FOCUS: EQUIPMENT & INSTRUMENTS

VOLUME 1 ISSUE 3

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VWR® DOUBLE BEAM UV-VIS SPECTROPHOTOMETER

VWR COLLECTION

SUITABLE FOR A WIDE RANGE OF APPLICATIONS

- Standard photometrics - absorption, transmission, concentration
- Quantitative analysis and kinetics
- Multi-wavelength scan, spectrum scan
- DNA/RNA and protein analysis

The instrument can be used in stand-alone mode or in conjunction with a PC using the supplied UV-VIS analyst software which then delivers more powerful data processing, expanded data collecting, and removes the limit on storage capability.

Description	Cat. No.
UV-6300PC Spectrophotometer	**10037-442**

VWR® SPECTROPHOTOMETERS, UV-VIS SCANNING UV-3100PC AND VIS V-3000-PC

VWR COLLECTION

TWO FULLY SCANNING SPECTROPHOTOMETERS FOR ADVANCED MEASUREMENTS AND QUALITY CONTROL

- Large LCD display (320×240 pixels)
- Full scan mode
- Easily accessible USB port for data import and export
- Supplied application software 'UV-Vis analyst' allows PC control of the spectrophotometer

Reliable, robust and easy to use instruments with a range of accessories that will support the creation of a personal spectrophotometer measuring station. The application software offers all the important methods expected from a 'universal' instrument. All housed in a robust cover with a well designed optical bench.

Description	Bandwidth	Calibration	Light Type	Wavelength	Weight	Cat. No.
V-3000PC, VIS Scanning Spectrophotometer	4	±0,002 A (320 - 1000 nm)	Tungsten Halogen, ±0,05% T at 360 nm	320 - 1100 nm	12 kg	**10037-440**
UV-3100PC, UV/ VIS Scanning Spectrophotometer	2	±0,002 A (200 - 1000 nm)	Deuterium/Tungsten Halogen, Stray Light ±0,05% T @ 220, 360 nm	190 - 1100 nm	14 kg	**10037-438**

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You can select and customize services for peak efficiency, quality, and accelerated innovation.

Spectrophotometer for water analysis

By Luke Johnson, Commercial Channel for Hach

Spectrophotometry is widely used in water quality analysis. Spectrophotometric methods measure the amount of light transmitted through a liquid sample. Analyte in the sample is reacted with reagents which create colored compounds. The intensity of the color created is proportional to the concentration of the analyte in the sample. The differences in the intensities of light absorbed by the sample are converted to concentration values by the built-in calibration curve.

The procedural steps involved in a spectrophotometric method generally involve:

- Sample pretreatment
- Addition of a volume of sample to a measuring cell
- Addition of one or more chemical reagents
- Sample reaction
- Transfer or sample cell to spectrophotometer
- Measurement of reacted sample absorbance
- Comparison of sample absorbance to calibration curve and determination of sample concentration

Each of these steps may be broken down into sub-steps depending on the sample and the method. Each step and sub-step adds a layer of complexity to the analysis along with an opportunity for error and chemical exposure and spillage. Incorrect analytical technique, sample preparation, or instrument performance will lead to lost time and erroneous results. Common spectrophotometric errors can be classified broadly as optical, chemical, and instrumental.

Since spectrophotometry is an optical technique, any interaction with the measurement light beam can cause error. Smudges, scratches, water droplets, glass imperfections, films, residues, deposits, and grime on the sample cell can all interact with the light beam. Turbidity in the sample itself can also cause error. Suspended particulates block the transmission of the colorimeter's light beam just like scratches on the sample cell. Color in the sample can also interfere with the measurement.

Most spectrophotometric analyses depend on the reaction of the sample analyte with a color reagent. Several physical and chemical parameters effect how this reaction proceeds. Important among these are time, temperature, pH, volume, mixing, interferences, and reagent quality. Some or all of these parameters may be critical for a given color reaction.

The quality or operating condition of the spectrophotometer and any built-in software are also sources of potential error. Dirty, damaged, malfunctioning, or poorly designed spectrophotometer hardware will make an accurate measurement almost impossible. Many spectrophotometers are pre-programmed with manufacturer determined calibration curves which correspond to a particular method. The quality of these curves and the quality of the corresponding methods are also critical for the generation of accurate data.

The Hach® DR3900 spectrophotometer and Test-in-Tube® (TNTplus) reagents have been designed to make spectrophotometric measurements simple, accurate, safe, and environmentally responsible. The DR3900- TNTplus system encompasses every aspect of spectrophotometric measurement, building in accuracy and precision at every step. TNTplus reagents are analyte-specific pre-dosed chemistries which are reacted and measured in a single disposable glass vial. The DR3900 spectrophotometer contains calibration curves for each TNTplus chemistry, measuring the absorbance of the sample vial and providing an accurate concentration result.

The chemicals required for each parameter are pre-dosed into each TNTplus vial. Sample preparation is reduced to simply adding sample to the TNTplus vial. Additional powder reagents may be added through the Dosicap if required. There is minimal risk of spillage, minimal safety risk, or risk of contamination because the reagents are completely contained within the vial cap.

Each TNTplus chemistry box is marked with simple pictogram-based instructions. In addition, procedural steps for each method are available through the DR3900 display. The proper method program is loaded by the DR3900 whenever a TNTplus vial is inserted into the cell compartment. Each TNTplus vial is marked with a 2D barcode which is read by the spectrophotometer, loading the correct method program and indicating whether the reagent has reached its expiration date. The DR3900 rotates the vial 360°, averaging 10 absorbance measurements taken around that circumference and rejecting any outliers, effectively eliminating optical errors associated with the sample cell.

Minor variances in reagent formulation can cause slight variability between lots. Hach has developed the Truecal™ system to provide the most accurate calibration curve ever. A unique calibration curve is created for each production lot, and that calibration curve is programmed into each TNTplus vial barcode. The curve is updated in the DR3900 spectrophotometer is updated with each lot, providing the most accurate results possible.

Many spectrophotometric methods use toxic and hazardous chemicals. TNTplus vials minimize the required volumes of these dangerous chemicals. Furthermore, the mouth of the TNTplus vial has been designed so that it does not spill if knocked over, ensuring that chemicals stay contained even during an accident.

Hach TNTplus chemistries are available for all of the most common water quality parameters. From drinking water to wastewater, the DR3900-TNTplus system is the simplest, safest, most accurate spectrophotometric solution. See **vwr.com/hach** for more details.

I-RAMAN PLUS PORTABLE FIBER OPTIC RAMAN SYSTEMS, B&W TEK

POWERED BY INNOVATIVE SMART SPECTROMETER TECHNOLOGY

The i-RAMAN plus features the unique combination of wide spectral coverage and high resolution with configurations measuring out to 4000cm-1, enabling you to measure stretching bands around 3100cm-1. The system's small footprint, lightweight design, and low power consumption provide research grade RAMAN capabilities anywhere. The i-RAMAN plus comes standard with a fiber optic probe, and can be used with an XYZ positioning stage probe holder, a cuvette holder, and a trial version of our proprietary BWIQ multivariate analysis software. With the i-RAMAN plus, a high precision qualitative and quantitative RAMAN solution is at your fingertips.

Description	Excitation Wavelength	Output Power	Spectral Range	Spectral Resolution	Cat. No.
RAMAN System					
i-Raman® Plus Highly Sensitive, High Resolution Fiber Optic Raman System	532 nm	50mW Max., Adjustable 0 to 100% (Laser)	175 cm^{-1} to 3300 cm^{-1}	about 3.0 cm^{-1} at 614 nm	**10122-304**
i-Raman® Plus Highly Sensitive, High Resolution Fiber Optic Raman System	785 nm	300mW Max., Adjustable 0 to 100% (Laser)	175 cm^{-1} to 3200 cm^{-1}	about 4.5 cm^{-1} at 912 nm	**10122-328**

NANORAM HANDHELD RAMAN SYSTEM, B&W TEK

STATE-OF-THE-ART HANDHELD RAMAN INSTRUMENT FOR NONDESTRUCTIVE IDENTIFICATION AND VERIFICATION OF MATERIALS SUCH AS APIS, EXCIPIENTS, INTERMEDIATES AND FINISHED PRODUCTS

RAMAN spectroscopy is an approved method by the U.S. and European Pharmacopoeia, as well as the Pharmacopoeia of the People's Republic of China. It is also a well-recognized method for compliance with the PIC/S GMP guide regarding 100% identity assurance for starting materials. The NanoRam is fully compliant with all governing regulations, including 21 CFR Part 11 and Part 1040.10, and can play an integral role in cGMP compliant facilities. B&W Tek offers a wide variety of services, including assistance with method and/or new library development as well as support with IQ/OQ/PQ implementation.

Description	Dimensions	Weight	Cat. No.
RAMAN System			
NanoRam Handheld Raman Spectrometer Package	22 x 10 x 5 cm (8.8 x 3.9 x 2.0")	1.2 kg (2.5 lbs.)	**10121-488**

ACETIC ACID GLACIAL ≥99.0%, ULTREX® II, ULTRAPURE

CAS 64-19-7
H_3CCOOH
Boiling Pt:
Flash Pt:

UN: 2789
M.W. 60.05 g/mol
Density:

Size	Packaging	Cat. No.
500 mL	PFA Bottle	**JT6903-5**

HYDROCHLORIC ACID 32 - 35%, ULTREX® II, ULTRAPURE FOR TRACE METAL ANALYSIS

CAS 7647-01-0
HCl
Boiling Pt: 110 °C (1013 hPa)
Flash Pt:

UN: 1789
M.W. 36.46 g/mol
Melting Pt: –30 °C
Density: 1.18 g/cm^3 (20 °C)

Size	Packaging	Cat. No.
500 mL	PFA Bottle	**JT6900-5**

For more information on specifications and accessories, simply enter the Cat. No. on **vwr.com**.

HYDROCHLORIC ACID 32 - 35%, ARISTAR® ULTRA, ULTRAPURE FOR TRACE METAL ANALYSIS

Ultra high purity acid for quantitative trace metal analysis at the parts-per-trillion (ppt) level.

CAS 7647-01-0
HCl
Boiling Pt: 110 °C (1013 hPa)
Flash Pt:

UN: 1789
M.W. 36.46 g/mol
Melting Pt: –30 °C
Density: 1.18 g/cm³ (20 °C)

Size	Packaging	Cat. No.
1 L	PFA Bottle	87003-218

HYDROFLUORIC ACID 47 - 51%, ARISTAR® ULTRA, ULTRAPURE FOR TRACE METAL ANALYSIS

Ultra high purity acid for quantitative trace metal analysis at the parts-per-trillion (ppt) level.

CAS 7664-39-3
HF
Boiling Pt:
Flash Pt:

UN: 1790
M.W. 20.01 g/mol
Density:

Size	Packaging	Cat. No.
500 mL	PFA Bottle	87003-222

NITRIC ACID 67 - 70%, ULTREX® II, ULTRAPURE FOR TRACE METAL ANALYSIS

CAS 7697-37-2
HNO_3
Boiling Pt:
Flash Pt:

UN: 2031
M.W. 63.01 g/mol
Density:

Size	Packaging	Cat. No.
500 mL	Fluoropolymer Bottle	JT6901-5

NITRIC ACID 67 - 70%, ARISTAR® ULTRA, ULTRAPURE FOR TRACE METAL ANALYSIS

Ultra high purity acid for quantitative trace metal analysis at the parts-per-trillion (ppt) level.

CAS 7697-37-2
HNO_3
Boiling Pt: 120.5 °C (1013 hPa)
Flash Pt:

UN: 2031
M.W. 63.01 g/mol
Melting Pt: –42 °C
Density: 1.4 g/cm³ (20 °C)

Size	Packaging	Cat. No.
1 L	FEP Bottle	87003-228

SULFURIC ACID 93-98%

CAS 7664-93-9
H_2SO_4
Boiling Pt:
Flash Pt:

UN: 1830
M.W. 98.08 g/mol
Density: 1.82 g/cm³ (20 °C)

Size	Packaging	Cat. No.
500 mL	PFA Bottle	JT6902-5

SULFURIC ACID 93-98%, ARISTAR® ULTRA, ULTRAPURE FOR TRACE METAL ANALYSIS

Ultra high purity acid for quantitative trace metal analysis at the parts-per-trillion (ppt) level.

CAS 7664-93-9
H_2SO_4
Boiling Pt: 335 °C (1013 hPa)
Flash Pt:

UN: 1830
M.W. 98.08 g/mol
Melting Pt: 3 °C
Density: 1.84 g/cm³ (20 °C)

Size	Packaging	Cat. No.
1 L	FEP Bottle	87003-234

Quantitative NMR (qNMR) on the benchtop

By Dr. Terry Chu, Senior Application Chemist, Nanalysis
Dr. Juan Araneda, Head of Application Chemistry for Nanalysis

INTRODUCTION

Nuclear magnetic resonance (NMR) spectroscopy is one of the most powerful analytical techniques available to chemists due to the wealth of information that can be obtained from an NMR spectrum. Historically, NMR spectroscopy has been primarily used as a tool for structural elucidation as the combination of chemical shift, multiplicity, and resonance peak area in an NMR spectrum provides a detailed picture of how atoms are connected in a molecule. More recently, the technique has been applied to quantitative applications, particularly in the areas of natural product and medicinal chemistry.[1] Further adoption of qNMR as a quantitative analytical technique is hampered by the large capital cost associated with installing and maintaining traditional super-conducting high field NMR instruments. However, significant advances in electronics and magnet design has resulted in the commercialization of high-resolution benchtop NMR spectrometers. In this note, the NMReady-60 will be used to perform qNMR experiments to check the purity of commercial chemicals.

PROCEDURE

Preparing Samples for Analysis

Using a 5 decimal place analytical balance, the analyte and internal calibrant (maleic acid or 1,2,4,5-tetrachloro-3-nitrobenzene) were weighed into the same vial and the masses recorded. The solids were then dissolved in 0.6 mL of DMSO-d_6 or $CDCl_3$ and mixed thoroughly making sure the compounds fully dissolve. The resulting solution was transferred into an NMR tube. The mass of the compounds used was such that approximately 0.3 M solutions were achieved. The selection of the balance will depend on the level of precision required. A micro- or ultramicro-balance is strongly recommended.

Recording the NMR Spectra

The NMR samples were placed into the NMReady-60 and left to equilibrate for 5 minutes. The ^{1}H NMR spectra were then recorded in triplicates using the following parameters: spectral width: 80 ppm; interscan delay: 14 sec; spectral center: 20 ppm; number of points: 16384; number of scans: 16; dummy scans: 0; pulse angle: 90°; gain: auto.

Processing the NMR Spectra and Calculating Analyte Purity

The NMR data was exported into the MNova software and the phase and baseline of each spectra were manually corrected. The signals of the calibrant and analyte were integrated, and the purity of the analyte was calculated using the following equation:

$$P\,[\%]=(n_{IC}\cdot Int_A\cdot MW_A\cdot m_{IC})/(n_A\cdot Int_{IC}\cdot MW_{IC}\cdot m_A)\cdot P_{IC} \quad (1)$$

where n = number of protons; Int = integral area; MW = molecular weight; m = mass; P = purity; IC = internal calibrant; A = analyte.

RESULTS AND DISCUSSION

The qNMR experiment is reliant on the fact that the area under the curve of a signal (the integral) is directly proportional to the number of nuclei responsible for that individual peak.[2] Therefore, unlike other analytical methods, a calibration curve correlating the known concentration of the analyte and its signal response is not needed. Instead, what is needed is a signal from the analyte that does not overlap with any other signal. The concentration of the analyte is then obtained by directly comparing the integral of the signal chosen for the analyte with the integral of the signal(s) from the internal calibrant with a known concentration. As such, selection of an appropriate internal calibrant is vitally important for a qNMR experiment and several qualifications must be met. The calibrant must be inert to the sample as well as the solvent. Furthermore, the signal(s) from the calibrant must be clear and distinct and do not overlap with signals from the analyte. To ensure the highest precision, the calibrant should be of high purity and materials that are volatile and/or hygroscopic avoided.

The precision of the measurement is also dependent on accurate integrations of the signals of the analyte and the calibrant.[2] To meet this criterion, a long interscan delay is employed in the qNMR

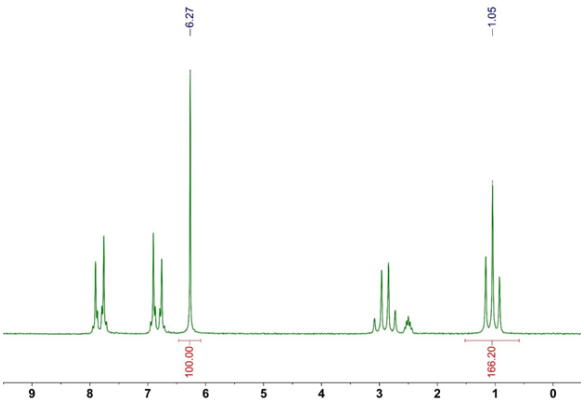

FIGURE 1. ^{1}H NMR spectrum of 4′-hydroxypropiophenone and maleic acid in DMSO-d_6.

Compound	Manufacturer	Experimental (NMReady-60)[a]	Experimental (400 MHz)[a]
		Purity (%)	
4′-hydroxypropiophenone	98	98.76	98.45
ibuprofen	≥98	100.00	99.92
indomethacin	≥99	99.40	99.68
fluorene	98	98.58	98.64
1,4-dinitrobenzene	98	98.44	98.58
1,2,4,5-tetramethylbenzene	98	98.64	98.62
dimethyl terephthalate	≥99	99.76	99.81

[a]The experimental values are an average of three separate acquisitions.

TABLE 1. Percent purity of the compounds tested using the NMReady-60 and a 400 MHz NMR spectrometer.

experiment to ensure that every nucleus in the sample has fully relaxed before the next pulse is applied. Choosing an appropriate length for the interscan delay will depend on the T_1 relaxation times of the analyte and the calibrant. Typically, the interscan delay is set to 5–7 times the longest T_1 relaxation time.

An example of the ^{1}H NMR spectrum recorded on the NMReady-60 for this note is displayed in Figure 1.

In this example, the signal of the internal calibrant (maleic acid) at 6.27 ppm was integrated while the triplet at 1.05 ppm was chosen as the signal to integrate for 4′-hydroxypropiophenone. The purity of 4′-hydroxypropiophenone was then calculated with equation 1 and the results, plus the other compounds tested in this study, are listed in Table 1.

Excellent correlation was observed between the purity determined experimentally and what was stated from the manufacturer. As well, the results obtained with the NMReady-60 matches very well with the results obtained with a 400 MHz NMR spectrometer. Thus, qNMR experiments can be performed readily and effectively with the benchtop NMReady-60 spectrometer at a fraction of the cost required for high field instruments.

REFERENCES

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2. a) Pauli, G. F.; Jaki, B. U.; Lankin, D. C. J. Nat. Prod. 2007, 70, 589. b) Pauli, G. F.; Chen, S.; Simmler, C.; Lankin, D. C.; Gödecke, T.; Jaki, B. U.; Friesen, J. B.; McAlpine, J. B.; Napolitano, J. G. J. Med. Chem. 2014, 57, 9220.

MULTI-ELEMENT ICP AND ICP-MS CERTIFIED REFERENCE STANDARDS, ARISTAR®, VWR CHEMICALS BDH®

CAN BE FOUND GROUPED FOR STABILITY AND EASE OF USE AS WELL AS COMMONLY USED CERTIFIED REFERENCE MATERIALS (CRMS) RECOMMENDED BY MANY INSTRUMENT MANUFACTURERS

For the pharmaceutical industry, the range includes a line of CRMs that comply with the general chapters on elemental impurity USP <232> limits and USP<233> procedures. These multi-element CRMs are available for precious metals, oral elemental and parenteral element impurities.

Description	Size	Matrix	Elements and Concentration	Additional Information	Cat. No.
ICP Calibration Standard	125 mL	HNO_3 / HCl / HF	1µg/mL: Ca 2µg/mL: Be, Li, Sr 5µg/mL: Mn, Mo, Sc, Na 10µg/mL: Ce, Cu, Eu, In, Fe, Ni, P, K, Si, Ti, V, Y, Zr 50µg/mL: S	ICP multi-element calibration standard with 22 elements, designed as an alternative to solutions offered by instrument manufactures.	BDH89800-558
ICP Calibration Standard	125 mL	HNO_3	10000µg/mL: Ca, Mg, K, Na	ICP common multi-element calibration standard with 4 elements	BDH89800-572
ICP Tuning Solution	500 mL	HNO_3	50µg/mL: Al, As, Ba, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Sr, Zn 500µg/mL: K	ICP multi-element tuning solution standard with 15 elements.	BDH89800-614
ICP Calibration Standard - Trace Metals In Water	125 mL	HNO_3	1µg/L: Ag, Te 7µg/L: Cd, Tl 12µg/L: Se 14µg/L: Be, Bi, Rb 17µg/L: Li 20µg/L: Cr, Pb 23µg/L: Cu 27µg/L: Co 38µg/L: V 39µg/L: Mn 58µg/L: Sb 60µg/L: As 62µg/L: Ni 79µg/L: Zn 98µg/L: Fe 113µg/L: Re 121µg/L: Mo 142µg/L: Al 158µg/L: B 323µg/L: Sr 544µg/L: Ba 2000µg/L: K 8000µg/L: Mg 21000µg/L: Na 32000µg/L: Ca	ICP multi-element calibration standard, designed as an alternative to NIST SRM 1643 trace metals in water with 30 elements.	BDH89800-656
ICP Alkaline, Alkali Earth, Non-Transition Group Calibration Standard	125 mL	HNO_3	100µg/mL: Al, As, Ba, Be, Bi, Ca, Cs, Ga, In, Li, Mg, K, Rb, Se, Na, Sr	ICP multi-element alkaline, alkali earth, non-transition group calibration standard with 16 elements. Part of the 69 Element Group.	BDH82025-930

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Vials contain premeasured digestion reagents suited to your expected range of COD, so there is no measuring of harmful chemicals - simply add your sample to the vial and digest.

Description	Range	Size	Type	Cat. No.
COD Digestion Vials	3 - 150 mg/L	25	Low range	BDH0400-25
COD Digestion Vials	20 - 1500 mg/L	25	High range	BDH0401-25
COD Digestion Vials, Hg-free	20 - 1500 mg/L	25	Mercury-free, high range	BDH0403-25
COD Digestion Vials	200 - 15000 mg/L	25	High range Plus	BDH0402-25

The art of pH measurement

By METTLER TOLEDO, pH Strategic Business Unit

InLab® Routine Pro-ISM

1 **Silver ion trap**
This prevents Ag+ ions from entering the reference electrolyte solutions and reacting with the sample. Ag+ ions form insoluble precipitates with sulfide or protein-containing samples, which can clog the junction.

2 **ARGENTHAL™** reference element provides a defined, stable potential which is independent of the measured solution.

3 **Reference electrolyte**
Establishes a salt bridge between the pH measurement electrode and the reference electrode by slowly diffusing salt solution into the sample.

4 **SafeLock™**
Refill opening for replenishment/ replacement of the bridge or reference electrolyte.

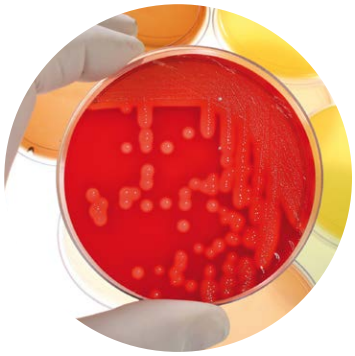
5 **Integrated temperature probe**
Allows for automatic temperature compensation (ATC).

6 **Junction**
The opening through which the reference electrolyte diffuses out of the electrode.

pH Troubleshooting

When the performance of a pH measurement system declines, the first step in restoring its original performance is identifying the problem.

Where could the problem lie? With the meter set to read mV, dip the electrode into pH 7 buffer. The reading should be 0 mV ± 30 mV with an Ag / AgCl reference. Next read a pH 4 or pH 10 buffer – the solution should be greater than 150 mV different from the pH 7 potential. If not then test the following…



APPLICATION

Are you using the right electrode for your application? There are different types of pH electrodes for special applications: non-aqueous, low conductivity, TRIS, etc. To make sure that you are using the right electrode, visit the METTLER TOLEDO Sensor Product Guide.

OPERATOR

It is sometimes worthwhile to check the obvious:

The unit is properly grounded or plugged into the wall outlet. The electrodes are plugged into proper terminals and are seated firmly. The meter is properly calibrated with the correct buffers.

Before taking a measurement, check that the wetting cap and side filling aperture have been removed or, in the case of SafeLock™, opened. Remember to rinse the electrodes with deionized water before measuring a different buffer or sample.

pH METER

Test the pH meter with the shorting clip (standard delivery) or Test Plug Set. If this plug does not set the potential to 0 mV, the meter may be the problem. In this case call METTLER TOLEDO Service.

InLab® Expert Pro-ISM

METTLER TOLEDO

7 **pH sensitive glass membrane**
Specially formulated glass that forms a "gel" layer when in contact with an aqueous solution.

8 **Internal buffer solution**
Provides a stable pH on the inside of the pH sensitive glass. In acidic solutions H+ ions diffuse into the gel layer, creating a positive potential. The opposite occurs in alkaline solutions. The total membrane potential is a result of the difference between the inner and outer charge.

9 **XEROLYT® reference system**
Solid polymer electrolyte in combination with open junction: No maintenance, no clogging of the junction.

BUFFERS

Ensure that you are using the correct buffers in the correct sequence. Always use fresh buffers.

CABLE AND CONNECTOR

Test your detachable cable by replacing it with an identical one. If you do not have a spare cable or are using a hard wired electrode, then check to see whether there is a change in the signal on the instrument when you bend the cable.

Inspect and clean all connectors including the meter socket. If you are using an electrode with a MultiPin™ or S7 connector, make sure that they are free from KCl crystals or other deposits. Dirty or corroded connectors lead to erroneous readings.

ELECTRODES

Visual inspection of the electrode can often provide important clues about the cause of the problem:

Filling solution

- Ensure that the electrolyte level is above the internal elements.
- Empty, rinse and refill the electrode reference chamber.
- Ensure that you are using the correct electrolyte as written on the electrode shaft or in the operating instructions, and that the electrolyte fill port is open.

Air bubbles

- Check for air bubbles inside the electrode. If some are present, remove them by gently shaking the electrode downward or, in the case of electrodes with gel electrolyte, placing the electrode upright in warm water.

Blocked junction

- Are there visual signs of blockage or discoloration of the reference junction?
- Hang the electrode in the air for 30 minutes to check whether the electrolyte flows through the junction. If no KCl creeping is visible, it is a sign that the junction is clogged and must be cleaned.

a) Soak the electrode in hot (50°C – 60°C) electrolyte for a few minutes. If this does not work then…

b) …soak the electrode overnight in 0.1mol/L HCl.

c) For protein contamination, soak the electrode in Pepsin–HCl solution.

d) For sulfide contamination, soak the electrode in Thiourea solution.

e) As a last resort, soak the electrode in ammonium biflouride regeneration solution for approx. one minute.

METTLER TOLEDO

Precision measurement with excellence made easy

METTLER TOLEDO's SevenExcellence™ pH meter and UV5Bio spectrophotometer are the ideal pair for your laboratory. Both offer unparalleled measurement precision, no matter your needs, and an ultra-intuitive user interface to keep operation consistently simple.

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thermo scientific

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- Select modules to measure pH, ion concentration, conductivity, dissolved oxygen and LogR™ temperature
- Onscreen measurement stability indicator shows when readings are ready
- View active calibration log while taking measurements to help ensure data integrity
- Audible alarms notify offset value, high/low limit, and calibration time limit

Description	Cat. No.
Orion™ Versa Star Pro™ pH benchtop meter kit with software	**76074-214**
Orion™ Versa Star Pro™ pH meter difficult sample kit with software	**76074-206**
Orion™ Versa Star Pro™ micro sample pH meter kit with software	**76074-210**
Orion™ Versa Star Pro™ benchtop meter pure water conductivity kit with software	**76074-208**

For more information on specifications and accessories, simply enter the Cat. No. on **vwr.com**.

TITRALAB® AT1000 SERIES POTENTIOMETRIC TITRATOR, 1 BURETTE, 1 PUMP, HACH

AUTOMATIC TITRATION WITHOUT ALL THE COMPLICATIONS

- Reliable titration results
- Eliminates operator interpretation and manual processes
- Simple setup and titration
- Application-specific functions

Simplify complex titration with the TitraLab® AT1000 from Hach

Description	Cat. No.
TitraLab AT1000 Series Potentiometric Titrator	10662-254

VWR® BENCHTOP METERS

RUGGED AND DURABLE BENCHTOP METERS ARE VERSATILE ENOUGH TO FIT YOUR UNIQUE TESTING NEEDS

- Simple to operate and maintain
- Consistently accurate and reliable measurements
- Configurable to each user's unique needs
- VWR three-year limited warranty
- Available with ISO/IEC 17025 NIST traceable calibration certificate

These meters are simple to operate and offer an intuitive user interface allowing for easy set up and use from day one.

Description	Includes	Cat. No.
Benchtop Meter Kits		
B10P Benchtop pH Meter with pH Probe	B10P Meter (**89231-662**) and Refillable Glass pH Electrode (**89231-580**)	**89231-664**
B10C Benchtop Conductivity Meter with Conductivity Probe	B10C Meter (**89231-676**) and Conductivity Probe (**89231-614**)	**89231-678**
B40PCID Benchtop Multimeter with pH, Conductivity, and DO Probes	B40PCID Meter (**89231-684**), pH (**89231-586**), Conductivity (**89231-618**), and DO (**89231-624**) Probes	**89231-686**

pH REFERENCE STANDARD BUFFERS

AVAILABLE AS EITHER COLORLESS OR COLORED SOLUTIONS

- Traceable to NIST standards reference materials
- Calibrated in an ISO 17025 certified laboratory using certified standards
- Store at room temperature

Size	pH Value	Color	pH Accuracy	Packed	Traceable to N.I.S.T. Standard Reference Material (SRM) Number	Cat. No.
500 mL (16.9 oz.)	4.00	Red	±0.01	Poly Bottle	185, 186	**BDH5018-500ML**
500 mL (16.9 oz.)	7.00	Yellow	±0.01	Poly Bottle	186, 191, 192	**BDH5046-500ML**
500 mL (16.9 oz.)	10.00	Blue	±0.01	Poly Bottle	186, 191, 192	**BDH5072-500ML**
500 mL (16.9 oz.)	Buffer Set	Assorted	±0.01	Poly Bottle		**BDH5100-PK**

ELECTROCHEMISTRY CONSUMABLES

TRACEABLE® CONDUCTIVITY CALIBRATION STANDARDS (CRM), VWR®

VWR COLLECTION

THESE CERTIFIED REFERENCE MATERIALS (CRM) CALIBRATE CONDUCTIVITY METERS AND PROBES FOR MAXIMUM ACCURACY

- Traceable
- Available in single-use (100 mL) or 473 mL (16 oz.) sizes
- Easy to calibrate
- Polyethylene container
- Ideal for both lab and field conditions

They are compatible with all makes of equipment, and can be used in lab or field.

Bottle Size	Conductivity	Dissolved Solids	Resistivity	Bottle Size	Cat. No.
Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	10 µmhos (µS)	6.6 ppm	0.1 megohms	Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	**23226-650**
Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	100 µmhos (µS)	66 ppm	0.01 megohms	Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	**23226-651**
Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	1000 µmhos (µS)	666 ppm	0.001 megohms	Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	**23226-652**
Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	10000 µmhos (µS)	6666 ppm	0.0001 megohms	Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	**23226-653**
Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	100000 µmhos (µS)	66666 ppm	0.00001 megohms	Single-Use, 100 mL (3.4 oz.) Polyethylene Bottles (NIST/ISO 17025 Certificate)	**23226-654**

BROMATE-BROMIDE SOLUTION 0.1 N

VWR BDH CHEMICALS

APHA for phenols.

$KBrO_3/KBr$
Boiling Pt:
Flash Pt:
Density:

Size	Packaging	Cat. No.
1 L	Amber Poly Bottle	**BDH7862-1**

HYDROCHLORIC ACID 2.0 N

VWR BDH CHEMICALS

Made with high purity acid and deionized water. Suitable as a titrant.

CAS 7647-01-0
HCl
Boiling Pt:
Flash Pt:
UN: 1789
M.W. 36.46 g/mol
Density:

Size	Packaging	Cat. No.
1 L	Poly Bottle	**BDH7203-1**

IODINE SOLUTION 0.1 N

VWR BDH CHEMICALS

Made with iodine crystals, potassium iodide and deionized water.

CAS 7553-56-2
I_2
Boiling Pt:
Flash Pt:
UN: 3495
M.W. 253.81 g/mol
Density:

Size	Packaging	Cat. No.
1 L	Amber Glass Bottle	**BDH7207-1**

SODIUM HYDROXIDE 0.01 N IN AQUEOUS SOLUTION

VWR BDH CHEMICALS

NIST traceable. Suitable as a titrant.

CAS 1310-73-2
NaOH
Boiling Pt:
Flash Pt:
UN: 1824
M.W. 40 g/mol
Density: 1 g/cm^3 (25 °C)

Size	Packaging	Cat. No.
1 L	Poly Bottle	**BDH7620-1**

STARCH 2% (W/V) IN AQUEOUS SOLUTION INDICATOR

VWR BDH CHEMICALS

Starch Indicator, 2% (w/v) Aqueous Solution, Mercury Free, for Iodometric Titrations.

CAS 9005-25-8
$(C_6H_{10}O_5)n$
Boiling Pt:
Flash Pt:
M.W. 162.14 g/mol
Density:

Size	Packaging	Cat. No.
500 mL	Poly Bottle	**BDH5106-500ML**

For more information on specifications and accessories, simply enter the Cat. No. on **vwr.com**.

money saving offers

METTLER TOLEDO

PROMO CODE 3466

Trade in your old Mettler Toledo (or competitor) balance and receive a 15% total cash back on your new Mettler Toledo balance purchase through VWR.

To redeem your rebate, have your VWR proof of purchase (VWR invoice or packing slip) and visit **vwr.com/promotions**

Enter **Promo Code 3466** in the search field and fill out the online redemption form. Be sure to enter the serial number of the model purchased.

Valid on Valid on XPR, XSR and MS-TS/MS balances 15% Cash Back based on final purchase price. Rebate may not exceed $1,000.

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thermo scientific

Save up to $2000 when you purchase Orion Star A, Dual Star, and Versa Star Pro Benchtop Meter Kits!

Save on select Thermo Scientific™ Orion™ Benchtop Meter Kits!

Thermo Scientific™ Orion™ meters are designed to offer an easier way to test. Simple interfaces with onscreen prompts allow for easy training and consistent testing.

- A210 series meters offer dedicated single and dual parameter measurement capabilities
- Orion meters are available in kit versions, providing you with the electrodes, buffers and solutions you need at a great value

Visit **vwr.com/promotions** and search **Promo Code 5484** for a complete list of qualifying products and redemption details. Offer expires 12.31.19.

VWR COLLECTION

$165 VALUE

VWR® ADVANCED HOTPLATE STIRRERS

BUY A VWR ADVANCED HOTPLATE STIRRER AND GET A FREE SUPPORT ROD AND CLAMP KIT! (CAT. NO. 11301-110)

- Excellent temperature uniformity
- Microprocessor controlled
- Cool touch, chemical-resistant housing
- LED display for temperature
- Best-in-class five-year warranty

VWR Advanced Hotplate Stirrers deliver accurate and repeatable results. Temperature range from ambient +5° to 500°C, speed range from 60 to 1600rpm. Control panel features easy to use controls which allow user to dial in adjustments. Recall last set temperature with the touch of a button, even after unit has been turned off. Rear housing features an off-centered integral support rod holder with locking knob that works with the optional support rod kit.

Electrical	Top Plate Dimensions, cm	Maximum Capacity	Top Plate Material	Each	Cat. No.
120V, 400W, 3.3A	10.2 x 10.2	600 mL	Aluminum	503.79	**97042-606**
120V, 400W, 3.3A	10.2 x 10.2	600 mL	Ceramic	652.20	**97042-602**
120V, 1000W, 8.3A	17.8 x 17.8	2500 mL	Aluminum	694.57	**97042-646**
120V, 1000W, 8.3A	17.8 x 17.8	2500 mL	Ceramic	615.06	**97042-642**
120V, 1550W, 12.9A	25.4 x 25.4	6000 mL	Aluminum	736.85	**97042-686**
120V, 1550W, 12.9A	25.4 x 25.4	6000 mL	Ceramic	758.45	**97042-682**

Visit **vwr.com/promotions** and search **Promo Code 4292**. Offer expires 12.31.2019.

money saving offers

VWR COLLECTION

VWR® MELTING POINT APPARATUS

PROMO CODE 5089

Save up to 20% when you purchase the MP numbers listed here before December 31, 2019.

KEY FEATURES

- LCD screen displays temperature, date, and time
- Audible alarm when set temperature is reached Large, clear viewing window with 8x magnification and white LED to illuminate samples
- Best-in-class five-year warranty
- Available with an NIST Traceable, ISO/IEC 17025 Accredited Calibration Certificate"

Description	Cat. No.
Basic Melting Point Apparatus	MP75840-104
Advanced Melting Point Apparatus	MP75840-112

Promotional part numbers are available through 12.31.2019. They must be used at the time of purchase, and may be ordered via the "ORDER ENTRY" link on **vwr.com** (promotional part numbers cannot be found via Search on **vwr.com**). For assistance with ordering, please contact VWR Customer Service at 1 800 932 5000. All prices in US dollars.

ELGA VEOLIA

FREE 2ND PURIFICATION PACK

CAN YOUR WATER KEEP UP WITH YOUR NEEDS?

BUY AN ELGA LABWATER SYSTEM AND GET A FREE 2ND PURIFICATION PACK!

ELGA specializes in delivering water purification systems for research, science, and clinical environments. Our comprehensive range of pure and ultrapure water (Type I, II, III) purification systems offer several features and benefits, including either a few liters or up to thousands of liters of water per day.

System	Qualifying Products	Free 2nd Purification Pack
PURELAB Chorus	10034-540, 10034-542, 10034-544, 10034-546, 10034-548, 76048-804, 76048-806, 76048-808, 76048-810, 76048-796, 76048-798	10035-894, 10035-890, 76048-854, 76048-852
PURELAB Classic	89204-072, 89204-076, 89204-080, 89204-084	89204-376
PURELAB Flex	89204-088, 89204-092, 89221-838, 89221-840, 89221-844	89204-392, 89204-404

Must purchase 1st purification pack with order to receive the 2nd free through online redemption. Cannot be combined with other offered promotions. One redemption only. Visit **vwr.com/promotions** and search for **Promo Code 5188**. Offer expires 12.31.2019.

thermo scientific

BUY 2 AND GET 1 FREE!

Thermo Scientific Chromacol GOLD-Grade Vials and Inserts

Ever more sensitive chromatography and mass spectrometry systems demand reliable vials which can routinely deliver the ultimate purity grade and the lowest surface activity possible. Sample security and confidence in data integrity are paramount in trace analysis and can only be achieved with the highest vial-glass quality.

Visit **vwr.com/promotions** and search **Promo Code 5298** for a complete list of qualifying products and redemption details. Offer expires 12.31.19.

PALL Laboratory

UP TO $562 VALUE

ACRODISC ONE™ SYRINGE FILTER WITH WWPTFE MEMBRANE

BUY 2 AND GET 1 OF THE SAME PRODUCT FREE!

- Extend column life up to 52 times
- Universally compatible membrane simplifies sample prep filter selection and validation
- Extremely low extractables for more reliable data

Qualifying Acrodisc One wwPTFE Syringe Filters

Description	Cat. No.
wwPTFE, 25 mm, 0.2 µm	76308-662
wwPTFE, 25 mm, 0.45 µm	76308-674
wwPTFE/GxF, 25 mm, 0.2 µm	76308-668
wwPTFE/GxF, 25 mm, 0.45 µm	76308-680

Visit **vwr.com/promotions** and search **Promo Code 5410**. Offer expires 12.31.2019.

BUCHI

$4422 VALUE

BUCHI ROTAVAPOR® R-300 SYSTEM

BUY AN R-300 ROTAVAPOR MODEL (10023-928 OR 10023-932), PLUS A V-300 VACUUM PUMP (10808-692) AND GET A FREE PRO VACUUM CONTROLLER

The R-300 Pro Controller offers a 7" touchscreen to view and control all of your parameters at a glance.

Description	Cat. No.
R-300 Rotavapor, Vertical Condenser for Standard Distillation (Cold Water or a Chiller)	10023-928
R-300 Rotavapor, Cold Trap Condenser for Distillation of Low Boiling-Point Solvents (Dry Ice)	10023-932
V-300 Vacuum Pump, without Secondary Condenser	10808-692
Pro Vacuum Controller	10806-454

Visit **vwr.com/promotions** and search **Promo Code 5415**. Offer expires 12.31.2019.

Highest level of precision

VWR COLLECTION

3-YEAR WARRANTY

Buy a VWR® U-Series Ultra-Microbalance or Microbalance and receive free onsite installation and training.

VWR® U-SERIES ULTRA-MICROBALANCES AND MICROBALANCES

- Large, color-resistive touch screen
- Hands-free operation via IR proximity sensors
- Automatic level control
- Continuous ambient condition monitoring

Description	Size (or Secondary Description)	VWR Cat. No. or MP numbers
VWR-2.1U	2.1g x 0.1µg	76321-866
VWR-2U	2.1g x 1µg	76321-868
VWR-5U	5.1g x 1µg	76321-870
VWR-11U	11g x 1µg	76321-872
VWR-21U	21g x 1µg	76321-874

3-YEAR WARRANTY

Buy a VWR® X and XA-Series Microbalance and receive free onsite installation and training.

VWR® X AND XA-SERIES MICROBALANCES

- Automatic doors (XA-series)
- Hands-free operation via IR proximity sensors
- Large, color-resistive touch screen
- Built-in antistatic ionizer (XA-series)

Description	Cat. No.
VWR-6XA (6.1g x 1µg, auto door, antistatic ionizer)	76321-898
VWR-6.21XA (6/21g x 1/2µg, auto door, antistatic ionizer)	76321-900
VWR-21XA (21g x 1µg, auto door, antistatic ionizer)	76321-902
VWR-21.52XA (21/52g x 1/5µg, auto door, antistatic ionizer)	76321-904
VWR-52XA (52g x 1/5µg, auto door, antistatic ionizer)	76321-906
VWR-6XC (6.1g x 1µg, manual door)	76321-876
VWR-6.21XC (6/21g x 1/2µg, manual door))	76321-878
VWR-21XC (21g x 1µg, manual door))	76321-880
VWR-21.52XC (21/52g x 1/5µg, manual door))	76321-882
VWR-52XC (52g x 1/5µg, manual door))	76321-896

XPR MICROBALANCES, METTLER TOLEDO®

METTLER TOLEDO

MAKE YOUR MICRO-WEIGHING TASKS SIMPLER, SAFER AND MORE SECURE

- Capacities from 2.1 g to 10.1 g
- Readabilities from 0.1µg
- Glass draft shield with motorized drive for precise weighing even in unstable environments
- Compact design with small footprint

To make the most of your valuable resources, XPR microbalances and ultra-microbalances deliver a unique level of precision with exceptionally low minimum weights.

Model	Weighing Capacity	Linearity	Pan/Platform Size	Readability	Stabilization Time	Repeatabilty	Cat. No.
XPR2U	2.1 g	0.0015 mg	Ø .6"	0.0001 mg	10 s	0.00025 mg (@ 5% load)	**75832-842**
XPR2	2.1 g	0.004 mg	Ø 1.06"	0.001 mg	8 s	0.001 mg (@ 5% load)	**75832-782**
XPR6U	6.1 g	0.004 mg	Ø .6"	0.0001 mg	15 s	0.0004 mg (@ 5% load)	**75832-844**
XPR6UD5	6.1 g	0.004 mg	Ø 1.06"	0.0005 mg	8 s	0.0007 mg (@ 5% load)	**75832-778**
XPR10	10.1 g	0.004 mg	Ø 1.06"	0.001 mg	8 s	0.0008 mg (@ 5% load)	**75832-780**

SCOUT® PORTABLE TOPLOAD BALANCE WITH SQUARE PAN, OHAUS®

OHAUS

IDEAL FOR LABORATORY AND INDUSTRIAL APPLICATIONS, IN A SLIM, STACKABLE DESIGN WITH LARGE BACKLIT LCD

- Bright backlit LCD and 4-button control
- Superior overload protection and impact-resistant pan support

Additional standard features include; transportation lock, stainless steel pan, menu and calibration lockout switch, slip-resistant and adjustable feet, leveling bubble, mechanical and software overload/underload protection, stability indicator, auto tare, low battery indicator, auto shut-off, user selectable printing options, and user selectable communication settings.

Description	Weighing Capacity	Readability	Cat. No.
Scout® Model SPX1202, Portable Topload Balance with Square Pan	1200 g	0.01 g	**10805-406**
Scout® Model SPX2202, Portable Topload Balance with Square Pan	2200 g	0.01 g	**10805-408**
Scout® Model SPX621, Portable Topload Balance with Square Pan	620 g	0.1 g	**10805-412**
Scout® Model SPX2201, Portable Topload Balance with Square Pan	2200 g	0.1 g	**10805-414**
Scout® Model SPX6201, Portable Topload Balance with Square Pan	6200 g	0.1 g	**10805-416**
Scout® Model SPX8200, Portable Topload Balance with Square Pan	8200 g	1 g	**10805-356**

VWR® DISPOSABLE ALUMINUM CRINKLE DISHES WITH TABS

VWR COLLECTION

IDEAL FOR GENERAL-PURPOSE WEIGHING, DISPENSING, AND STORING APPLICATIONS

- Dishes feature tabs for easy handling
- Crimped sides for rigidity
- Sturdy construction

Dishes also function as evaporating dishes, parts containers, or dust covers. Sturdy, with a flat bottom and slight taper for easy stacking.

Capacity	I.D. x D	Weight	Cat. No.
60 mL (2 oz.)	5.7 x 1.6 cm (2¼ x ⅝")	1.3 g	**25433-008**
60 mL (2 oz.)	5.7 x 1.6 cm (2¼ x ⅝")	1.3 g	**25433-010**
20 mL (0.68 oz.)	4.3 x 1.3 cm (1¹¹⁄₁₆ x ½")	1 g	**25433-052**

VWR® DISPOSABLE SQUARE WEIGHING BOATS

VWR COLLECTION

ENABLE ACCURATE POUR-OUT WITH MINIMAL SAMPLE LOSS

- Shallow form with wide, flat bottom avoids tipping
- Rounded corners simplify transfer
- Temperature resistant up to 70°C

They are biologically inert and resistant to dilute and weak acids, aqueous solutions, alcohols, and bleaches. Ideal for use with microwaves, balances, or moisture analyzers.

Capacity	Color	Cat. No.
Antistatic Version		
100 mL	Blue	**10770-406**
100 mL	White	**10770-448**
250 mL	White	**10770-450**

Pure tips - how to maintain a green, clean chromatography lab

By Bart Denoulet, Business Area Manager, Purification for Buchi

INTRODUCTION

Chromatography is one of the most routinely performed separation methods by chemists. Although it is a common procedure, the chromatography process still comes with hazards for the scientists, their samples and their surrounding environment. As maintaining the health of the chemist is of top priority, one should recognize potential dangers that can jeopardize the safety of laboratory staff and install measures to sufficiently protect the scientists. Importantly, the sample itself needs adequate care throughout the chromatography process. A successful chromatography performance can only occur if the integrity of the sample is maintained. With better protected samples, the number of times a chromatography separation needs to be repeated is minimized and resources are saved.

All chromatography separations have a substantial environmental impact. To reduce the environmental footprint of the chromatography process, one can implement green chromatography in the laboratory. Although this might sound burdensome at first, there are simple solutions that chemists can adopt to perform more environmentally friendly chromatography.

Most obstacles to obtaining a safer and greener chromatography process can be resolved with a smartly designed chromatography platform. The new Pure systems by BUCHI offers numerous features for safe and green operation to adequately protect users, their samples and their surroundings.

A list of common roadblocks to achieving a safer, more environmentally friendly chromatography space and suggestions for how to overcome these obstacles is included below.

HOW TO MINIMIZE CHEMICAL EXPOSURE DURING CHROMATOGRAPHY SEPARATIONS

Safety check chemist and sample: As with any general laboratory safety guidelines, chemists should familiarize themselves with relevant material data safety sheets and should protect themselves with goggles and gloves when using toxic or corrosive chemicals. Importantly, chromatographers face the most toxicity in the organic solvents used in the mobile phase. All solvents should be transported in appropriate containers and handled in a laboratory fume hood.

Pure Safety Tip: Pure chromatography systems are equipped with a fume hood enclosure at the fraction collection and contain active ventilation to help keep lab air clean. Eliminating the need to perform the chromatography separations in a fume hood also optimizes lab space and could prevent incidents due to overcrowding. With the Pure platform, scientists can store the solvent bottles on top of the system to make better use of available space and reduce risk of spills.

Environmental check: To reduce the amount of hazardous chemicals released in the environment, one should plan each experiment carefully. Chemists should also attempt to reduce the amount of organic solvent in the mobile phase. One could achieve this by using columns with reduced length, internal diameter and particle size. When performing less demanding isocratic analysis, chromatographers could consider using a mobile phase recycler to minimize hazardous waste generation.

Pure Eco-friendly Tip: A system like Pure contains flash cartridges with an air purge function. This feature is designed to remove solvents before the cartridge is disposed of, reducing the amount of hazardous chemicals disregarded as waste.

Although ventilation in the laboratory is necessary for chromatography work, performing the separations in a fume hood can be quite damaging to the environment. Fume hoods require a huge amount of energy. A University of South Florida study estimates that buildings with fume hoods require four to

five times as much energy as buildings without them. The Pure chromatography systems support energy conservation efforts by eliminating the need to perform the chromatography separations in a fume hood. The active ventilation system of the Pure products requires less energy for fume evacuation than a fume hood.

HOW TO PROPERLY HANDLE COLUMNS AND CARTRIDGES DURING SET-UP AND OPERATION

Safety check chemist and sample: Chromatographers should carefully follow manufacturer's instructions when installing new columns or cartridges. Importantly, the working pressure of the column should never exceed the maximum pressure recommended by the manufacturer.

Pure Safety Tip: A system like Pure employs cutting-edge radio frequency identification (RFID) technology to adhere to the maximum pressure setting and reduce the risk of cartridge cracking. By enabling automatic digital transfer of cartridge settings such as column name, default flow rate, equilibration time, separation lengths, air purge time and sample size, RFID tags on cartridges eliminate potential risks of other wrong settings. RFID technology also helps protect the sample by reducing potential settings errors that would cause the process to fail and subsequently need to be repeated.

Environmental check: An efficient way to extend the lifetime of your preparative HPLC columns is to use guard columns or pre-columns for glass columns. These guards protect the HPLC column from contamination from insoluble particles or non-eluting compounds from the sample, debris from worn pump seals and injector rotor sales or from unfiltered mobile phases.

Pure Eco-friendly Tip: With RFID technology, the user can maintain cartridges in good shape so that the need to purchase new equipment is reduced.

HOW TO AVOID RISKY REACTIONS FROM NEIGHBORING BENCHES

Safety check chemist and sample: Potential health risks could arise from neighboring experiments that are unrelated to ongoing chromatography separations.

To reduce the risk of a harmful bystander situation, scientists should aim to optimize their lab space.

Pure Safety Tip: The Pure chromatography system features a compact design to enable chemists to use their lab area as efficiently as possible. The product contains integrated UV and ELS detectors and combines both flash and preparative HPLC into one system eliminating the need for multiple machines that would congest the chemistry laboratory.

Pure can also be conveniently operated outside of the fume hood, as the system contains a closed fraction collector bay. This helps optimize the available space in busy fume hoods.

Environmental check: The best prevention of health hazards in the laboratory is to limit the time spent in the lab. Pure supports this notion by offering the user remote control possibilities. These options allow the user to monitor and control the chromatography separation from a PC, tablet or smart phone, reducing the amount of time the scientist must be physically present in the laboratory. The high degree of automation of the Pure platform decreases sample loss by increasing the probability of a successful chromatography separation.

Pure Eco-friendly Tip: Besides making better use of available space, the small dimensions and smart design of the Pure chromatography system help increase energy efficiency and reduce its environmental footprint.

REVELERIS® X2 FLASH CHROMATOGRAPHY/PREP PURIFICATION SYSTEMS, BUCHI

ALLOWS THE CHEMIST TO SEE PREVIOUSLY INVISIBLE COMPONENTS AND IMPURITIES, HELPING TO PROVIDE MAXIMUM PURITY AND RECOVERY OF TARGET COMPOUNDS IN MINIMAL TIME

- Synchronized detection and fraction collection from up to four detector signals (ELSD/UV/Vis)
- Detects the widest range of compounds
- Maximizes recoveries by directing only 50 µL/min or less of your sample to ELSD
- Quickly modify run parameters on a large 12" touch screen display
- Edit gradients in real time, using click and drag or table

The patented RevealX™ detection technology combines multiple detector signals to optimize the timing of fraction collection.

Description	Electrical	Maximum Pressure	Flow Range	Cat. No.
Reveleris® X2 Flash Chromatography System	120/240 V, 50/60 Hz	200 psi (14 bar)	Pump flow 1-200 mL/min	**75841-056**
Reveleris® Prep Purification System	120/240 V, 50/60 Hz	1700 psi (120 bar)	Pump flow 1-200 mL/min	**75841-058**

PURE CHROMATOGRAPHY SYSTEMS, BUCHI

EXTREMELY COMPACT AND CAN BE USED OUTSIDE OF THE FUME HOOD

- Small footprint onboard solvent platform
- Integrated UV and ELSD (C-815/850)
- Flash and prep HPLC in one system (C-850)
- Flash- up to 250 ml/min @50 bar (725 psi)
- Prep HPLC- up to 100 ml/min @300 bar (4350 psi)
- Lowest sample loss for ELSD (30 µl/min)
- Closed fraction collector bay
- Leak and pressure sensors for safety

Pure space. Pure safety. Pure simplicity. Pure chromatography systems are designed for minimal width, freeing up bench space for science. The Pure instruments can be operated safely even outside of a fume hood as they are all equipped with a fume enclosure at the fraction collector and are capable of active ventilation. Combine both flash and prep HPLC in one system with the C-850.

Description	Model	Maximum Pressure	Flow Rate	Cat. No.
Flash system with UV detector	C-810	50 bar (725 psi)	250 ml/min	**76316-224**
Flash system with UV/ELSD detector	C-815	50 bar (725 psi)	250 ml/min	**76316-226**
Flash/prep HPLC system with UV-Vis/ELSD detector	C-850	300 bar (4350 psi)	250 ml/min	**76316-228**

ACETONITRILE ≥99.9% (BY GC, CORRECTED FOR WATER CONTENT), BAKER ANALYZED® HPLC, ULTRA GRADIENT FOR HPLC/UHPLC, FOR SPECTROPHOTOMETRY

CAS 75-05-8
H_3CCN
Boiling Pt: 81.6 °C (1013 hPa)
Flash Pt: 2 °C (closed cup)

UN: 1648
M.W. 41.05 g/mol
Melting Pt: –45.7 °C
Density: 0.782 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 l	Narrow Mouth Amber Glass Bottle, PVC Coated	JT9017-33

ACETONITRILE, ANHYDROUS (MAX. 0.003% H_2O) ≥99.9%, HIPERSOLV CHROMANORM®, SUPER GRADIENT GRADE FOR HPLC

CAS 75-05-8
H_3CCN
Boiling Pt: 81.6 °C (1013 hPa)
Flash Pt: 2 °C (closed cup)

UN: 1648
M.W. 41.05 g/mol
Melting Pt: –45.7 °C
Density: 0.782 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Amber Glass Bottle	BDH83639.400

N,N-DIMETHYLFORMAMIDE ≥99.9%, HIPERSOLV CHROMANORM® FOR HPLC

CAS 68-12-2
$HCON(CH_3)_2$
Boiling Pt: 153 °C (1013 hPa)
Flash Pt: 57.5 °C (closed cup)

UN: 2265
M.W. 73.09 g/mol
Melting Pt: –61 °C
Density: 0.949 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Amber Glass Bottle	BDH83634.400

N-HEXANE ≥95% FOR HPLC/UHPLC, FOR SPECTROPHOTOMETRY

For use in liquid chromatography and spectrophotometry. UV cutoff 192nm. Lot analysis on label.

CAS 110-54-3
$H_3C(CH_2)_4CH_3$
Boiling Pt: 69 °C (1013 hPa)
Flash Pt: –22 °C

UN: 1208
M.W. 86.18 g/mol
Melting Pt: –94.3 °C
Density: 0.659 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Narrow Mouth Amber Glass Bottle, PVC Coated	JT9304-33

METHANOL ≥99.9% (BY GC, CORRECTED FOR WATER CONTENT) FOR LIQUID CHROMATOGRAPHY, FOR HPLC/UHPLC, FOR SPECTROPHOTOMETRY

CAS 67-56-1
CH_3OH
Boiling Pt: 64.6 °C (1013 hPa)
Flash Pt: 11 °C (closed cup)

UN: 1230
M.W. 32.04 g/mol
Melting Pt: –98 °C
Density: 0.7918 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Narrow Mouth Amber Glass Bottle, PVC Coated	JT9093-33

METHANOL ≥99.9% ACS, PH. EUR., SUPER GRADIENT GRADE FOR HPLC

CAS 67-56-1
CH_3OH
Boiling Pt: 64…65 °C
Flash Pt:

UN: 1230
M.W. 32.04 g/mol
Density: 0.791…0.793

Size	Packaging	Cat. No.
4 L	Glass bottle	BDH85681.400

METHANOL ≥99.8%, HIPERSOLV CHROMANORM®, GRADIENT GRADE FOR HPLC

CAS 67-56-1
CH_3OH
Boiling Pt: 64.6 °C (1013 hPa)
Flash Pt: 11 °C (closed cup)

UN: 1230
M.W. 32.04 g/mol
Melting Pt: –98 °C
Density: 0.7918 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Amber Glass Bottle	BDH20864.400

TETRAHYDROFURAN ≥99.8% (BY GC, CORRECTED FOR WATER CONTENT) CONTAINS NO PRESERVATIVES, BAKER ANALYZED™ HPLC FOR HPLC/UHPLC, FOR SPECTROPHOTOMETRY

BAKER ANALYZED™ HPLC Reagent - high purity solvents for use in analytical and preparative separations. All are optimized for all of your liquid chromatography applications, including HPLC, UHPLC, gel permeation chromatography and UV-spectrophotometric analysis.

CAS 109-99-9
C_4H_8O
Boiling Pt: 66 °C (1013 hPa)
Flash Pt: –21.5 °C

UN: 2056
M.W. 72.11 g/mol
Melting Pt: –108.5 °C
Density: 0.888 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 l	Narrow Mouth Amber PVC Coated Glass Bottle	JT9441-33

WATER FOR HPLC/UHPLC, FOR SPECTROPHOTOMETRY

For use in high performance liquid chromatography. Free from organic compounds. Lot analysis on label.

CAS 7732-18-5
H_2O
Boiling Pt: 100 °C (1013 hPa)
Flash Pt:

M.W. 18.02 g/mol
Melting Pt: 0 °C
Density: 1 g/cm³ (4 °C)

Size	Packaging	Cat. No.
4 L	Narrow Mouth Amber Glass Bottle	JT4218-3

WATER, HIPERSOLV CHROMANORM® FOR HPLC

CAS 7732-18-5
H_2O
Boiling Pt: 100 °C (1013 hPa)
Flash Pt:

M.W. 18.02 g/mol
Melting Pt: 0 °C
Density: 1 g/cm³ (4 °C)

Size	Packaging	Cat. No.
4 L	Amber Glass Bottle	BDH23595.400

VWR® 9 MM SCREW-THREAD VIALS

SPECIFICALLY DESIGNED WITH A CRIMP CAP PROFILE FOR ROBOTIC ARM AUTOSAMPLERS BUT HAVE EASY-TO-USE SCREW-THREAD CAPS

- Ideal for use with autosamplers
- Crimp-top cap profile for robotic arm autosamplers
- Easy-to-use screw caps included with vial kits

Vials are manufactured from Type 1 borosilicate glass and have a maximum fill volume of 1.8 mL. Ideal for use with Agilent® 7673 and 1100 autosamplers, as well as all other 12x32 mm vial format autosampler units. Certified vial kits are tested and certified to meet or exceed up to nine critical performance parameters; certificate enclosed with kit.

Description	Capacity	O.D. x L	Bottom Style	Color	Cat. No.
Vials					
Screw Thread Glass Vials with ID Patch	2 mL	12 x 32 mm	Flat Bottom	Clear	46610-724

Description	Cat. No.
Accessories	
Screw Caps	89239-016

CAPS FOR VWR® 9 MM SCREW-THREAD VIALS

Description	Cap Color	Cap Size	Cap Type	Septa Type	Cat. No.
Screw Caps	Blue	9 mm	Polypropylene	Ivory PTFE/Red Rubber	89239-016

CAPS FOR VWR® VERSATILE 11 MM DUAL CRIMP-TOP/SNAP-CAP VIALS

Description	Cap Color	Cap Size	Cap Type	Septa Type	Cat. No.
Snap Caps	Clear	11 mm	Polyethylene	Red PTFE/White Silicone	46610-720
Snap Caps	Blue	11 mm	Polyethylene	Blue PTFE/White Silicone, Pre-Slit	89239-014

wwPTFE (WATER WETTABLE PTFE) MEMBRANE DISC FILTERS, PALL LABORATORY

MAXIMUM CHEMICAL COMPATIBILITY WHEN FILTERING BOTH AQUEOUS SOLUTIONS AND AGGRESSIVE SOLVENTS

- Hydrophilic
- Low protein binding

HPLC certified for low extractables assuring that the filter will not add artifacts or contamination to your analysis. Low protein binding of wwPTFE membrane provides high recovery of critical proteinaceous samples.

Diameter	Pore Size	Cat. No.
25 mm	0.2 µm	76308-704
50 mm	0.2 µm	76308-708
25 mm	0.45 µm	76308-710
50 mm	0.45 µm	76308-714

VWR® SYRINGE FILTERS

VWR COLLECTION

POLYPROPYLENE, NYLON, AND PTFE MEMBRANES ARE IDEAL FOR SAMPLE PREPARATION AND SMALL VOLUME CHEMICAL FILTRATION

- Ideal for sterile filtration
- Manufacturing process certified to ISO 9001
- Biosafe according to Class VI plastics tests

Syringe filters with cellulose acetate or polyethersulfone membranes are ideal for sterile filtration of buffers, tissue culture media or additives, and other biologicals. The polyethersulfone membrane offers high flow rates. Nonsterile syringe filters are excellent for HPLC applications. Each filter has a female luer-lock inlet and a male slip Luer outlet.

Description	Diameter	Membrane Material	Pore Size	Sterility	Cat. No.
Syringe Filters with Acrylic Housing	25 mm	Cellulose Acetate	0.2 µm (Retains 107 Brevundimonus diminuta per cm^2 according to modified ASTM F838-83)	Sterile	**28145-477**
Syringe Filters with Acrylic Housing	25 mm	Polyethersulfone	0.2 µm (Retains 107 Brevundimonus diminuta per cm^2 according to modified ASTM F838-83)	Sterile	**28145-501**
Syringe Filters with Polypropylene Housing	13 mm	PTFE	0.2 µm	Nonsterile	**28145-491**
Syringe Filters with Polypropylene Housing	25 mm	Nylon	0.45 µm	Nonsterile	**28145-489**
Syringe Filters with Polypropylene Housing	25 mm	PTFE	0.45 µm	Nonsterile	**28145-497**

ACCLAIM 120 C18 LC COLUMNS, THERMO SCIENTIFIC

thermo scientific

IMPROVE THE SEPARATION EFFICIENCY IN YOUR REVERSED-PHASE APPLICATIONS WITH THERMO SCIENTIFIC™ ACCLAIM 120 C18 COLUMNS

These columns feature an ultrapure silica substrate with extremely low metal content to minimize tailing effects and deliver symmetrical peak shapes. The unique bonding chemistry yields excellent surface coverage to provide highly predictable separations that are unaffected by secondary interactions. Use these high-efficiency columns for maximum resolution in a wide variety of applications.

Column Format	I.D. x L	Particle Size	Pore Size	Cat. No.
Analytical	2.1 x 250 mm	2.2 µm	120 Å	**10043-322**
Analytical	2.1 x 100 mm	5 µm	120 Å	**10044-436**
Analytical	3 x 50 mm	3 µm	120 Å	**10044-602**

RAPTOR™ C18 LC COLUMNS, RESTEK

RESTEK

OFFERS THE HIGHEST HYDROPHOBIC RETENTION OF ANY RAPTOR™ PHASE, AND IT IS COMPATIBLE WITH A WIDE RANGE OF MOBILE PHASES FROM MODERATELY ACIDIC TO NEUTRAL (PH 2–8)

- Surface Area: 150 m^2/g (2.7 µm) or 100 m^2/g (5 µm)
- pH Range: 2.0–8.0
- Maximum Temperature: 80°C

Whether for food safety or environmental or bioanalytical analyses, this phase offers consistently excellent data quality in less time across myriad reversed-phase applications, matrices, and compound classes. To lower costs and improve profitability, you need columns to last longer, data to be reproducible, and existing HPLC instrumentation to run faster.

Description	Column Format	Phase	I.D. x L	Packing Material	Particle Size	Pore Size	Cat. No.
Raptor™ HPLC Column	Analytical	C18 (ODS or Octadecyl)	3.0 x 100 mm	X 3 Re	5 µm	90 Å	**10840-922**
Raptor™ HPLC Column	Analytical	C18 (ODS or Octadecyl)	3.0 x 30 mm	X 3 Re	5 µm	90 Å	**10840-924**
Raptor™ HPLC Column	Analytical	C18 (ODS or Octadecyl)	2.1 x 100 mm	X 2 Re	2.7 µm	90 Å	**10840-936**
Raptor™ HPLC Column	Analytical	C18 (ODS or Octadecyl)	3.0 x 50 mm	X 3 Re	2.7 µm	90 Å	**10840-952**

GC-2014 GAS CHROMATOGRAPH, SHIMADZU

SHIMADZU

US ONLY

COVERS A WIDE RANGE OF APPLICATIONS FROM CAPILLARY TO PACKED COLUMN ANALYSIS

Advanced Flow Controller (AFC) technology comes standard, offering users the precision of AFC, automatic and manual flow or pressure control. AFC provides superior retention time repeatability. Flow rate can be set easily by keypad input while a large LCD screen graphically monitors the flow rate and column inlet pressure. The GC oven is capable of 20 temperature program ramps and hold steps, and features rapid cooling: 300° C to 50° C < 6 minutes. In addition, it provides users with the flexibility to expand their systems for any application by installing up to four redesigned detectors and three injectors.

Description	Cat. No.
GC-2014 Gas Chromatograph	89217-152

This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region.

GC-8AIT GAS CHROMATOGRAPH, SHIMADZU

SHIMADZU

US ONLY

UNCOMPLICATED, RUGGED DESIGN MAKE IT IDEAL FOR DEDICATED APPLICATIONS AND SIMPLE TO OPERATE

Two on-column injection ports, differential flow control, compact design and rugged construction make this GC ideal for high-volume dedicated use.

Description	Cat. No.
GC-8AIT Gas Chromatograph	89217-146

This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region.

GC-8IF GAS CHROMATOGRAPH, SHIMADZU

SHIMADZU

US ONLY

INCORPORATES AN UNCOMPLICATED, RUGGED DESIGN MAKING IT IDEAL FOR DEDICATED APPLICATIONS AND SIMPLE TO OPERATE

Two on-column injection ports, differential flow control, compact design and rugged construction make this GC ideal for high-volume dedicated use.

Description	Cat. No.
GC-8IF Gas Chromatograph	89217-148

This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region.

GC-8IE GAS CHROMATOGRAPH, SHIMADZU

SHIMADZU

INCORPORATES AN UNCOMPLICATED, RUGGED DESIGN MAKING IT IDEAL FOR DEDICATED APPLICATIONS AND SIMPLE TO OPERATE

US ONLY

One on-column injection port, one pressure regulator and one column inlet pressure gauge, compact design and rugged construction make this GC ideal for high-volume dedicated use.

Description	Cat. No.
GC-8IE Gas Chromatograph	89217-150

This specific product is not available in Canada. Please contact your VWR Sales Representative to learn about easy access to similar options available in your region.

RESTEK GAS MANAGEMENT SYSTEM, RESTEK

RESTEK

REMOVES MOISTURE, HYDROCARBONS, AND OXYGEN FROM CARRIER GAS, EXTENDING COLUMN LIFETIME

- Produces high-purity carrier gas for most applications
- Includes one each: moisture, hydrocarbon, and indicating oxygen trap
- Replacing traps is safe and easy
- Maximum flow: 150 cc/min for optimal performance

Restek has put together a convenient unit providing gas purification all in one step. Complete with an indicating trap, your gas purification issues are handled in one central location.

Description	Includes	Cat. No.
Restek Gas Management System	includes fittings for 1/8" and 1/4" gas line	10854-934

VWR® ZERO AIR GENERATORS

VWR COLLECTION

SYSTEMS PRODUCE UHP ZERO AIR WITH A PURITY LEVEL BELOW 0.05PPM TOTAL HYDROCARBON CONTENT FROM A COMPRESSED AIR SUPPLY

- Eliminate dangerous gas cylinders from lab
- Recommended and used by major GC and column manufacturers
- Generated air can be used as a support gas
- Simple installation with standard equipment

The air generated can be used as support gas for total hydrocarbon analyzers, as nebulizer and exhaust pump gas for LC/MS instruments, or as oxidants/support gas for GC with FID, FPD, and NPD detectors. The generators are engineered for easy installation, operation, and long-term performance. All that is required for installation is a standard compressed air line and an electrical outlet.

Dimensions	Flow Capacity	Weight	Cat. No.
25W x 8D x 30H cm (10 x 3 x 12")	1.0 L/min.	3 kg (7 lbs.)	89237-564
25.4W x 7.62D x 30.5H cm (10 x 3 x 12")	3.5 L/min.	3.2 kg (7 lbs.)	89237-566
24.8W x 14.6D x 30.5H cm (9¾ x 5¾ x 12")	7.0 L/min.	5 kg (11 lbs.)	26000-024
24.8W x 14.6D x 30.5H cm (9¾ x 5¾ x 12")	18.0 L/min.	5 kg (11 lbs.)	26000-026
24.8W x 14.6D x 30.5H cm (9¾ x 5¾ x 12")	30.0 L/min.	5 kg (11 lbs.)	26000-028

TRACEGOLD TG-5MS GC COLUMNS, THERMO SCIENTIFIC

EMPLOY THE MOST WIDELY USED MS PHASE IN GAS CHROMATOGRAPHY WITH THE 5% PHENYL PHASE THERMO SCIENTIFIC TRACEGOLD TG-5MS GC COLUMN

Low polarity phase, 5% diphenyl/95% dimethyl polysiloxane. Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity. Exceptional inertness ideal for analysis of active compounds. Equivalent to USP G27 phase. Similar to Rxi-5ms, DB-5, HP-5, HP-5ms, Ultra-2, SPB-5, Equity-5, CP-Sil 8. Recommended for semivolatiles, phenols, amines, residual solvents and solvent impurities, drugs of abuse, pesticides, PCB cogeners, and aroclor mixes.

Column Format	I.D. x L	Film Thickness	Packing Material	Cat. No.
Capillary	0.32 mm x 30 m	0.50 µm	5% Phenyl Methylpolysiloxane	**10038-968**
Capillary	0.53 mm x 30 m	1.00 µm	5% Phenyl Methylpolysiloxane	**10038-990**

RTX®-1301 GC COLUMNS, RESTEK

GENERAL-PURPOSE COLUMNS DESIGNED FOR USE WITH RESIDUAL SOLVENTS, ALCOHOLS, OXYGENATES, AND VOLATILE ORGANIC COMPOUNDS

- Low bleed
- Longer column lifetime
- Increased inertness
- General-purpose columns

The cyanosilicone-bonded stationary phase offers low bleeds, long lifetimes, and increased inertness.

Description	Column Format	I.D. x L	Film Thickness	Cat. No.
Rtx-1301 GC Column	Capillary	0.53 mm×50 m	0.50 µm	**10850-226**
Rtx-1301 GC Column	Capillary	0.32 mm×60 m	1.80 µm	**10850-502**

ACETONE ≥99.4% (BY GC, CORRECTED FOR WATER CONTENT), ULTRA RESI-ANALYZED® FOR ORGANIC RESIDUE ANALYSIS

BAKER ULTRA RESI-ANALYZED® Reagent - ultra high-purity solvents and salts developed for organic residue extraction/concentration procedures. These solvents are fully characterized and lot controlled by ECD, FID, or other method-specific detectors. Advanced stabilizer systems are incorporated to ensure solvent stability and superior performance. Solvents are suitable for exacting EPA sample cleanup protocols.

CAS 67-64-1
CH_3COCH_3
Boiling Pt: 56.2 °C (1013 hPa)
Flash Pt: <–20 °C (closed cup)

UN: 1090
M.W. 58.08 g/mol
Melting Pt: –95.4 °C
Density: 0.792 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Narrow Mouth Amber Glass Bottle	JT9254-3

DICHLOROMETHANE ≥99.8% (BY GC, CORRECTED FOR WATER CONTENT) STABILIZED, ULTRA RESI-ANALYZED® FOR ORGANIC RESIDUE ANALYSIS

CAS 75-09-2
CH_2Cl_2
Boiling Pt: 39.8 °C (1013 hPa)
Flash Pt:

UN: 1593
M.W. 84.93 g/mol
Melting Pt: –95 °C
Density: 1.322 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 l	Narrow Mouth Amber Glass Bottle	JT9264-3

DIETHYL ETHER ≥99.0% (BY GC, CORRECTED FOR WATER CONTENT) STABILIZED, ULTRA RESI-ANALYZED® FOR ORGANIC RESIDUE ANALYSIS

CAS 60-29-7
$(CH_3CH_2)_2O$
Boiling Pt: 35 °C (1013 hPa)
Flash Pt: –45 °C

UN: 1155
M.W. 74.12 g/mol
Melting Pt: –123 °C
Density: 0.7135 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 l	Narrow Mouth Amber Glass Bottle	JT9259-3

METHANOL ≥99.9%, ULTRA RESI-ANALYZED® FOR GAS CHROMATOGRAPHY, FOR PURGE AND TRAP GC ANALYSIS

BAKER ULTRA RESI-ANALYZED® Reagent - ultra high purity solvents and salts developed for organic residue extraction/concentration procedures. These solvents are fully characterized and lot controlled by ECD, FID, or other method-specific detectors. Advanced stabilizer systems are incorporated to ensure solvent stability and superior performance. Solvents are suitable for exacting EPA sample cleanup protocols.

CAS 67-56-1
CH_3OH
Boiling Pt: 64.6 °C (1013 hPa)
Flash Pt: 11 °C (closed cup)

UN: 1230
M.W. 32.04 g/mol
Melting Pt: –98 °C
Density: 0.7918 g/cm³ (20 °C)

Size	Packaging	Cat. No.
1 L	Narrow Mouth Amber Glass Bottle	JT9077-2

METHANOL ≥99.8% (BY GC, CORRECTED FOR WATER CONTENT), ULTRA RESI-ANALYZED® FOR ORGANIC RESIDUE ANALYSIS

BAKER ULTRA RESI-ANALYZED® Reagent - ultra high-purity solvents and salts developed for organic residue extraction/concentration procedures. These solvents are fully characterized and lot controlled by ECD, FID, or other method-specific detectors. Advanced stabilizer systems are incorporated to ensure solvent stability and superior performance. Solvents are suitable for exacting EPA sample cleanup protocols.

CAS 67-56-1
CH_3OH
Boiling Pt: 64.6 °C (1013 hPa)
Flash Pt: 11 °C (closed cup)

UN: 1230
M.W. 32.04 g/mol
Melting Pt: –98 °C
Density: 0.7918 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Narrow Mouth Amber Glass Bottle	JT9263-3

GASTIGHT® 1000 SERIES SAMPLELOCK™ PURGE AND TRAP SYRINGE, HAMILTON

PURGE AND TRAP SYRINGE ALLOWS EASY REMOVAL OF THE SYRINGE PLUNGER FOR LOADING WATER SAMPLES INTO THE SYRINGE BARREL

Designed for the analysis of drinking water samples according to EPA purge and trap concentration techniques (EPA methods 502.1, 502.2, 503.1, 524.1 and 524.2).

Description	Volume	Cat. No.
Model 1005 Purge and Trap Syringe	5 mL	60373-630

VWR® MEMBRANE NITROGEN GENERATORS

VWR COLLECTION

DESIGNED TO SUPPLY SINGLE OR MULTIPLE LC/MS INSTRUMENTS WITH DRY NITROGEN AT PURITIES OF 99.0–99.5%

- Recommended and certified by all major LC/MS instrument manufacturers

These membrane generators can also be used for solvent evaporation or analytical instruments. Installation requires a minimum of 60psig of compressed air to a 63.5mm (1/4") or 127mm (1/2") inlet connection. The outlet nitrogen supply is then directed to analytical instruments. The generators require no electrical connections and the only maintenance required is to change the prefilters periodically.

Flow Range	Cat. No.
2–24 L/min.	26000-014
4–60 L/min.	26000-016
7–88 L/min.	26000-018

METHANOL ≥99.9%, BAKER ANALYZED ULTRA LC/MS™ FOR LC-MS, TESTED FOR UHPLC

J.T.Baker

CAS 67-56-1
CH_3OH
Boiling Pt: 64.6 °C (1013 hPa)
Flash Pt: 11 °C (closed cup)

UN: 1230
M.W. 32.04 g/mol
Melting Pt: –98 °C
Density: 0.7918 g/cm³ (20 °C)

Size	Packaging	Cat. No.
1 L	Narrow Mouth Flint Bottle	JT9863-2

METHANOL ≥99.9%, HIPERSOLV CHROMANORM® FOR LC-MS

VWR BDH CHEMICALS

CAS 67-56-1
CH_3OH
Boiling Pt:
Flash Pt:

UN: 1230
M.W. 32.04 g/mol
Density:

Size	Packaging	Cat. No.
1 L	Glass bottle	BDH85800.100E

ACETONITRILE ≥99.9%, BAKER ANALYZED ULTRA LC/MS™ FOR LC-MS, TESTED FOR UHPLC

J.T.Baker

CAS 75-05-8
H_3CCN
Boiling Pt: 81.6 °C (1013 hPa)
Flash Pt: 2 °C (closed cup)

UN: 1648
M.W. 41.05 g/mol
Melting Pt: –45.7 °C
Density: 0.782 g/cm³ (20 °C)

Size	Packaging	Cat. No.
1 L	Narrow Mouth Flint Bottle	JT9853-2

ACETONITRILE ≥99.9%, HIPERSOLV CHROMANORM® FOR LC-MS

VWR BDH CHEMICALS

CAS 75-05-8
H_3CCN
Boiling Pt: 81.6 °C (1013 hPa)
Flash Pt: 2 °C (closed cup)

UN: 1648
M.W. 41.05 g/mol
Melting Pt: –45.7 °C
Density: 0.782 g/cm³ (20 °C)

Size	Packaging	Cat. No.
4 L	Glass bottle	BDH83640.400

WATER, BAKER ANALYZED ULTRA LC/MS™ FOR LC-MS, TESTED FOR UHPLC

J.T.Baker

CAS 7732-18-5
H_2O
Boiling Pt: 100 °C (1013 hPa)
Flash Pt:

M.W. 18.02 g/mol
Melting Pt: 0 °C
Density: 1 g/cm³ (4 °C)

Size	Packaging	Cat. No.
1 L	Narrow Mouth Flint Bottle	JT9823-2

WATER, HIPERSOLV CHROMANORM® FOR LC-MS

VWR BDH CHEMICALS

CAS 7732-18-5
H_2O
Boiling Pt: 100 °C (1013 hPa)
Flash Pt:

M.W. 18.02 g/mol
Melting Pt: 0 °C
Density: 1 g/cm³ (4 °C)

Size	Packaging	Cat. No.
4 L	Treated Glass Bottle	BDH83645.400

Effortless pipetting and reliable results

CORNING

CORNING® LAMBDA™ ELITETOUCH™ PIPETTORS

Engineered to provide the highest levels of comfort, accuracy, and precision. The lightweight construction, contoured handle, and four-digit counter were designed to ensure comfortable pipetting. All pipettors feature smooth plunger movement and extremely low pipetting forces to reduce wrist strain and fatigue (RSI). Colored pushbuttons (included) can help identify a user or application for sample safety and lower risk of cross-contamination.

- Ergonomic handle design is a perfect fit for both the right and left hand
- Convenient one-hand volume setting with auto-lock system prevents accidental volume change during work
- Four-digit counter provides greater precision and is perfectly positioned for visibility at all times
- Single-channel pipettors are compatible with very narrow tubes

Volume Range (µL)	Accuracy (%)	Precision (%)	Non-filtered Tip (µL)	Cat. No.
Single-channel				
0.1 - 2	±40.0 to ±1.5	≤12.0 to ≤0.7	10	**76319-688**
0.5 - 10	±4.0 to ±1.0	≤2.8 to ≤0.4	10	**76319-690**
8-channel				
0.5 - 10	±10.0 to ±2.0	≤8.0 to ≤1.2	10	**76319-702**
5 - 50	±4.0 to ±1.6	≤2.5 to ≤0.6	200	**76319-704**
12-channel				
0.5 - 10	±10.0 to ±2.0	≤8.0 to ≤1.2	10	**76319-710**
5 - 50	±4.0 to ±1.6	≤2.5 to ≤0.6	200	**76319-712**
Corning Lambda EliteTouch Starter Kit				
Corning Lambda EliteTouch Starter Kit includes: four single-channel pipettors: 0.5 to 10 µL (Cat. No. **76319-690**), 2 to 20 µL (Cat. No. **76319-692**), 20 to 200 µL (Cat. No. **76319-698**), 100 to 1000 µL (Cat. No. **76319-700**); universal linear stand for four single-channel pipettors (Cat. No. **76324-824**); Corning deckworks pipet tips: 10 µL (Cat. No. **89136-155**), 200 µL (Cat. No. **89136-161**), 1000 µL (Cat. No. **89136-165**); three colored push buttons (four sets)				**76319-650**

The industry's best performing -80°C Ultra-Low Freezer

PHCbi

THE LOWEST TOTAL DAILY ENERGY USAGE.[1]

- ENERGY STAR® Certified
- 7.00 kWh/day, steady state energy consumption
- 0.29 kWh/cu.ft., daily energy consumption
- Choose 25.7 cu.ft. and 18.6 cu.ft. upright models, 115V or 220V operation

PHCbi brand VIP® ECO -86°C ultra-low temperature freezers deliver performance without compromising reliability. Benefits include natural refrigerants, fast temperature recovery, greater resistance to high ambient temperature and excellent interior temperature uniformity.

Description	Electrical	Cat. No.
ULT Freezer (18.6 cu. ft.)	220V	**76269-676**
ULT Freezer (18.6 cu. ft.)	115V	**76305-596**
ULT Freezer (25.7 cu.ft.)	115V	**76305-598**
ULT Freezer (25.7 cu. ft.)	220V	**76020-716**

[1] Based on independent third party testing for model MDF-DU702VHA-PA at time of publication. ENERGY STAR test results for submitted products can be compared for performance across the competitive market. Results are published on the ENERGY STAR website www.energystar.gov. See PHCbi certification number 4788723268.

Designed as a universal reactor workstation that can be used for different vessel sizes and experiments

heidolph
research made easy

RADLEYS REACTOR-READY LAB REACTOR

The convenience and efficiency of the workstation allows for a single reactor workstation to replace many, saving both money and fume hood space. A quick-releaase vessel clamp allows rapid vessel exchange. The workstation accommodates a range of single and double jacketed glass vessels, including 250mL, 500mL, 1L, 2L, and 5L sizes. The support system accepts all leading brands of overhead stirrers and allows easy, tool-free adjustment.

Triple support stand features heavy-duty stainless steel support rods for maximum strength and stability, thus minimizing vibration. Glassware accessories include condenser, dropping funnels, etc. Self aligning stirrer coupling engages wtihout the need for tools. Quick-release hose coupling allows rapid exchange of vessels. Hose manifolds allow easy thermofluid drain. The workstation can be easily and quickly configured to suit the chemistry and scale needed for each project.

Description	Cat. No.
Heidolph Radleys Reactor-Ready Core Lab Reactor	10129-170

Nor-Lake® Scientific White Diamond Series Flammable Storage Undercounter Refrigerators & Freezers

NORLAKE SCIENTIFIC

DESIGNED FOR RELIABILITY

- Units meet NFPA & OSHA guidelines 45 and 70 for the refrigerated storage of flammable (volatile) materials
- Electrical components sealed in a vapor-proof enclosure for additional safety
- Microprocessor temperature controller
- Natural, environmentally-friendly refrigerants
- Keyed door locks & magnetic door gasket for positive seal

The White Diamond Series Flammable Storage Undercounter Refrigerators & Freezers are skillfully designed and purpose built for laboratory applications where volatile material storage is needed. The White Diamond Series utilizes the latest technology including a microprocessor temperature controller, digital temperature display, and a multitude of audible and visual alarms providing additional product security.

Description	Size (Or Another Secondary Description)	Cat. No.
White Diamond Series Flammable Material Storage Undercounter Refrigerator	4 Cu. Ft.	76271-346
White Diamond Series Flammable Material Storage Undercounter Freezer	4 Cu. Ft.	76271-344

Exceptional capabilities for fast and gentle drying

SHEL LAB SVAC VACUUM OVENS

- Watlow controller capable of 40 step ramp and soak profiles, or four files with 10 steps per file
- Cross ventilation air flow design
- Built-in over temperature protection
- Sizes range from 16 to 127 liters

Shel Lab vacuum ovens prevent residue accumulation on products and also allow safe drying of materials at lower temperatures than typically required when using convection ovens. All Shel Lab vacuum ovens are built with a seamless stainless steel chamber for exceptional durability. Our double plenum design meets UL, CSA and EU safety requirements resulting in a cool outer surface. To achieve required vacuum levels, users can choose from a 3/8 inch orifice or a KF25 fitting to withstand heavy use and minimize draw-down time. Maximum permitted end vacuum is 10 mTorr. Leak rate is 10 mTorr per hour.

Description	Capacity	Cat. No.
Vacuum oven 110-120V	16 L (0.6 cu.ft.)	89409-480
Vacuum oven 220-230V	16 L (0.6 cu.ft.)	89409-482
Vacuum oven 110-120V	47 L (1.67 cu.ft.)	89409-484
Vacuum oven 220-230V	47 L (1.67 cu.ft.)	89409-486
Vacuum oven 110-120V	127 L (4.5 cu. ft.)	89409-488
Vacuum oven 220-230V	127 L (4.5 cu. ft.)	89409-490

Gain flexibility in the lab

thermo scientific

BARNSTEAD GENPURE XCAD PLUS WATER PURIFICATION SYSTEMS

The Barnstead Genpure xCAD plus water purification systems provides up to 200L/day of type 1, ultrapure (18.2 megohm) water from pre-treated feed water.

The GenPure xCAD plus systems offer highly versatile mounting options. The units can be mounted on the wall, on the bench or under the bench. The xCAD remote dispenser can be mounted on the wall or on the bench for maximum flexibility. In addition, up to two additional remote dispensers can be added to create up to three work stations from one water system.

Description	Dispenser Type	Technology	Cat. No.
Genpure with bench top x-CAD plus	Bench top (remote dispenser mounting)	Deionization	89414-714
Genpure UV with wall mount x-CAD plus	Wall mount (remote dispenser mounting)	Deionization and UV	89414-728
Genpure UV/UF-TOC with bench top x-CAD plus	Bench top (remote dispenser mounting)	Deionization, UV, ultrafiltration and TOC monitoring	89414-724
Genpure UV/UF-TOC with wall mount x-CAD plus	Wall mount (remote dispenser mounting)	Dispenser mounting, deionization, UV, ultrafiltration and TOC monitoring	89414-736

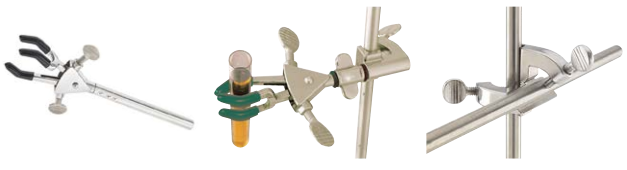
The ideal solution to safely hold everything in your lab!

VWR COLLECTION

VWR® TALON® MULTI-PURPOSE CLAMPS AND SUPPORTS

- Choose premium, corrosion resistant stainless steel when working with corrosive materials to prolong the life of the clamp, lab-lift, or support
- Nickel-plated zinc and aluminum offer a high tensile strength at an economical price
- Secure any glassware with sturdy two and three prong clamps
- Durable lab-jacks are available in seven convenient sizes; choose premium stainless steel or anodized aluminum whenever a variable height is needed for your application

The unique design of the talon clamp line offers one of the most extensive selections in the industry. With a variety of sizes, materials, hardware, and designs, there is always an option to accommodate any application.



Description	Cat. No.
Large three-prong stainless steel multi-purpose clamp	12621-236
Medium three-prong stainless steel multi-purpose clamp	12621-238
Small three-prong stainless steel multi-purpose clamp	12621-240
Jumbo holder stainless steel	12621-250
Medium three-prong swivel clamp	21573-708
Medium two-prong fixed position clamp	21573-266
Lab-jack 6x6" stainless steel	14233-364
Lab-jack 6x6" stainless steel	14233-368

For a complete listing of all VWR Talon Clamps, Lab-Lifts, & Supports with additional styles, sizes, and materials, visit **vwr.com**

For more information on specifications and accessories, simply enter the Cat. No. on **vwr.com**.

Welch Diaphragm Vacuum Pumps to support Rotary Evaporators

WELCH
A Gardner Denver Product

- Self cleaning vacuum pumps include a self cleaning cycle and a post run air purge that inhibits buildup on the diaphragm and exhaust
- This extends service intervals and ensures maximum vacuum performance
- Includes digital gauge and programmable setpoint to maintain the vacuum in order to maximize the stripping rate to avoid a bumping zone
- Standalone dryfast pumps have manual vacuum regulation and air purge along with a narrow footprint

Typical Solvents	Boiling Points	Cat. No.
Self Cleaning with digital gauge	≤80°C as Methylene Chloride, Acetone, Chloroform, Ethanol	54994-126
Self Cleaning with digital gauge	Between 80°C and 160°C. Heptane, Water, Toluene, DMF, n-propyl alcohol	12000-546
Standalone	≤80°C as Methylene Chloride, Acetone, Chloroform, Ethanol	55009-288
Standalone	Between 80°C and 160°C. Heptane, Water, Toluene, DMF, n-propyl alcohol	55009-284

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OMNI International
The Homogenizer Company®

BEAD RUPTOR ELITE BEAD MILL HOMOGENIZER

- Ideal for DNA/RNA extraction, tissue homogenization, enzyme isolation, protein purification, food safety testing and drug extraction
- Process up to 24 samples per cycle
- Process samples from 25 µL to 50 mL
- Wide selection of beads and tubes for ultimate versatility

Description	Cat. No.
Bead Ruptor Elite	76000-746
Choose a Tube Carriage (not included)	
1.5 mL Tube Carriage Kit	10032-524
2 mL Tube Carriage Kit	10032-380
7 mL Tube Carriage Kit	10809-030
30 mL Tube Carriage Kit	10032-384

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