

Sample Preparation Solutions for Environmental Analysis

Bond Elut SPE, Bond Elut QuEChERS, and Chem Elut Part Numbers



Experience and Expertise

As the leader in chromatography with over 40 years of experience, Agilent takes extensive measures to ensure that your sample prep results are accurate and reliable every time.



Bond Elut Plexa method for polyaromatic hydrocarbons

Twenty-four PAHs in drinking water by automated SPE with fast HPLC/FLD/UV detection (Pub No. 5990-7686EN)

1. 800 mL water sample + 5% isopropanol + internal standard (benzo[a]pyrene-d¹⁰)
2. Condition with 4 mL ethyl acetate + 4 mL dichloromethane + 4 mL methanol + 4 mL water
3. Load sample
4. Dry for 30 min
5. Elute with 4 mL ethyl acetate + 4 mL dichloromethane
6. Make up to 10 mL with ethyl acetate:dichloromethane (1:1)
7. Evaporate off 4 mL
8. Add 0.5 mL acetonitrile

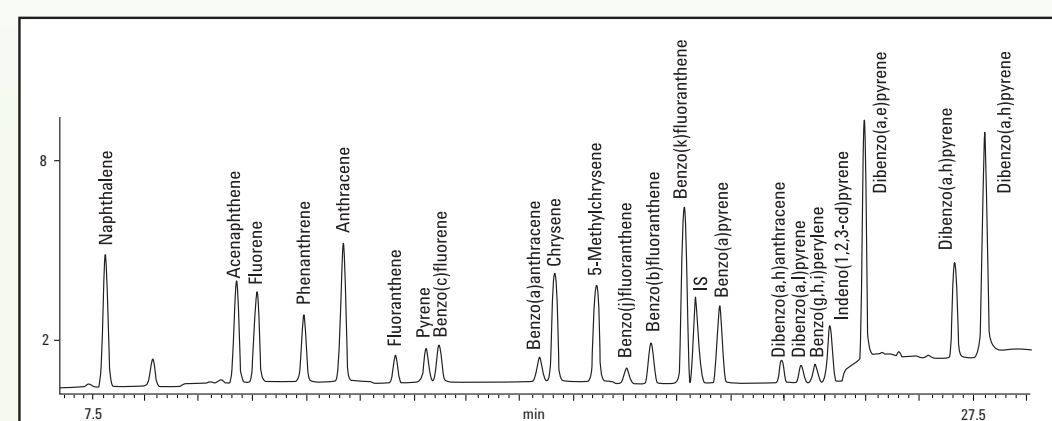


Figure 1. HPLC/FLD chromatogram of a 5 µL injection of the 20 ppt PAH standard solution on the Agilent Pursuit 3 PAH column.



Bond Elut Plexa method for phenols

Bond Elut Plexa efficient preparation of phenols in drinking water (Pub No. 51-1549)

1. Condition with 10 mL ethyl acetate/10 mL methanol/10 mL water
2. Apply sample at 10-20 mL/min
3. Rinse with 10 mL water
4. Dry for 30 min or more with N₂ gas or a vacuum manifold
5. Elute with 5 mL ethyl acetate
6. Dry using a few crystals of anhydrous sodium sulfate
7. Gently concentrate 4 mL of eluted solution down to 0.8 mL under N₂ gas
8. Add 100 µL N.O.-bis (trimethylsilyl) trifluoroacetamide and let stand for an hour
9. Add 20 µL of internal standard
10. Make up to 1 mL with ethyl acetate

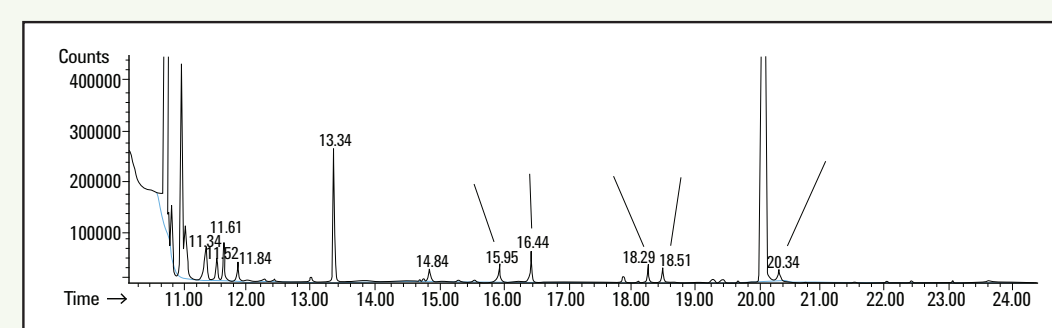


Figure 2. Gas chromatogram of an extract of phenols from drinking water using Agilent Bond Elut Plexa (phenols at 0.1 ppm).



Bond Elut SAX method for haloacetic acids

Determination of haloacetic acids in water by GC/µECD using Agilent J&W DB-5ms Ultra Inert and DB-XLB columns (Pub No. 5990-8765EN)

Bond Elut SAX SPE method

1. Add 0.5 mL aqueous NH₄Cl to 50 mL water sample
2. Adjust pH of sample to pH 5 ± 0.5 with sulfuric acid as necessary
3. Add surrogate, and GC spike solution if necessary
4. Assemble glass block manifold and attach SPE cartridges
5. Condition Bond Elut SAX SPE cartridges with 10 mL MeOH, followed by 10 mL reagent water
6. Add the 50 mL water sample to cartridge while drawing under vacuum at 2 mL/min
7. Add 10 mL MeOH to cartridge and draw through at 2 mL/min
8. Disassemble vacuum manifold and insert 15 mL screw cap centrifuge tubes
9. Add 3 mL 10% H₂SO₄/MeOH to cartridge and elute at 1.5 mL/min

Estimation procedure

1. Add 2 mL MTBE w/IS solution to eluent, cap, vortex for 5 seconds
2. Place capped centrifuge tubes in heating block at 50 °C for 2 hrs
3. Remove centrifuge tubes and allow to cool
4. Add 7 mL of 150 g/L aqueous sodium bicarbonate solution and vortex for 30 seconds
5. Allow phases to separate (~5 min)
6. Remove and discard lower aqueous layer using long Pasteur pipet
7. Add 1 mL saturated aqueous sodium bicarbonate solution and vortex for several seconds
8. Transfer ether layer to GC vial and analyze

Methylated HAAs fortified QC sample

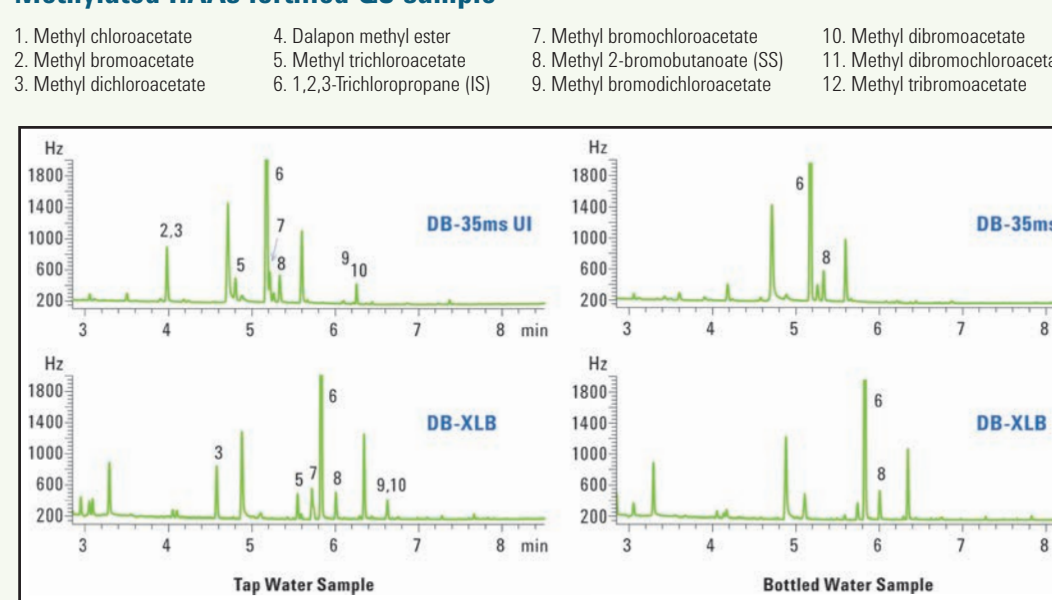


Figure 3. GC/µECD chromatograms for two water samples analyzed using Agilent J&W DB-5ms UI (p/n 122-3832X) and DB-XLB (p/n 122-1238) GC columns. Chromatographic conditions are listed in Table 1 in Pub. No. 5990-8765EN.



Bond Elut QuEChERS method for PAHs

Analysis of PAH in soil with Agilent Bond Elut QuEChERS ADAC kit and HPLC/FLD (Pub No. 5990-5452EN)

QuEChERS ADAC sample prep procedure

1. Weigh 5 g soil homogenate into a 50 mL centrifuge tube
2. Spike samples with 2000 µL spiking solution and shake vigorously for 1 min
3. Add 5 mL water and shake vigorously for 1 min
4. Add 10 mL CH₃CN
5. Add Bond Elut QuEChERS ADAC salt packet and shake for 1 min, centrifuge at 4000 rpm for 5 min
6. Transfer 5 mL aliquot to Bond Elut QuEChERS Dispersive SPE 15 mL tube and shake for 1 min, centrifuge at 4000 rpm for 5 min
7. Filter through a 0.45 µm PVDF syringe filter
8. Transfer 1 mL extract to an autosampler vial
9. Analyze with HPLC/FLD

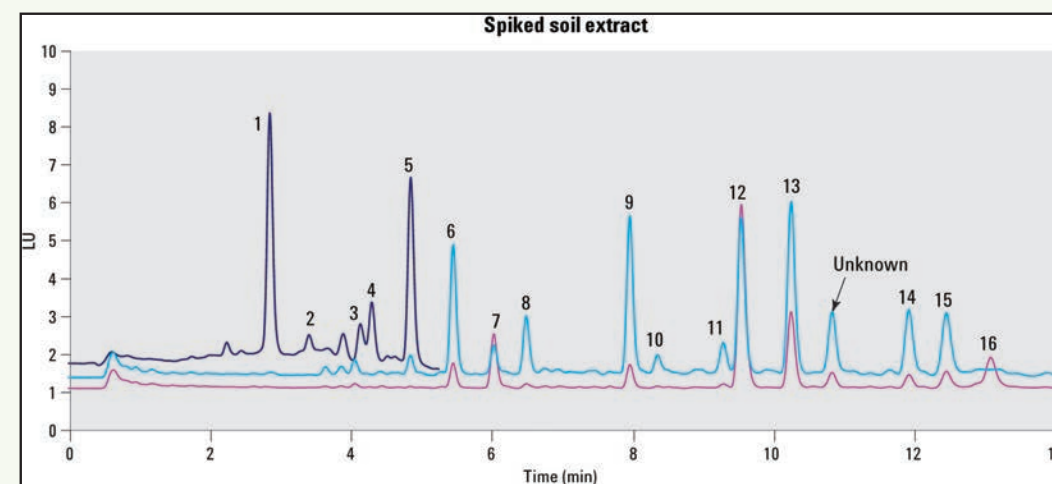


Figure 3. Overall HPLC/FLD chromatograms of a spiked soil sample containing: 1. Nap 2. Ace 3. Acy 4. Flu 5. Phe 6. Ant 7. Flr 8. Per 9. B[a]A 10. Chr 11. B[a]P 12. B[a]K 13. B[a]P 14. D[a]A 15. B[ghi]P 16. I[per]. The spiking level for this sample was 1 µg/l (see Table 3 in Pub. No. 5990-5452EN). The blue portion of the chromatogram used the following excitation/emission wavelengths: 280 nm/352 nm, the red portion: 280 nm/420 nm and the light blue portion: 280 nm/440 nm. However, due to lack of a fluorophore, UV detection at 230 nm was employed for acenaphthylene. Chromatographic conditions are shown in Table 1 in Pub. No. 5990-5452EN.

Bond Elut SPE

For over 30 years, Bond Elut has been the most trusted name in solid phase extraction (SPE).

Agilent Bond Elut SPE products selectively remove interferences from complex matrices and provide the largest choice of sorbent formats in the market today. Over 40 phase functionalities in more than 30 formats are available.

Bond Elut Polymeric SPE

- Bond Elut Plexa family is a new generation of polymeric SPE products designed for simplicity, improved analytical performance, and ease-of-use.
- Bond Elut Plexa is a non-polar divinylbenzene-based neutral polymeric sorbent.
- Bond Elut Plexa PCX is a cation exchanger with mixed mode sorbent characteristics.
- Bond Elut Plexa PAX is an anion exchanger with mixed mode sorbent characteristics.

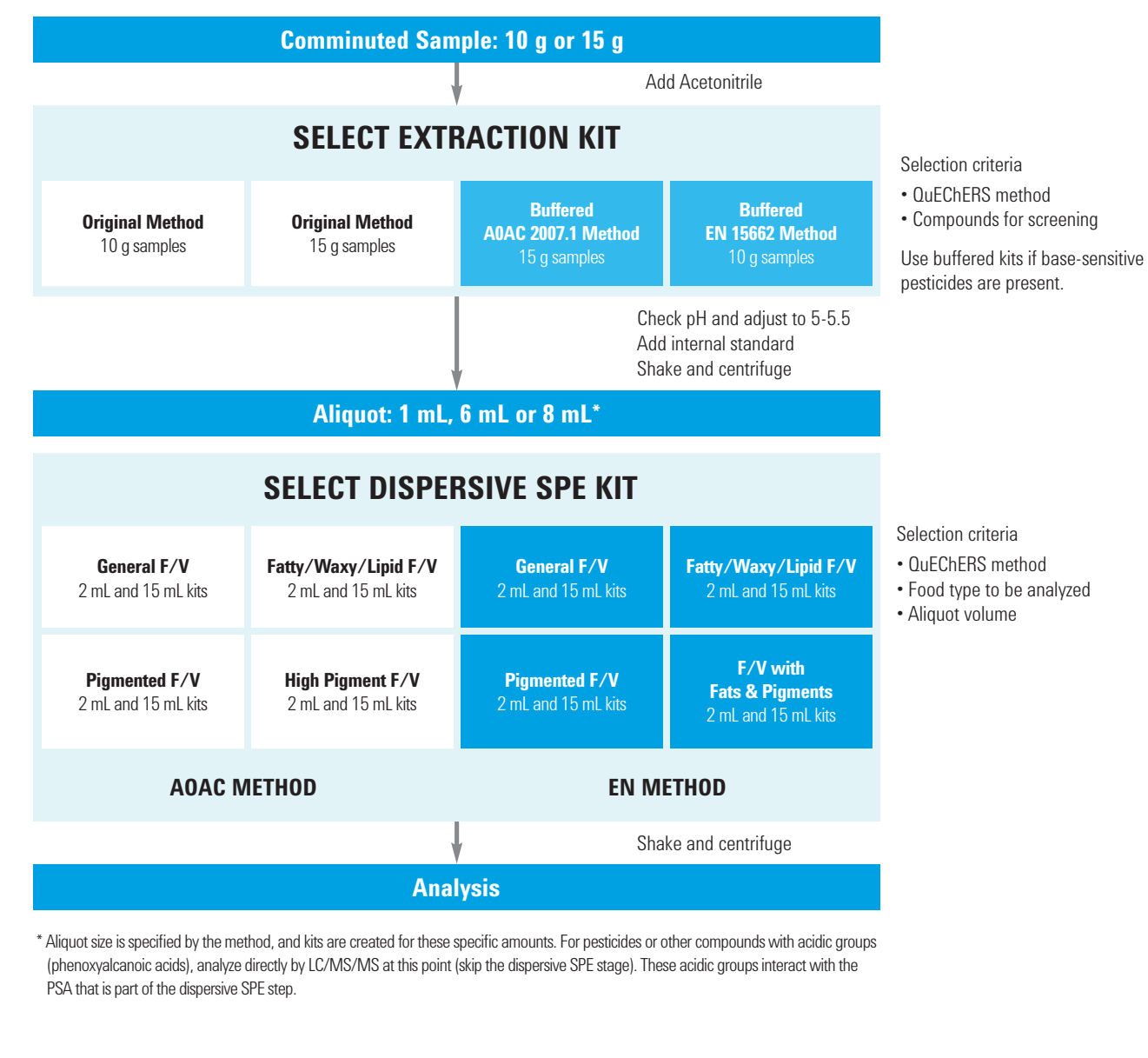
Bond Elut QuEChERS

Agilent Bond Elut QuEChERS Kits make sample prep easy as 1-2-3. Kits are pre-packaged, providing an easy way to capture the time-saving benefits of QuEChERS sample preparation.

- QuEChERS kits are pre-measured and packed in anhydrous salt packets to ensure high recoveries in your pesticide analysis.
- Kits with ceramic homogenizers save sample prep time by reducing shaking steps to a matter of seconds, promoting consistent sample extraction and increased product recovery.
- Universal dispersive kits provide excellent recoveries and reproducibility for soil and other non-food matrices.

Agilent Recommended Standard Operating Procedure for Bond Elut QuEChERS

In just 3 easy steps, you can prepare sample for multi-class, multi-residue compound analysis.



General protocol for trouble-free SPE applications with the Bond Elut Plexa family

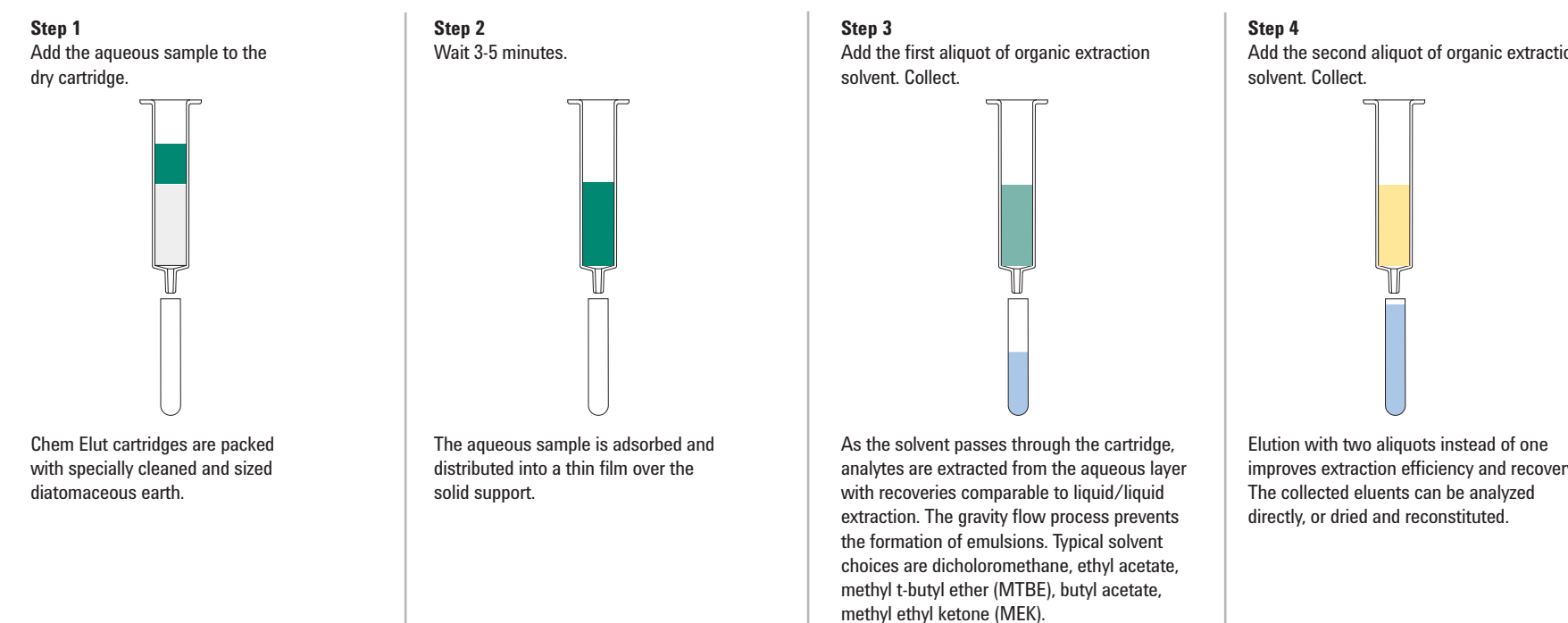
	Acids	Neutrals	Bases
Analyte	LogP > 1.0 pKa < 5	LogP > 1.5 pKa 3-5 pKa 6-10	LogP > 0.8 pKa 6-10
Sample Pre-treatment	2% NH ₄ OH	1% HClO ₄	2% NH ₄ OH
Sorbent Condition	100% MeOH	100% MeOH	100% MeOH
Equilibration	100% H ₂ O	100% H ₂ O	100% H ₂ O
Load	Apply pre-treated sample	Apply pre-treated sample	Apply pre-treated sample
Wash	100% H ₂ O	5% MeOH in H ₂ O	2% HClO ₄ in H ₂ O
Elution 1/wash 2	100% MeOH Neutrals	100% MeOH Neutrals	1:1 MeOH/ACN Acids, Neutrals
Elution 2	5% HClO ₄ in MeOH Acids		5% NH ₃ in 1:1 MeOH/ACN Bases
Analysis	Prepare extracts for instrumental analysis		

Chem Elut SLE

Chem Elut is a high purity, sorbent-supported liquid extraction (SLE) cartridge, available in buffered and unbuffered formats.

- Chem Elut streamlines methods for all sample types and eliminates phase separation and emulsion problems.
- Easier to automate than manual liquid-liquid method and requires lower volumes of organic (often chlorinated) solvents.
- The base-treated cartridge removes residual acid compounds from a variety of matrices.

Extraction procedure for aqueous samples



Keep your lab functioning at peak efficiency with these Agilent instruments, columns, and supplies

Agilent J&W Ultra Inert GC columns

Agilent J&W Ultra Inert GC columns push industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes. And, Agilent J&W Ultra Inert GC columns are individually tested with the most demanding Ultra Inert test probe mixture in the industry, and a performance summary sheet is shipped with each column. For more information visit www.agilent.com/chem/ultraintert



Agilent LC and LC/MS columns

With Agilent's ZORBAX and Poroshell 120 LC columns, you'll generate reproducible results across a wide range of applications and conditions. These columns are engineered to deliver superior performance and boost productivity. You get fast LC choices: Rapid Resolution High Throughput (RRHT), Eclipse Plus and Poroshell 120, stable to 800 bar, and Rapid Resolution High Definition (RRHD), stable to 1200 bar for ultra-fast separations. For more information visit www.agilent.com/chem/lccolumns



Agilent GC, GC/MS, LC and LC/MS instruments

Agilent GC/MS instruments provide higher sensitivity, more reliability and more uptime, with less maintenance. The clearly better Agilent GC/MS portfolio includes GC/MSD, Ion Trap GC/MS, Triple Quadrupole GC/MS, and Q-ToF GC/MS. The infinitely better Agilent LC and LC/MS portfolio includes the 1200 Infinity Series and the 6000 Series. Discover more possibilities for solving separation challenges: GPC/SEC – from nanoflow to high-throughput, and from amino acid to GPC/SEC analysis. For more information visit www.agilent.com/chem

Ensuring peak performance and productivity

Agilent offers an extensive portfolio of supplies for GC, LC, MS, and atomic and molecular spectroscopy. Agilent CrossLab is a range of GC supplies compatible with all major brands of analytical instruments. You can also maximize your lab's productivity and performance with MS analyzed via kits. Ultra Inert inlet liners, and other innovative supplies. For more information visit www.agilent.com/chem/supplies



Learn more about Agilent's Sample Prep Solutions www.agilent.com/chem/sampleprep



To learn more about Agilent environmental solutions, applications, webinars and the latest SPE and QuEChERS videos, visit www.agilent.com/chem/PlanetAgilent