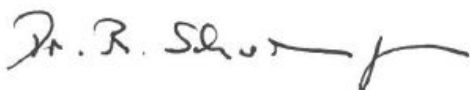


Certificate of Analysis

Product Name: Amino acids supplement, (6 amino acids)
Product Number: 5062-2478
Batch Number: BCCD1294
Brand: Sigma-Aldrich
CAS Number:
Formula:
Formula Weight:
Expiration Date: EXPIRY DATE PRINTED ON LABEL
Quality Release Date: 30 MAR 2020

TEST	RESULT
KIT-COMPOSITION PART 1	99979 LOT BCCC4585
PART 2	99980 LOT BCCC0562
PART 3	99981 LOT BCCB5593
PART 4	99982 LOT BCCC2054
PART 5	99983 LOT BCBV9573
PART 6	99984 LOT BCCB4904



Dr. Reinhold Schwenninger
Quality Assurance
Buchs, Switzerland

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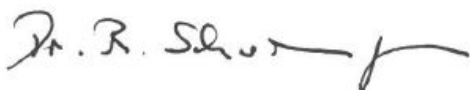
Certificate of Analysis

Product Name: L-Asparagine
BioUltra
Product Number: 99979
Batch Number: BCCC4585
Brand: Sigma-Aldrich
CAS Number: 70-47-3
Formula: $\text{H}_2\text{NCOCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$
Formula Weight: 132.12
Quality Release Date: 28 NOV 2019
Recommended Retest Date: OCT 2023

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	COLORLESS OR WHITE	WHITE
APPEARANCE (FORM)	POWDER OR CRYSTALS	POWDER
TITRATION (NT) HClO ₄ 0.1M	99.5 - 100.5 %	99.9 %
PURITY (TLC AREA %)	≥ 99.0 %	100.0 %
SPECIFIC ROTATION (20/D)	34.5 - 35.5 DEGREES	34.8 DEGREES
CONCENTRATION	C=5 IN HYDROCHLORIC ACID 5M	C=5 IN HYDROCHLORIC ACID 5M
LOSS ON DRYING	≤ 0.1 %	< 0.05 %
RESIDUE ON IGNITION	≤ 0.05 %	< 0.05 %
INFRARED SPECTRUM	CONFORMS TO STRUCTURE	CONFORMS
METAL TRACE ANALYSIS (ICP)	CORRESPONDS TO REQUIREMENTS	PASSED
ALUMINIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BARIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BISMUTH (ICP)	≤ 5 MG/KG	< 5 MG/KG
CALCIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
CADMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COBALT (ICP)	≤ 5 MG/KG	< 5 MG/KG
CHROMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COPPER (ICP)	≤ 5 MG/KG	< 5 MG/KG
IRON (ICP)	≤ 5 MG/KG	< 5 MG/KG
POTASSIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
LITHIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MAGNESIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
MANGANESE (ICP)	≤ 5 MG/KG	< 5 MG/KG
MOLYBDENUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
SODIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG

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NICKEL (ICP)	≤ 5 MG/KG	< 5 MG/KG
LEAD (ICP)	≤ 5 MG/KG	< 5 MG/KG
STRONTIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
ZINC (ICP)	≤ 5 MG/KG	< 5 MG/KG
ARSENIC TRACES (MHS-AAS)	≤ 0.1 MG/KG	< 0.1 MG/KG
TOTAL SULFUR AS SO₄ (ICP)	≤ 100 MG/KG	< 100 MG/KG
CHLORIDE (CL)	≤ 50 MG/KG	< 50 MG/KG
SOLUBILITY (METHOD)	0.396 G IN 30 ML H ₂ O (0.1 M)	0.396 G IN 30 ML H ₂ O (0.1 M)
APPEARANCE (SOLUTION)	CLEAR COLORLESS	CLEAR COLORLESS
PH (SOLUTION)	4.0 - 5.5	5.4
RESIDUE (FILTER TEST)	NO RESIDUE	NO RESIDUE
UV - ABS. AT 260 NM	≤ 0.07	0.003
UV - ABS. AT 280 NM	≤ 0.06	0.001



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Certificate of Analysis

Product Name: L-Glutamine
BioUltra

Product Number: 99980

Batch Number: BCCC0562

Brand: Sigma-Aldrich

CAS Number: 56-85-9

Formula: $\text{H}_2\text{NCOCH}_2\text{CH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$

Formula Weight: 146.14

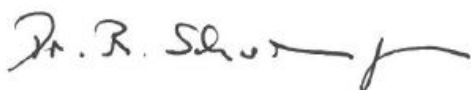
Quality Release Date: 05 SEP 2019

Recommended Retest Date: JUL 2023

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	COLORLESS OR WHITE	WHITE
APPEARANCE (FORM)	POWDER	POWDER
TITRATION (NT) HClO ₄ 0.1M	99.5 - 100.5 %	99.5 %
THIN LAYER CHROMATOGR.	FOREIGN AMINO ACIDS ≤0.5%	CORRESPONDS
SPECIFIC ROTATION (20/D)	32.0 - 34.0 DEGREES	33.8 DEGREES
CONCENTRATION	C=5 IN HYDROCHLORIC ACID 5M	C=5 IN HYDROCHLORIC ACID 5M
MELTING POINT (DEC.)	187 - 197 C	188 C
LOSS ON DRYING	≤ 0.1 %	<0.05 %
SULFATED ASH	≤ 0.1 %	<0.05 %
INFRARED SPECTRUM	CONFORMS TO STRUCTURE	CONFORMS
METAL TRACE ANALYSIS (ICP)	CORRESPONDS TO REQUIREMENTS	PASSED
ALUMINIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BARIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BISMUTH (ICP)	≤ 5 MG/KG	< 5 MG/KG
CALCIUM (ICP)	≤ 10 MG/KG	< 10 MG/KG
CADMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COBALT (ICP)	≤ 5 MG/KG	< 5 MG/KG
CHROMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COPPER (ICP)	≤ 5 MG/KG	< 5 MG/KG
IRON (ICP)	≤ 5 MG/KG	< 5 MG/KG
POTASSIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
LITHIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MAGNESIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG

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MANGANESE (ICP)	≤ 5 MG/KG	< 5 MG/KG
MOLYBDENUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
SODIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
NICKEL (ICP)	≤ 5 MG/KG	< 5 MG/KG
LEAD (ICP)	≤ 5 MG/KG	< 5 MG/KG
STRONTIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
ZINC (ICP)	≤ 5 MG/KG	< 5 MG/KG
ARSENIC TRACES (MHS-AAS)	≤ 0.1 MG/KG	< 0.1MG/KG
CHLORIDE (CL)	≤ 50 MG/KG	< 50 MG/KG
SULFATE (SO4)	≤ 50 MG/KG	< 50 MG/KG
SOLUBILITY (METHOD)	0.438 G IN 30 ML H2O (0.1 M)	0.438 G IN 30 ML H2O (0.1 M)
APPEARANCE (SOLUTION)	CLEAR COLORLESS	CLEAR COLORLESS
PH (SOLUTION)	5.0 - 6.0	5.3
RESIDUE (FILTER TEST)	NO RESIDUE	CORRESPONDS
UV - ABS. AT 260 NM	≤ 0.01	0.002
UV - ABS. AT 280 NM	≤ 0.01	< 0.001



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Buchs, Switzerland

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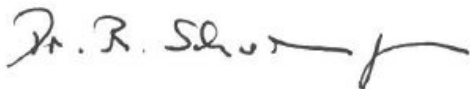
Certificate of Analysis

Product Name: L-TRYPTOPHAN
BioUltra
Product Number: 99981
Batch Number: BCCB5593
Brand: Sigma-Aldrich
CAS Number: 73-22-3
Formula: C₁₁H₁₂N₂O₂
Formula Weight: 204.23
Quality Release Date: 06 MAY 2019
Recommended Retest Date: APR 2023

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	COLORLESS OR WHITE	WHITE
APPEARANCE (FORM)	POWDER OR CRYSTALS	POWDER
TITRATION (NT) HClO ₄ 0.1M	99.5 - 100.5 %	100.3 %
SPECIFIC ROTATION (20/D)	-31.5 ± 1.0 DEGREES	-30.7 DEGREES
CONCENTRATION	C=1 IN WATER	C=1 IN WATER
MELTING POINT (DEC.)	280 - 290 C	282 C
LOSS ON DRYING	≤ 0.1 %	< 0.05%
SULFATED ASH	≤ 0.1 %	0.07 %
CARBON CONTENT	64.69 % (THEORY)	64.54 %
HYDROGEN CONTENT	5.92 % (THEORY)	5.92 %
NITROGEN CONTENT	13.72 % (THEORY)	13.63 %
INFRARED SPECTRUM	CONFORMS TO STRUCTURE	CONFORMS
METAL TRACE ANALYSIS (ICP)	CORRESPONDS TO REQUIREMENTS	PASSED
ALUMINIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BARIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BISMUTH (ICP)	≤ 5 MG/KG	< 5 MG/KG
CALCIUM (ICP)	≤ 10 MG/KG	< 10 MG/KG
CADMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COBALT (ICP)	≤ 5 MG/KG	< 5 MG/KG
CHROMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COPPER (ICP)	≤ 5 MG/KG	< 5 MG/KG
IRON (ICP)	≤ 5 MG/KG	< 5 MG/KG
POTASSIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG

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LITHIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MAGNESIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MANGANESE (ICP)	≤ 5 MG/KG	< 5 MG/KG
MOLYBDENUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
SODIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
NICKEL (ICP)	≤ 5 MG/KG	< 5 MG/KG
LEAD (ICP)	≤ 5 MG/KG	< 5 MG/KG
STRONTIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
ZINC (ICP)	≤ 5 MG/KG	< 5 MG/KG
ARSENIC TRACES (MHS-AAS)	≤ 0.1 MG/KG	< 0.1MG/KG
TOTAL SULFUR AS SO4 (ICP)	≤ 50 MG/KG	< 50 MG/KG
CHLORIDE (CL)	≤ 50 MG/KG	< 50MG/KG
SOLUBILITY (METHOD)	3.065 G IN 30 ML 0.5M HCL (0.5 M)	3.065 G IN 30 ML 0.5M HCL (0.5 M)
APPEARANCE (SOLUTION)	CLEAR, COLORLESS TO FAINTLY YELLOW	CLEAR COLORLESS
RESIDUE (FILTER TEST)	NO RESIDUE	NO RESIDUE
CUT-OFF	≤326 NM	317.7 NM



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Certificate of Analysis

Product Name: L-4-Hydroxyproline
BioChemika

Product Number: 99982

Batch Number: BCCC2054

Brand: Sigma-Aldrich

CAS Number: 51-35-4

Formula:

Formula Weight:

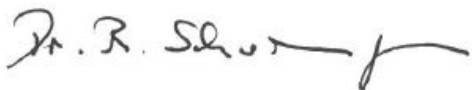
Quality Release Date: 19 SEP 2019

Recommended Retest Date: AUG 2023

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	COLORLESS OR WHITE	WHITE
APPEARANCE (FORM)	POWDER OR CRYSTALS	CRYSTALS
TITRATION (NT) HClO ₄ 0.1M	99.0 - 101.0 %	100.0 %
PURITY (TLC AREA %)	≥ 99.7 %	100.0 %
SPECIFIC ROTATION (20/D)	-78 - -75 DEGREES	-75.5 DEGREES
CONCENTRATION	C=5 IN WATER	C=5 IN WATER
SOLUBILITY (COLOR)	COLORLESS	COLORLESS
SOLUBILITY (TURBIDITY)	CLEAR	CLEAR
SOLUBILITY (METHOD)	1G IN 10ML WATER	1G IN 10ML WATER
LOSS ON DRYING	≤ 0.1 %	< 0.05 %
SULFATED ASH	≤ 0.1 %	< 0.05 %
INFRARED SPECTRUM	CONFORMS TO STRUCTURE	CONFORMS
METAL TRACE ANALYSIS (ICP)	CORRESPONDS TO REQUIREMENTS	PASSED
CALCIUM (ICP)	≤ 10 MG/KG	< 10 MG/KG
CADMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COBALT (ICP)	≤ 5 MG/KG	< 5 MG/KG
CHROMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COPPER (ICP)	≤ 5 MG/KG	< 5 MG/KG
IRON (ICP)	≤ 5 MG/KG	< 5 MG/KG
POTASSIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
MAGNESIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MANGANESE (ICP)	≤ 5 MG/KG	< 5 MG/KG
SODIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
NICKEL (ICP)	≤ 5 MG/KG	< 5 MG/KG
LEAD (ICP)	≤ 5 MG/KG	< 5 MG/KG

Certificate of Analysis

ZINC (ICP)	≤ 5 MG/KG	< 5 MG/KG
TOTAL SULFUR AS SO₄ (ICP)	≤ 100 MG/KG	< 100 MG/KG
CHLORIDE (CL)	≤ 100 MG/KG	< 100 MG/KG
ION CHROMATOGRAPHY (NH₄⁺)	≤ 100 MG/KG	< 100 MG/KG



Dr. Reinhold Schwenninger
Quality Assurance
Buchs, Switzerland

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Certificate of Analysis

Product Name: L-NORVALINE
BioChemika
Product Number: 99983
Batch Number: BCBV9573
Brand: Sigma-Aldrich
CAS Number: 6600-40-4
Formula: CH₃CH₂CH₂CH(NH₂)CO₂H
Formula Weight: 117.15
Quality Release Date: 04 DEC 2017
Recommended Retest Date: SEP 2021

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	COLORLESS OR WHITE	WHITE
APPEARANCE (FORM)	POWDER OR CRYSTALS	POWDER
TITRATION (NT) HClO ₄ 0.1M	99.0 - 101.0 %	99.9 %
THIN LAYER CHROMATOGR.	CORRESPONDS TO STANDARD	CORRESPONDS
SPECIFIC ROTATION (20/D)	24.5 ± 1.5 DEGREES	25.6 DEGREES
CONCENTRATION	C=10 IN HYDROCHLORIC ACID 20%	C=10 IN HYDROCHLORIC ACID 20%
SOLUBILITY (COLOR)	COLORLESS	COLORLESS
SOLUBILITY (TURBIDITY)	CLEAR	CLEAR
SOLUBILITY (METHOD)	1G IN 10ML 5M HYDROCHLORIC ACID	1G IN 10ML 5M HYDROCHLORIC ACID
RESIDUE ON IGNITION	≤ 0.05 %	<0.05%
CARBON CONTENT	51.26 % (THEORY)	51.14 %
HYDROGEN CONTENT	9.46 % (THEORY)	9.19 %
NITROGEN CONTENT	11.96 % (THEORY)	11.92 %



Dr. Claudia Geitner
Manager Quality Control
Buchs, Switzerland

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Certificate of Analysis

Product Name: SARCOSINE
BioUltra

Product Number: 99984

Batch Number: BCCB4904

Brand: Sigma-Aldrich

CAS Number: 107-97-1

Formula: CH₃NHCH₂COOH

Formula Weight: 89.09

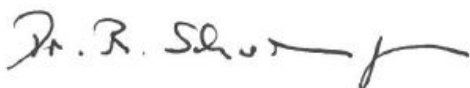
Quality Release Date: 18 APR 2019

Recommended Retest Date: MAR 2023

TEST	SPECIFICATION	RESULT
APPEARANCE (COLOR)	COLORLESS OR WHITE	WHITE
APPEARANCE (FORM)	POWDER OR CRYSTALS	POWDER
TITRATION (NT) HClO ₄ 0.1M	99.0 - 101.0 %	99.7 %
LOSS ON DRYING	≤ 0.4 %	0.06 %
RESIDUE ON IGNITION	≤ 0.05 %	< 0.05 %
INFRARED SPECTRUM	CONFORMS TO STRUCTURE	CONFORMS
METAL TRACE ANALYSIS (ICP)	CORRESPONDS TO REQUIREMENTS	PASSED
ALUMINIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BARIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
BISMUTH (ICP)	≤ 5 MG/KG	< 5 MG/KG
CALCIUM (ICP)	≤ 10 MG/KG	< 10 MG/KG
CADMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COBALT (ICP)	≤ 5 MG/KG	< 5 MG/KG
CHROMIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
COPPER (ICP)	≤ 5 MG/KG	< 5 MG/KG
IRON (ICP)	≤ 5 MG/KG	< 5 MG/KG
POTASSIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
LITHIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MAGNESIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
MANGANESE (ICP)	≤ 5 MG/KG	< 5 MG/KG
MOLYBDENUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
SODIUM (ICP)	≤ 50 MG/KG	< 50 MG/KG
NICKEL (ICP)	≤ 5 MG/KG	< 5 MG/KG

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LEAD (ICP)	≤ 5 MG/KG	< 5 MG/KG
STRONTIUM (ICP)	≤ 5 MG/KG	< 5 MG/KG
ZINC (ICP)	≤ 5 MG/KG	< 5 MG/KG
ARSENIC TRACES (MHS-AAS)	≤ 0.1 MG/KG	< 0.1MG/KG
TOTAL SULFUR AS SO₄ (ICP)	≤ 50 MG/KG	< 50 MG/KG
CHLORIDE (CL)	≤ 600 MG/KG	< 600MG/KG
SOLUBILITY (METHOD)	--	2.673 G IN 30 ML H ₂ O (1 M)
APPEARANCE (SOLUTION)	CLEAR COLORLESS	CLEAR COLORLESS
PH (SOLUTION)	4.5 - 7.0	6.2
RESIDUE (FILTER TEST)	NO RESIDUE	CORRESPONDS
UV - ABS. AT 260 NM	≤ 0.200	0.064
UV - ABS. AT 280 NM	≤ 0.100	0.053



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Quality Assurance
Buchs, Switzerland

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