Undissolved or complex-bound iron can be determined after pretreatment of the sample using one of the Spectroquant® Crack Sets. **Do not add reagent R-3 (from Crack Set 10) or, respectively, reagent R-2K (from Crack Set 10C) during digestion!**
- Check the iron content with the MQuant™ Iron Test.
  Samples containing more than 5.00 mg/l Fe must be diluted with distilled water **prior to** digestion.
- **The pH must be within the range 2 - 8.**
  Adjust, if necessary, with sodium hydroxide solution or nitric acid.
- Filter turbid samples.

7. Procedure

Both iron(II) as well as the sum of iron(II) + iron(III) can be measured as described below in one and the same sample.
The iron(III) content can be calculated on the basis of the results of these two determinations.

① Pretreated sample **(5 - 40 °C)**	8.0 ml	Pipette into a test tube.
② Reagent Fe-1	1 drop[1]	Add and mix.
③ Reagent Fe-2	0.50 ml	Add with pipette and mix.
Determination of	**sum of iron(II) + iron(III):** continue with step ⑤ **iron(II):** step ④ only **iron(III):** steps ④ - ⑥ and calculation	
④ **Leave to stand for 5 min (reaction time A)**, then fill the measurement sample into the cell, and measure in the photometer: **result A**		
⑤ Reagent Fe-3	1 dose	Add and shake **vigorously until the reagent is completely dissolved**.
⑥ **Leave to stand for 10 min (reaction time B)**, then fill the sample into the cell, and measure in the photometer: **result B**		

[1] **Hold the bottle vertically while adding the reagent!**

Calculation of the iron(III) content:

mg/l Fe(III) = result B - result A

Notes on the measurement:

- **Certain photometers may require a blank** (preparation as per measurement sample, but with distilled water instead of sample).
- For photometric measurement the cells must be clean.
  Wipe, if necessary, with a clean dry cloth.
- Measurement of turbid solutions yields false-high readings.
- The pH of the measurement solution must be within the range 3.5 - 4.0.
- The color of the measurement solution remains stable for at least 60 min after the end of the respective reaction times stated above.
- In the event of iron concentrations exceeding 50 mg/l, other reaction products are formed and false-low readings are yielded. In such cases it is advisable to conduct a plausibility check of the measurement results by diluting the sample (1:10, 1:100).

8. Analytical quality assurance

recommended before each measurement series
To check the photometric measurement system (test reagents, measurement device, handling) and the mode of working, Spectroquant® CombiCheck 30 can be used. Besides a **standard solution** with 1.00 mg/l Fe, this article also contains an **addition solution** for determining sample-dependent interferences (matrix effects).
Additional notes see under **www.qa-test-kits.com**.

Characteristic quality data:

In the production control, the following data were determined in accordance with ISO 8466-1 and DIN 38402 A51 (10-mm cell):

Standard deviation of the method (mg/l Fe)	± 0.015
Coefficient of variation of the method (%)	± 0.59
Confidence interval (mg/l Fe)	± 0.04
Number of lots	19

Characteristic data of the procedure:

	Measuring range mg/l Fe	
	0.010 - 1.000	**0.10 - 5.00**
Sensitivity: Absorbance 0,010 A corresponds to (mg/l Fe)	0.011	0.06
Accuracy of a measurement value (mg/l Fe)	max. ± 0.024	max. ± 0.12

For quality and batch certificates for Spectroquant® test kits see the website.

9. Notes

- Reclose the reagent bottles immediately after use.
- **Information on disposal can be obtained at www.disposal-test-kits.com.**

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