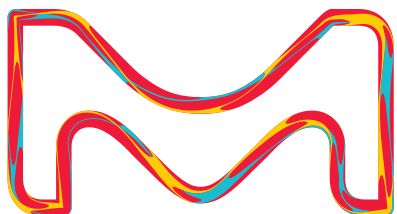


PHENOMENAL CONSISTENCY

High-Purity Biological Buffers
from Bench to Bulk Volumes



MilliporeSigma is
the U.S. and Canada
Life Science business
of Merck KGaA,
Darmstadt, Germany.

Sigma-Aldrich®
Lab & Production Materials

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Biological Buffers

Many biochemical systems and processes can be impaired by relatively small changes in the hydrogen ion concentration. Biological buffers provide solution stability and pH control without interfering with the biological processes of the medium. Moreover, buffers supply cofactors, critical salts, and nutrients essential for the viability of cells and tissues.

Higher Purity for Superior Stability

At Sigma-Aldrich®, we understand the importance of protecting the integrity of your biomolecules and reagents with the right buffering systems. We offer an extensive portfolio of biological buffers backed by in-depth scientific knowledge, analytical capabilities, and technical support: strengthened by decades of manufacturing these critical products.

Our high-purity buffers are characterized to assure minimal trace element levels, chemical impurities, and biological contaminants. Due to their impeccable lot-to-lot consistency, our products can be trusted to perform reliably every time. Their high solubility and solution clarity also ensure low background for ultra-sensitive spectroscopic and visual detection.

To find the ideal buffering system for your application, please visit:
[SigmaAldrich.com/biobuffers](https://www.sigmaaldrich.com/biobuffers)



Complete Workflow Solution

Besides high-purity buffers, Sigma-Aldrich® supplies an extensive selection of high-quality biochemicals in various grades with innovative, user-friendly packaging options. In addition to off-the-shelf products, we provide custom reagent manufacturing, blending, and packaging to meet your exact needs. All of our chemicals and equipment can be scaled to optimize your workflows from early research to downstream production applications. Discover our unparalleled biochemical portfolio for your breakthrough ideas.



R&D

Optimize your development cycle with the convenience and availability of key R&D reagents.



Scale up

Simplify product selection and avoid unnecessary revalidation by identifying the right materials from the start with our guidance.



Manufacturing

Ensure risk mitigation, supply chain transparency, enhanced QC, and superior documentation with our expertise.

Learn More
SigmaAldrich.com/Biochemicals

Packaging and Handling

Our buffers are supplied in an array of safe, reliable packaging options that are optimally suited to the product and its applications. For instance, liners used in our bulk products are classified as a secure seal to reduce the risk of contamination. We also offer innovative handling technologies, such as Redi-Dri™ and EZ BioPac®, as well as custom packaging options.

Current Standard Packaging	Buffer Form
Single-use pouches	Powder, crystals/granules
Glass bottles and vials	Liquid, powder
Plastic bottles	Liquid, powder, tablets, capsules, crystals/granules
Plastic pails (square and round)	Powders, crystals/granules
Plastic drums (square and round)	Powders, crystals/granules
Fiber drums	Powders, crystals/granules
EZ BioPac®	Bulk free-flowing transfer bags

Solutions

High quality Sigma-Aldrich® buffer solutions are available in various grades, concentrations, pH and pKa values, conveniently packaged in 1L, 4L or bulk volumes to suit your needs.

Tablets

Sigma-Aldrich® tablet products dissolve easily and are a convenient method to prepare buffer solutions with stable pH values.

Capsules

Our capsule formulations require no weighing, buffer calculations, or pH adjustments - for reproducible analysis again and again.

Pre-weighed Powders

Our pre-weighed packets are designed to simplify your buffer preparation. Strictly tested to ensure exact concentrations and pH levels, simply mix with water for reliable results.



Redi-Dri™ Free-Flowing Salts and Buffers

Keep Your Work Flowing

Our innovative Redi-Dri™ free-flowing, ready-to-use salts and buffers don't harden or clump like most hygroscopic powders.

Features and Benefits

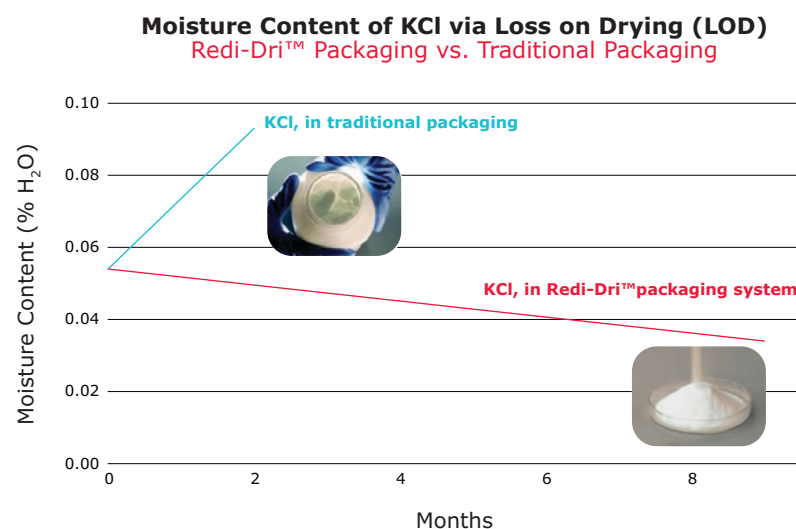
- Reduce time, waste and costs due to easy handling: no need to loosen hardened powders from inside packaging
- No use of anti-caking agents that can compromise your research
- Excellent expert-tested quality
- Available in wide selection and flexible volumes for research and bulk production

Our Most Popular Salts and Buffers

- **HEPES:** One of the best general purpose buffers available for bio-research
- **MOPS:** Component of running buffer in fractionation of RNA on formaldehyde agarose gels
- **Trizma® and Trizma® HCl:** Sigma-Aldrich® is the pioneer in Tris for laboratory and production use

Redi-Dri™ Packaging: Proven to Protect

A long-term study was done to compare a hygroscopic salt (KCl) in the Redi-Dri™ system to that in standard packaging. For nine months, loss of drying (LOD) was measured in both cases under humidity-controlled conditions. The results showed a stark difference. KCl in the traditional packaging appeared hard and clumpy, whereas the material in the Redi-Dri™ system had far lower LOD values, and remained free-flowing during the entire test period.



Learn more:
SigmaAldrich.com/redi-dri

Redi-Dri™ packaging innovation



Traditional packaging

pHast Pack™ Ready-to-Use Buffers

Buffer prep with no pH adjustment? No weigh!

Save time, effort, and shelf space with pHast Pack™ ready-to-use buffers. Our formulations are specially developed to simplify your work, and strictly tested to ensure exact concentrations and pH. No weighing, calculations, or pH adjustments. Simply mix with water for fast, reproducible analysis – every time.

Convenient

- Ready to use in 2 minutes
- No calculations, weighing, or pH adjustment
- Ideal for smaller volumes
- Simply dissolve pouch contents in 500 ml H₂O

High Quality and Reproducible Results

- **Stringent QC testing:** For unparalleled quality and reliability
- **Biological tests:** Free of DNase, RNase, protease, and nickase
- **Chemical tests:** Iron ≤10 ppm, lead ≤5 ppm
- **Physical tests:** pH, solubility, pouch weights
- **Application tests:** electrophoresis, cell culture suitability, etc.

Economical

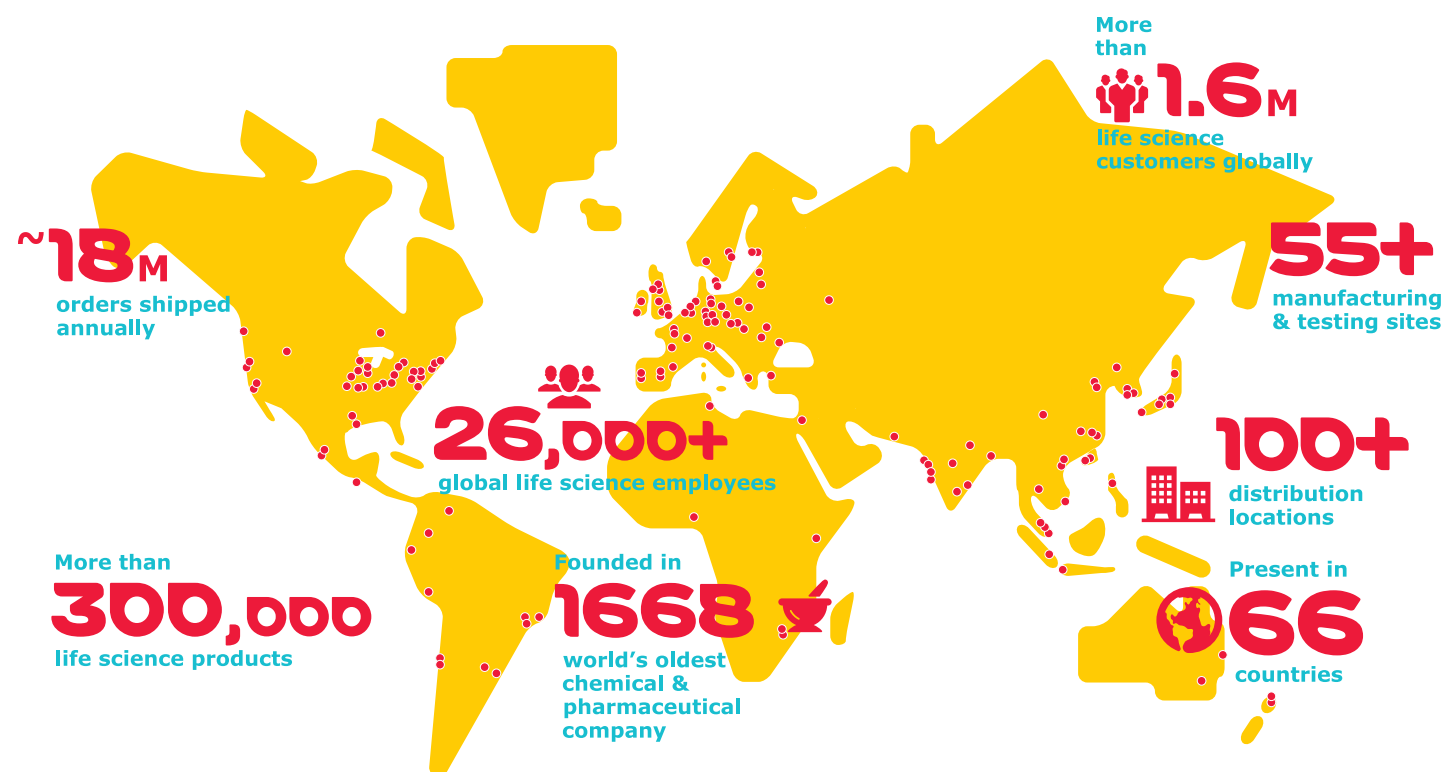
- Lower labor costs through faster prep
- Minimize expenditure for multiple chemicals
- Reduce cost of repeat analysis due to faulty buffer prep



Cat. No.	pHast pack™ Buffer	Application
General Use		
PPB022-20PAK	0.1M Tris buffer, pH 7.0	Multipurpose
PPB023-20PAK	0.1M Tris buffer, pH 8.1	Multipurpose
PPB011-20PAK	Tris Buffered Saline (TBS), pH 7.6	Wash buffer
PPB001-20PAK	Tris Buffered Saline (TBS), pH 8.0	Wash buffer
PPB006-20PAK	Phosphate Buffered Saline (PBS), pH 7.4	Wash buffer
DNA Gel Electrophoresis		
PPB008-20PAK	Tris Acetate EDTA (TAE), pH 8.3	Running buffer
PPB009-20PAK	Tris Borate EDTA (TBE), pH 8.3	Running buffer
PPB010-20PAK	10X Tris EDTA (TE), pH 8.0	10X stock buffer
Western Blot		
PPB002-20PAK	Tris Buffered Saline with 0.05% Tween-20®, pH 8.0	Wash buffer
PPB005-20PAK	Phosphate Buffered Saline with 0.05% Tween-20®, pH 7.4	Wash buffer
PPB015-20PAK	Tris-Glycine (TG), pH 8.3	Running buffer
PPB019-20PAK	Bis-Tris Bicine EDTA (Bis-Tris), pH 7.2	Transfer buffer
Northern or Southern Blot		
PPB020-20PAK	Saline-Sodium Citrate (SSC), pH 7.0	Hybridization or Wash buffer
PPB021-20PAK	Saline-Sodium Phosphate-EDTA (SSPE), pH 7.4	Hybridization or Wash buffer

Learn more:
SigmaAldrich.com/pHast-Pack

Robust Supply Chain for Reliable Scale Up



creating **more** value for you

Building a reliable supply chain together.

Because we understand how important on-time delivery is to you, we have centers of excellence around the world that provide a wide range of prompt and personalized services.

Get the results you expect each and every time with our expanded offering.

Our strengths

- Breadth and value of portfolio
- Robust supply chain
- Global manufacturing sites and distribution facilities
- Regional third party distributors

Our know-how

- Innovative R&D
- Data traceability and reliability
- Complete quality and safety solutions
- Technical, quality and regulatory expertise

Our assets

- Customized manufacturing and development materials
- 24/7 technical support and best-in-class customer service
- Consistency and reliability across geographies

Unparalleled Portfolio

As a leader in manufacturing and distributing high-quality biological buffers, Sigma-Aldrich® offers a comprehensive portfolio of solutions — available from a few grams to multi-metric tons — to serve virtually all applications from bench to bulk. Through our multiple production sites, stringent quality controls, and various product grades, we can cater to your exact requirements and always ensure a reliable, timely supply.

Complete Accreditations

- ISO9001:2008 life science
- ISO13485:2003 molecular diagnostics
- QC capability
- Packaging room certifications

Stringent Quality

- Over 80% of products made in-house
- Excellent product consistency
- Rigorous process and product controls
- Supplier qualification
- Change notification
- Risk mitigation
- Optimized packaging technology

Reliable Supply

- Broadest product offering in the industry
- Excellent supply chain security
- Shorter lead times and greater custom options
- Multiple parallel production lines and sites
- Unrivaled manufacturing capacity and flexibility
- Organic buffers: multiple sites in US and Europe
- Organic/inorganic buffers: Darmstadt, Germany



Darmstadt, Germany



St. Louis, Missouri, US



Buchs, Switzerland



Cleveland, Ohio, US

Complete Range of Bulk and Custom Services

Our extensive selection of high-purity buffers and high quality biochemicals can be scaled from early research quantities to commercial production volumes. Through custom reagent manufacturing, blending, liquid formulation, and packaging, we have the capabilities to meet your needs. Optimize your workflow through one trusted source from start to finish with our proven scaling abilities.

SigmaAldrich.com/bulk

- Customized product testing
- Extensive optimized packaging options
- Made-to-order products, blends and solutions

Expert Guidance

Our technical support team is specialized in every stage of biopharmaceutical production. This means we can help you develop robust and scalable processes that get your products to market as quickly as possible. We are also happy to support you with risk assessment, developing custom packaging and equipment, and navigating regulatory changes.

For Technical Service visit: [SigmaAldrich.com/techservice](https://www.sigmaaldrich.com/techservice)



Buffer Grades

Value & Price Level	Grade	Description	Typical Uses
High ↑	BioUltra	Finest quality products for life science, with extensive trace metal analysis. Nuclease-, phosphatase- & protease-free. Other tests may include, but are not limited to, purity by gel electrophoresis, trace metal testing and application testing	For the most demanding applications such as Nucleic Acid & Protein Purification, Transformation/Transfection, Electrophoresis, PCR & Buffer Prep
	BioXtra	Stringent testing protocols include trace metal analysis. Specialized suitability testing, such as hybridoma or mouse embryo, may be included on certain products	Molecular Biology applications where trace metals are a concern
	BioPerformance Certified	Tested and pre-qualified for use in multiple life science applications	Molecular Biology, Cell Culture & Electrophoresis, Buffer Prep & Manufacturing
	BioReagent	Products with specifications or suitability testing for specific life science applications	General Life Science applications including Sample Prep, Purification, Buffer Prep, PCR, Flow Cytometry & Manufacturing
	Calbiochem® OmniPur®	Nuclease- and protease-free products to ensure the integrity of starting materials and improve downstream results	General Life Science applications & including Sample Prep, Protein Expression, Isolation, Analysis, Cell Culture, Transfection, Gene Expression, Electrophoresis & Western Blotting
Low ↓	"meets analytical specification of Ph. Eur., BP, USP, ..."	Non-GMP products that meet the latest testing specifications of the United States Pharmacopeia (USP), Food Chemicals Codex (FCC), National Formulary (NF), Pharmacopeia Europe (EP or Ph. Eur.), British Pharmacopeia (BP), and/or Japanese Pharmacopeia (JP)	For R&D and testing purposes only
	ACS	Meets ACS specifications	General Lab Use
	Reagent grade	Reagent grade, ReagentPlus, laboratory reagent and technical grades. Includes products that do not have an established standard set for quality and impurity levels	General Lab Use

Quality Levels

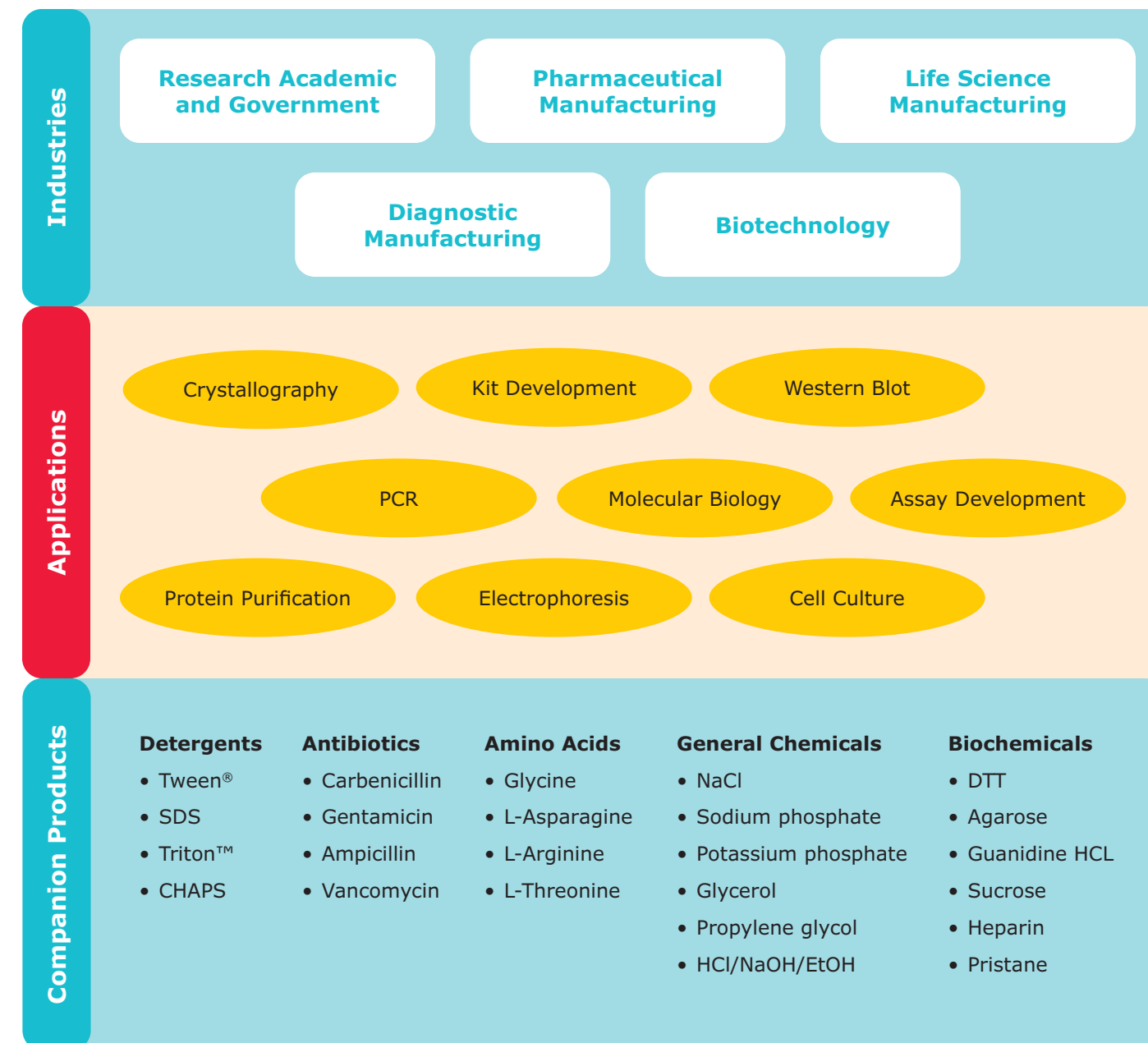
Quality Levels						
	MQ 100	MQ 200	MQ 300	MQ 400	MQ 500	MQ 600
Application scope	For non-regulated applications with no change notification requirements	For non-regulated applications with limited change notification requirements	For products used in applications requiring enhanced change control and quality agreement	For critical products and applications driven by high expectations and requiring verified process control or manufacturing control	For regulated applications	For highly-regulated applications under authority surveillance
Discriminating features	Standard control	Increased control	Enhanced control	Driven by customer expectation	Driven by authority regulations	Driven by authority regulations and surveillance
Quality systems	ISO 9001	ISO 9001	ISO 9001	ISO 9001	IPEC GMP and/or HACCP, FSSC 22000 and/or ISO17025 and/or ISO 13485	ICH Q7 or 21 CFR medical device
Quality attributes	✓	✓	✓	✓	✓	✓
Basic change control		✓	✓	✓	✓	✓
Enhanced level of control			✓	✓	✓	✓
Verified process				✓	✓	✓
Certified/validated process					✓	✓
Highly regulated application						✓

*Instruments, custom products, and contract manufacturing products are not part of the M-Clarity™ Program.

For more information on the M-Clarity™ Program, please contact your local representative or visit: SigmaAldrich.com/m-clarity

Application Fields

Common Buffer Usage



Buffer Portfolio

Buffer Name	Synonym	CAS	M.W.	Ready-to-Use Solutions	Redi Dri™ Free-Flowing Technology	General-Use Reagent Grade	Mult-Application Life Science Grade	PharmaGrade with Stringent Controls	Empove Program with Documentation	OmniPur® & ULTROL® Application-Focused Products	d(pKa)/oC	pKa	pH low	pH high	Mg(II)	Ca(II)	Cr(III)	Mn(II)	Fe(III)	Co(II)	Ni(II)	Cu(II)	Zn(II)	Cd(II)	Pb(II)	Metal Ion	
➤ MES	2-(N-Morpholino)ethanesulfonic free acid	4432-31-9	195.24	M1317		M3671				475893	-0.009	6.27	5.5	6.7	°	°	°	°	•	°	°	°	°	°	°	Weak Cu2+, Mg2+, Mn2+, Ni2+, Strong Fe3+ binding	
➤ MES hydrate	2-(N-Morpholino)ethanesulfonic acid hydrate	1266615-59-1	195.24		RDD030	M8250	M2933, M5287, 69890				-0.009	6.27	5.5	6.7	°	°	°	°	•	°	°	°	°	°	°	Weak Cu2+, Mg2+, Mn2+, Ni2+, Strong Fe3+ binding	
➤ MES monohydrate	2-(N-Morpholino)ethanesulfonic acid monohydrate	145224-94-8	213.25				69892, 69889			6110-OP	-0.009	6.27	5.5	6.7	°	°	°	°	•	°	°	°	°	°	°	Weak Cu2+, Mg2+, Mn2+, Ni2+, Strong Fe3+ binding	
➤ MES sodium salt	2-(N-Morpholino)ethanesulfonic acid sodium salt	71119-23-8	217.22			M3885	M3058, M5057		Yes	475894	-0.009	6.27	5.5	6.7	°	°	°	°	•	°	°	°	°	°	°	Weak Cu2+, Mg2+, Mn2+, Ni2+, Strong Fe3+ binding	
➤ BIS-TRIS	2-Bis(2-hydroxyethyl)amino-2-(hydroxymethyl)-1,3-propanediol	6976-37-0	209.24		RDD013	B9754	B4429, B7535, 14879			2650-OP, 391335	-0.017	6.48	5.8	7.2	°	°	°	°	°	°	°	•	°	°	°	Weak Mg, Ca, Mn, Co, Ni, Zn, Cd, Strong Cu, Pb	
➤ BIS-TRIS hydrochloride	2-Bis(2-hydroxyethyl)amino-2-(hydroxymethyl)-1,3-propanediol hydrochloride	124763-51-5	245.7			B6032					-0.017	6.48	5.8	7.2	°	°	°	°	°	°	°	•	°	°	°	Weak Mg, Ca, Mn, Co, Ni, Zn, Cd, Strong Cu, Pb	
➤ Glycine	aminoacetic acid	56-40-6	75.07	G5418		G7126, 410225	G8898, G7403, 50046	G8790, 50058	Yes	4810-OP, 357002	#N/A	2.35	5.9	6.4	°	°	°	°	°	°	°	•	°	°	°		
➤ PIPES	1,4-Piperazinediethanesulfonic acid	5625-37-6	302.37		RDD004	P6757	P1851, P8203, 80635			528131	-0.007	7.141	6.1	7.5	°	°	°	°	°	°	°	°	°	°	°	Some divalent cations, Co, Ni	
➤ PIPES sodium salt	1,4-Piperazinediethanesulfonic acid sodium salt	10010-67-0	324.35			P2949				6910-OP	-0.007	7.141	6.1	7.5	°	°	°	°	°	°	°	°	°	°	°	Some divalent cations, Co, Ni	
➤ PIPES disodium salt	1,4-Piperazinediethanesulfonic acid disodium salt	76836-02-7	346.33			P3768					-0.007	7.141	6.1	7.5	°	°	°	°	°	°	°	°	°	°	°	Some divalent cations, Co, Ni	
➤ ACES	2-[(2-Amino-2-oxoethyl)amino]ethanesulfonic acid	7365-82-4	182.2		RDD010	A9758	A7949, A3594, 00194				-0.019	6.84	6.1	7.5	•	°	°	°	°	°	°	°	°	°	°	Cu2+, Mg2+, Weak:CA, Mn, Co, Ni, Zn	
➤ MOPSO	β-Hydroxy-4-morpholinepropanesulfonic acid	68399-77-9	225.26			M8389					-0.016	6.87	6.2	7.5	°	°	°	°	•	°	°	°	°	°	°	Strong Fe, Weak Ni	
➤ MOPSO sodium salt	β-Hydroxy-4-morpholinepropanesulfonic acid sodium salt	79803-73-9	247.24			M8767	M5914				-0.016	6.87	6.2	7.5	°	°	°	°	•	°	°	°	°	°	°	Strong Fe, Weak Ni	
➤ BIS-TRIS propane	1,3-Bis[tris(hydroxymethyl)methylamino]propane	64431-96-5	282.363		RDD014	B6755	B9410, B4679			394111	#N/A	6.8, 9.0	6.3	9.5	°	°	°	°	°	•	•	•	•	•	•	Strong Ni, Co, Cu, Zn, Cd, Pb	
➤ Imidazole	1,3-diaza-2,4-cyclopentadiene	288-32-4	68.08	68268	792527, RDD044, RDD039	I202, 10250, 56750, 12399	I5513, 56749, 56748		Yes	IX0005	#N/A	6.95	6.2	7.8	°	°	°	°	°	•	•	•	•	•	•	Divalent cations	
➤ Imidazole hydrochloride	1,3-diaza-2,4-cyclopentadiene hydrochloride	1467-16-9	104.54			I3386					#N/A	6.95	6.2	7.8	°	°	°	°	°	•	•	•	•	•	•	Divalent cations	
➤ BES	N,N-Bis(2-hydroxyethyl)-2-aminoethanesulfonic acid	10191-18-1	213.25			B9879	B6420, B4554, 14853			391334	-0.015	7.187	6.4	7.8	°	°	°	°	°	°	°	°	°	°	°	Weak Co, Cu	
➤ BES sodium salt	N,N-Bis(2-hydroxyethyl)-2-aminoethanesulfonic acid sodium salt	66992-27-6	235.23			B2891																					
➤ MOPS	3-(N-Morpholino)propanesulfonic acid	1132-61-2	209.26		RDD003	M1254	M5162, M3183, 69947			6310-OP, 475898	-0.013	7.184	6.5	7.9	°	°	°	°	•	°	°	°	°	°	°	Strong Fe, Weak: Mg, Mn, Co, Ni	
➤ MOPS sodium salt	3-(N-Morpholino)propanesulfonic acid sodium salt	71119-22-7	231.25		RDD018	M9381	M9024, M5789			475899	-0.013	7.184	6.5	7.9	°	°	°	°	•	°	°	°	°	°	°	Strong Fe, Weak: Mg, Mn, Co, Ni	
➤ MOPS hemisodium salt	3-(N-Morpholino)propanesulfonic acid hemisodium salt	117961-20-3	220.25			M9027, M0289					-0.013	7.184	6.5	7.9	°	°	°	°	•	°	°	°	°	°	°	Strong Fe, Weak: Mg, Mn, Co, Ni	
➤ TES	2-[(2-Hydroxy-1,1-bis(hydroxymethyl)ethyl)amino]ethanesulfonic acid	7365-44-8	229.25			T1375	T5691, 93359, T6541			505147	-0.02	7.55	6.8	8.2	°	°	°	°	•	•	°	°	°	°	°	Strong: Cr, Fe, Weak: Co, Ni, Cu, Zn	
➤ TES sodium salt	2-[(2-Hydroxy-1,1-bis(hydroxymethyl)ethyl)amino]ethanesulfonic acid sodium salt	70331-82-7	251.23			T0772					-0.02	7.55	6.8	8.2	°	°	°	°	•	•	°	°	°	°	°	Strong: Cr, Fe, Weak: Co, Ni, Cu, Zn	
➤ TES hemisodium salt	2-[(2-Hydroxy-1,1-bis(hydroxymethyl)ethyl)amino]ethanesulfonic acid hemisodium salt	1204213-54-6	240.24			T1030					-0.02	7.55	6.8	8.2	°	°	°	°	•	•	°	°	°	°	°	Strong: Cr, Fe, Weak: Co, Ni, Cu, Zn	
➤ HEPES	4-(2-Hydroxyethyl)piperazine-1-ethanesulfonic acid	7365-45-9	238.3	H3537, 83264	RDD002	H3375, H23830 - NEW!	H4034, H6147, H7523, 54457		Yes	5310-OP, 391338	-0.012	7.5	6.8	8.2	°	°	°	°	°	°	°	°	°	°	°	Oxidized by Cu2+	
➤ HEPES sodium salt	4-(2-Hydroxyethyl)piperazine-1-ethanesulfonic acid sodium salt	75277-39-3	260.29	H3662	RDD035	H7006	H3784, H8651		Yes	5380-OP, 391333	-0.012	7.5	6.8	8.2	°	°	°	°	°	°	°	°	°	°	°	Oxidized by Cu2+	

Buffer Name	Synonym	CAS	M.W.	Ready-to-Use Solutions	Redi Dri™ Free-Flowing Technology	General-Use Reagent Grade	Mult-Application Life Science Grade	PharmaGrade with Stringent Controls	Empove Program with Documentation	OmniPur® & ULTROL® Application-Focused Products	d(pKa)/oC	pKa	pH low	pH high	Mg(II)	Ca(II)	Cr(III)	Mn(II)	Fe(III)	Co(II)	Ni(II)	Cu(II)	Zn(II)	Cd(II)	Pb(II)	Metal Ion
▶▶ HEPES hemisodium salt	4-(2-Hydroxyethyl)piperazine-1-ethanesulfonic acid hemisodium salt	103404-87-1	249.3			H7637, H9897					-0.012	7.5	6.8	8.2								°	°	°	°	Oxidized by Cu2+
▶▶ HEPES potassium salt	4-(2-Hydroxyethyl)piperazine-1-ethanesulfonic acid potassium salt	82207-62-3	276.39			H0527					-0.012	7.5	6.8	8.2								°	°	°	°	Oxidized by Cu2+
▶▶ TAPSO	3-[[1,3-dihydroxy-2-(hydroxymethyl)propan-2-yl]amino]-2-hydroxypropane-1-sulfonic acid	68399-81-5	259.28			T9269						7.6	7	8.2	•	•		°	•	°	°	•	°	°	•	
▶▶ Trizma® base	2-Amino-2-(hydroxymethyl)-1,3-propanediol	77-86-1	121.14	T1699, T1449	RDD008	T1503, T4661, 93352, 93350	T6791, 93362	T6066		9210-OP, 648311	-0.029	8.1	7	9	°	°	•		•	•	•	•	°	°	°	Strong: Cr, Fe, Co, Ni, Cu, Weak: Mg, Ca, Zn, Cd, Pb
▶▶ Tromethamine	2-Amino-2-(hydroxymethyl)-1,3-propanediol	77-86-1	121.14					T6687	Yes	108382	-0.029	8.1	7	9	°	°	•		•	•	•	•	°	°	°	Strong: Cr, Fe, Co, Ni, Cu, Weak: Mg, Ca, Zn, Cd, Pb
▶▶ Sigma 7-9®	2-Amino-2-(hydroxymethyl)-1,3-propanediol	77-86-1	121.14				T1378				-0.029	8.1	7	9	°	°	•		•	•	•	•	°	°	°	Strong: Cr, Fe, Co, Ni, Cu, Weak: Mg, Ca, Zn, Cd, Pb
▶▶ Trizma® hydrochloride	Tris(hydroxymethyl)aminomethane hydrochloride	1185-53-1	157.6	T6666, T2694, T3038, T3069, T2319, T2663, T2819, T2194, T1819, T2944	RDD009	T3253, T15760 - NEW!	T5941, 93363		Yes	9310-OP, 648313	-0.029	8.1	7	9	°	°	•		•	•	•	•	°	°	°	Strong: Cr, Fe, Co, Ni, Cu, Weak: Mg, Ca, Zn, Cd, Pb
▶▶ Triethanolamine	tris(2-hydroxyethyl)amine	102-71-6	149.19			90279	90278		Yes		#N/A	7.8	7.3	8.3	°	°				°	°	•	°	°	°	
▶▶ Triethanolamine hydrochloride	tris(2-hydroxyethyl)amine hydrochloride	637-39-8	185.65			T1502	T9534				#N/A	7.8	7.3	8.3	°	°				°	°	•	°	°	°	
▶▶ Tricine	N-(2-Hydroxy-1,1-bis(hydroxymethyl)ethyl)glycine	5704-04-1	179.17	T9784	RDD024	T0377, T17917 - NEW!	T5816			9010-OP	-0.019	8.1	7.4	8.8	•	•				•	•	•	•			Strong: Mg, Ca, Co, Cu, Ni, Zn
▶▶ EPPS (HEPPS)	4-(2-Hydroxyethyl)-1-piperazinepropanesulfonic acid	16052-06-5	252.33			E9502	E1894, E0276				-0.013	7.957	7.3	8.7								°			°	Weak: Ni, Pb
▶▶ Gly-Gly	Glycyl-glycine	556-50-3	132.12			G1002	50199, 50200, G3915				-0.026	8.27	7.5	8.9				°				•	°			Weak: Zn, Hg
▶▶ BICINE	N,N-Bis(2-hydroxyethyl)glycine	150-25-4	163.17		RDD036	B3876	B8660				-0.016	8.334	7.6	9	•	•		°	•	•	•	•	•	•		Strong: Mg, Ca, Fe, Co, Ni, Cu, Zn, Weak: Mn
▶▶ TAPS	3-[[1,3-Dihydroxy-2-(hydroxymethyl)-2-propanyl]amino]-1-propanesulfonic acid	29915-38-6	243.28			T5130	T9659, T5316			394675	-0.024	8.44	7.7	9.1			•		•			•	°	°	°	Strong: Cr, Fe, Cu, Weak: Zn, Cd, Pb
▶▶ TAPS sodium salt	3-[[1,3-Dihydroxy-2-(hydroxymethyl)-2-propanyl]amino]-1-propanesulfonic acid sodium salt	91000-53-2	265.26			T0647	T5441				-0.024	8.44	7.7	9.1			•		•			•	°	°	°	Strong: Cr, Fe, Cu, Weak: Zn, Cd, Pb
▶▶ CHES	2-(Cyclohexylamino)ethanesulfonic acid	103-47-9	207.29			C2885	C8210, 29311			3100-OP, 239779	-0.023	9.394	8.6	10	•	•		•		•					•	Strong: Mg, Ca, Mn, Co, Pb
▶▶ CAPSO	3-(Cyclohexylamino)-2-hydroxy-1-propanesulfonic acid	73463-39-5	237.32			C2278					-0.028	9.825	8.9	10.3												
▶▶ CAPSO sodium salt	3-(Cyclohexylamino)-2-hydroxy-1-propanesulfonic acid sodium salt	102601-34-3	259.3			C2154					-0.028	9.825	8.9	10.3												
▶▶ Amp	2-Amino-2-methyl-1-propanol	124-68-5	89.14			A65182, 08581	A9199, 08578				-0.032	9.69	9	10.5							°	°	°	°	°	Weak: Ni, Cu, Zn, Cd, Pb
▶▶ Amp hydrochloride	2-Amino-2-methyl-1-propanol hydrochloride	3207-12-3	125.6								-0.032	9.69	9	10.5							°	°	°	°	°	Weak: Ni, Cu, Zn, Cd, Pb
▶▶ CAPS	3-(Cyclohexylamino)-1-propanesulfonic acid	1135-40-6	221.32		RDD015	C2632	C6070, 29337			239782	-0.029	10.499	9.7	11.1												

Selection Guide

Buffer Name	CAS #	d(pKa)/°C	pKa at Temperature				Grade & Product Number				Useful pH Range						
			5 °C	20 °C	25 °C	37 °C	Reagent Grade	BioPerformance Certified	BioXtra	BioUltra	5	6	7	8	9	10	11
» MES hydrate**	1266615-59-1	-0.009	6.45	6.31	6.27	6.16	M8250	M2933	M5287	69890	5.5 - 6.7						
» MES monohydrate**	145224-94-8	-0.009	6.45	6.31	6.27	6.16	-	-	69892	69889	5.5 - 6.7						
» BIS-TRIS*	6976-37-0	-0.017	6.83	6.56	6.48	6.29	B9754	B4429	B7535	14879	5.8 - 7.2						
» ADA	26239-55-4	-0.008	7.01	6.88	6.84	6.76	A9883	-	-	00307	6.0 - 7.2						
» PIPES**	5625-37-6	-0.007	7.28	7.17	7.14	7.05	P6757	P1851	P8203	-	6.1 - 7.5						
» ACES	7365-82-4	-0.019	7.23	6.93	6.84	6.64	A9758	A3594	A7949	00194	6.1 - 7.5						
» MOPSO**	68399-77-9	-0.016	7.23	6.95	6.87	6.69	M8389	-	-	-	6.2 - 7.6						
» BIS-TRIS propane	64431-96-5				6.75 pK _{a1} 9.10 pK _{a2}		B6755	B4679	B9410	-	6.3 - 9.5						
» BES	10191-18-1	-0.015	7.49	7.26	7.19	7.01	B9879	B4554	B6420	-	6.4 - 7.8						
» MOPS**	1132-61-2	-0.013	7.44	7.25	7.18	7.04	M1254	M3183	M5162	69947	6.5 - 7.9						
» TES	7365-44-8	-0.020	7.96	7.65	7.55	7.34	T1375	T5691	T6541	93359	6.8 - 8.2						
» HEPES**	7365-45-9	-0.012	7.82	7.62	7.56	7.43	H3375	H4034	H7273	54457	6.8 - 8.2						
» DIPSO	68399-80-4	-0.018	7.95	7.66	7.58	7.37	-	-	D0306	-	7.0 - 8.2						
» Trizma® (Tris base)*	77-86-1	-0.029	8.68	8.21	8.07	7.75	T1503	T6066	T6791	93362	7.0 - 9.0						
» Tricine	5704-04-1	-0.019	8.54	8.23	8.14	7.91	T0377	T5816	T9784	93356	7.4 - 8.8						
» Gly-Gly	556-50-3	-0.026	8.81	8.39	8.27	7.94	G1002	G3915	50200	50199	7.5 - 8.9						
» EPPS (HEPPS)	16052-06-5	-0.013	8.22	8.02	7.96	7.81	E9502	E0276	E1894	54465	7.6 - 8.6						
» BICINE	150-25-4	-0.016	8.66	8.41	8.33	8.16	B3876	-	B8660	14871	7.6 - 9.0						
» TAPS	29915-38-6	-0.024	8.91	8.55	8.44	8.14	T5130	T5316	T9659	-	7.7 - 9.1						
» Ampd	115-69-5	-0.029	9.43	8.96	8.80	8.46	A9754	-	-	-	7.8 - 9.7						
» AMPSO	68399-79-1	-0.027	9.69	9.27	9.14	8.85	A6659	-	-	-	8.3 - 9.7						
» CHES	103-47-9	-0.023	9.89	9.51	9.39	9.12	C2885	-	C8210	29311	8.6 - 10						
» CAPSO**	73463-39-5	-0.028	10.41	9.96	9.83	9.51	C2278	-	-	-	8.9 - 10.3						
» Amp	124-68-5	-0.032	10.34	9.85	9.69	9.32	A65182	-	A9199	08578	9.0 - 10.5						
» CAPS	1135-40-6	-0.029	11.09	10.64	10.50	10.17	C2632	-	C6070	29337	9.7 - 11.1						

*Also available as a hydrochloride salt

**Also available as a sodium salt

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