Ludger Document # LT-MONO-96-Guide-v3.0.doc

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Contents

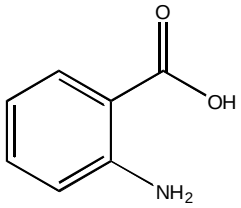
Specifications for LT-MONO-96

Application: For release of neutral and amino monosaccharides from glycoprotein therapeutics and pre-released glycans, and subsequent labeling with 2-aminobenzoic acid (2-AA).

Dye Properties: Relative Molecular Mass = 137 g/mol

Fluorescence, λex = 360 nm, λem = 425 nm.

Structure:



Synonyms: 2-AA; 2-aminobenzoic acid

Description: The kit contains reagents for the release of monosaccharides from glycoprotein biopharmaceuticals and standards. Released monosaccharides have a free reducing terminus to allow fluorescent tagging by reductive amination.

There are two hydrolysis acids provided: 2 molar trifluoroacetic acid (2M TFA) and 6 molar hydrochloric acid (6M HCl). Typically, for a pilot study, we recommend using both these acids on separate replicates of your samples. We have found that 2M TFA is good for releasing neutral monosaccharides but is less effective for releasing *N*-acetylglucosamine (GlcNAc) and *N*-acetylgalactosamine (GalNAc) monosaccharides that are attached directly to the protein (core sugars) for which we recommend using 6M HCl. Hydrochloric acid may also provide more effective release of other core linked sugars such as fucose or mannose; however, these monosaccharides are subject to degradation by HCl so care should be taken to perform hydrolysis in a consistent way. A pilot study will enable you to determine which type(s) of hydrolysis (2M TFA and/or 6M HCl) is the most suitable for quantitative analysis of monosaccharides for your specific glycoprotein.

Number of Samples: The kit contains reagents and materials for up to 96 glycoprotein samples, control and standards analysed in parallel or two sets of 48 samples.

Amount of Sample: Typically start with 50µg of glycoprotein per analysis. We recommend analysing samples in triplicate.

Suitable Samples: Biopharmaceutical glycoproteins.

Storage: Store the whole kit at 4°C in the dark. Once monosaccharide standards are dissolved in solvent, we recommend storing them at -20°C. Protect from sources of heat, light, and moisture. Use kit within 6 months of purchase.

Shipping: The product should be shipped at ambient temperature but can be stored at 4°C for up to 1 year.

Handling: Ensure that any glass, plasticware or solvents used are free of glycosidases and environmental carbohydrates. Use powder-free gloves for all sample handling procedures and avoid contamination with environmental carbohydrate.

Once individual vials of reagents are opened, their contents should be used immediately. Discard any excess according to local safety rules.

Safety: **For research use only. Not for human or drug use**

Please read the Safety Data Sheets (SDS's) for all chemicals used. All processes involving labelling reagents should be performed using appropriate personal safety protection - eyeglasses, chemically resistant gloves (e.g. nitrile), and where appropriate in a laboratory fume cupboard.

Kit Contents

Each kit contains the following:

Cat. #	Item	Number of Vials
LT-2MTFA-01	Trifluoroacetic acid	2
LT-6MHCL-01	Hydrochloric acid	2
LT-NAOAC-01	Sodium acetate	2
LT-NBM-01	Labelling solvent	2
LT-2AA-02	2-aminobenzoic acid	2
LT-CYANOB-03	Sodium cyanoborohydride	2
CM-MONO-MIX-10	10 nmols each of glucosamine (GlcN), galactosamine (GalN), Galactose (Gal), glucose (Glc), mannose (Man) and fucose (Fuc)	4
CM-XYL-100	100 nmol of xylose (Xyl)	2

Additional Reagents and Equipment Required

- Oven (recommended) or heating block set at 100°C for monosaccharide release; and at 80°C for the labelling reaction. Note that the use of a heating block can result in some solvent evaporation into the vial lid which may reduce the effectiveness of sample hydrolysis or labelling.
- Range of pipettes 1 to 1000 µL and tips
- Vacuum Centrifuge
- Vortexer
- Sonicator [*Optional*]
- Reaction vials: Screw capped 0.5 mL polypropylene vials. Vials lids should seal tightly to prevent escape of acid vapour. We do not recommend the use of snap cap type vials.
- Analytical grade water eg. MilliQ, resistivity above 18 MΩ-cm, particle free (>0.22 µm), TOC <10 ppb
- Additional Monosaccharide Standards if replicates are required [*Optional*]: CM-MONOMIX-10
- Process positive controls [*Recommended*]: Ludger Fetuin glycoprotein GCP-FET-50U and/or Ludger Bioquant™ glycopeptide BQ-GPEP-A2G2S2-10U
- LudgerSep™ R2 HPLC column LS-R2-4.6x150 *or* LudgerSep™uR2 uHPLC column LS-UR2-2.1x50
- BPT solvent: 0.2 % butylamine, 0.5 % phosphoric acid, 1 % tetrahydrofuran (made from LudgerSep™ R BPT concentrate LS-R-BPTX10)
- Acetonitrile
- LC system with fluorescence detector and LC vials

Timeline for Labelling

The release and labelling process is typically performed over 2 days, with the LC-analysis starting on the second day.

Day 1: acid release of monosaccharides from the dried analytical samples followed by overnight drying.

Day 2: preparation for the LudgerTag™ labelling procedure; 2-AA labelling:

Procedure	**Time**
Preparation of Samples	10 min + drying (1-2 hrs) *this can be performed the day before*
Release of Monosaccharides	3 hrs+ drying (8 hrs or overnight)
Preparation of samples for 2-AA labelling	up to 5 hrs (depending on numbers)
2-AA labelling	45 min

Method

1 Preparation of Samples

- We recommend taking triplicate 50 µg aliquots of samples through release and analysis (if performing both TFA and HCl release, then a total of six replicates will be required).

- Note that some salts/buffers commonly used with proteins may interfere with the monosaccharide analysis process. Samples should be supplied in buffer that does not contain any sugars that could interfere with the analysis (e.g. Trehalose).

- We recommend taking the CM-MONOMIX-10 standard through the process with your samples. This is because the different sugars degrade at different rates during acid hydrolysis.

- We recommend taking a number of controls through the process with your samples:
  Positive process control glycoprotein: Fetuin glycoprotein: GCP-FET-50U
  Positive process quantitative control glycopeptide: BQ-GPEP-A2G2S2-10U
  Negative process control: water
  Negative process control: Sample buffer

- Addition of xylose (if required).
  - The Xylose standard CM-XYL-100 can be added to the MonoMix (add 10%, i.e. 10 nmol to each vial of CM-MONOMIX-10), or treated as a separate standard, if xylose is expected in your samples (e.g. if they are plant derived).
  - You can also use xylose as an internal quantitative control if it is not present in your samples. For this add xylose (e.g. 10nmol) to samples after release and analysis.

- Aliquot samples and process controls (unless they are already dry) into 0.5 mL polypropylene vials, and dry in a vacuum centrifuge.

2 Monosaccharide Release

Note: Neutral sugars are hydrolysed by incubation with trifluoroacetic acid (TFA) or hydrochloric acid (HCl). Usually a 3 hour incubation at 100 °C with 2M TFA will release all of the monosaccharides. If harsher conditions are required (as can be the case to completely remove the core N-acetylhexosamines which are directly attached to the protein) 6M HCL can be used, however there will be degradation of the hexose sugars under these conditions, therefore release conditions may require optimising for individual glycoproteins. Also during hydrolysis, N-acetyl groups on GlcNAc and GalNAc are hydrolysed to glucosamine (GlcN) and galactosamine (GalN). When quantifying monosaccharides it is important to subject any monosaccharide standards to the same hydrolysis conditions as the glycoproteins as the different sugars degrade at different rates and have different molar fluorescence.

- Set oven to 100°C

- For non-acetylated monosaccharide analysis (i.e. Gal, Man, Glc, Fuc) add 200 µL LT-2MTFA-01 to the dried samples, controls and the monosaccharide standard mixture CM-MONO-MIX-10.

- For *N*-acetylgalactosamine (GalNAc) and *N*-acetylglucosamine (GlcNAc) monosaccharide analysis add 200 µL LT-6MHCl-01 to the dried samples, controls and the monosaccharide standard mixture CM-MONO-MIX-10.

- Vortex for 10 seconds and ensure cap is firmly closed to ensure no evaporation from vial during the heating step, then briefly centrifuge.

- Place the samples, controls and standards in an oven set at 100°C and incubate for 3 hours. The samples should be re-vortexed after 30 min to ensure dissolution of the glycoprotein in the acid *Ensure samples are not out of oven for more than 10 min (large numbers of samples should be taken out for mixing in small batches).*

- Remove vials from the oven and cool to room temperature.

- Vortex and briefly centrifuge to remove condensate from vial cap.

- *Optional: Add xylose internal standard to each sample. The xylose monosaccharide can be used as an internal standard. We provide a 100 nmol amount of xylose for this purpose. Dissolve the xylose in a set amount of water (e.g. 200 µl), mix thoroughly to ensure complete dissolution and then add a set amount to each test sample (e.g. 10 nmol or 20 µl dissolved sample). Often the use of xylose is more effective in a full study after a preliminary investigation has already been performed on the samples and any presence of xylose and the absolute levels of monosaccharides in the test samples have been determined. Xylose is not recommended as a standard for proteins expressed by plant-cell based expression systems.*

- Dry samples, controls and standards using a vacuum centrifuge. This usually takes approximately 8 hours and can be set to dry overnight.

  Samples may dry to a dark brown or black spot.
  The samples released in HCl may take longer to dry down than the samples released in TFA.
  Acid released samples can be stored at -20°C for at least 2 days if required.

3 Preparation of samples for 2-AA Labelling

Note: It can be difficult to dissolve the dried samples, so a combination of vigorous vortexing and sonication is recommended. Good dissolution at this stage is required for accurate quantitation.

- Add 50 µL LT-NaOAc-01 solution to each sample.

- Ensure samples dissolve thoroughly - we recommend thoroughly vortexing samples followed by sonication for 15 minutes, or longer if the samples prove difficult to dissolve. Centrifuge samples briefly to remove any solution from the vial cap. One of the greatest sources of error within monosaccharide analysis is insufficient dissolution of sample.

4 2-AA Labelling

- Set oven to 80°C.
- Make up the 2-AA solution by adding 2750 µL of the LT-NBM-01 solution to the LT-2AA-01 vial. Vortex thoroughly until dissolved, then briefly centrifuge.
- Add 50 µL of the 2-AA solution to each sample, control and standard.
- Make up the sodium cyanborohydride solution by adding 2750 µL of the LT-NBM-01 solution to the LT-CYANOB-03 vial. Vortex thoroughly until dissolved, then briefly centrifuge
- Add 50 µL of the sodium cyanborohydride solution to each sample, control and standard.
- Briefly vortex then centrifuge each vial.
- Place the samples, controls and standards in an oven set at 80°C and incubate for 45 min in the dark ensuring that vial lids are shut tight.
- Remove vials from oven and allow to cool then briefly centrifuge to remove condensate from vial cap.

  Samples are now ready for LC analysis. Samples can be stored at -20°C at this stage.

  During this incubation, you can start conditioning the LC ready for analysis – see section 5.

5 LC Analysis

- Dilute the MONOMIX standard replicates for the standard curves (using table 1 and 2 for guidance). Mix well.
- If you have used both **TFA** and **HCl** hydrolysis conditions you will need to perform a calibration curve for a set of monosaccharide standards hydrolysed with each acid.
- The monosaccharides have different molar fluorescence, so a standard curve is required for each.

Dilution	Ratio	Approximate Amount (nmoles)*	MONOMIX Std (µL)	Water or BPT (µL)
1 in 10	1:9	1.0	20	180
1 in 50	1:49	0.2	10	490
1 in 100	1:99	0.1	5	495
1 in 500	1:499	0.02	2	998
1 in 1000	1:999	0.01	1	999

Table 1. *Dilution scheme for standards (wide calibration range)*

**The exact amount of each monosaccharide is listed in the CofA for each batch.*

Dilution	Ratio	Approximate Amount (nmoles)*	MONOMIX Std (µL)	Water or BPT (µL)
1 in 100	1:99	0.1	25	2475
1 in 125	1:124	0.08	20	2480
1 in 167	1:166	0.06	15	2485
1 in 250	1:249	0.04	20	4980
1 in 500	1:499	0.02	10	4990

Table 2. *Dilution scheme for standards (narrow calibration range)*

**The exact amount of each monosaccharide is listed in the CofA for each batch.*

- Dilute the samples and process controls 1 in 100 with water or BPT (5 µL sample plus 495 µL water or BPT).

  Note: If you find that the areas of the LC peaks are not within the standard curve, then either make up more concentrated or dilute samples, or extend the standard curve.

  Samples are stable in the auto-injector in the dark at 10°C for at least 72hr.

- Prepare the LC system. Ensure that the solvent lines are primed.

  Solvent A = Acetonitrile

  Solvent B = BPT: 0.2 % butylamine, 0.5 % phosphoric acid, 1 % tetrahydrofuran (made from LudgerSep™ R BPT concentrate LS-R-BPTX10).

  Fluorescence: Excitation: 360 nm; Emission: 425 nm

  Column temp = 30°C for HPLC and 35°C for UHPLC; Sample temp = 10°C.

Time (min)	Flow mL/min	%A	%B
0	0.8	3.5	96.5
7	0.8	35	96.5
25.25	0.8	8.5	91.5
26.25	0.8	50	50
26.75	1.2	50	50
32.25	1.2	3.5	96.5
35	0.8	3.5	96.5

Table 3. *30 min running method for HPLC analysis using a LudgerSep-R1 column (4.6 x 150 mm, 3 µm particles) LS-R2-4.6x150. Injection volume: 10 µL.*

Time (min)	Flow mL/min	%A	%B
0	0.4	0	100
1	0.4	0	100
4.5	0.4	15.7	84.3
4.6	0.4	50	50
6.0	0.6	0	0
8.0	0.6	0	0

Table 4. *15 min running method for UHPLC analysis using a LudgerSep-uR2 column (2.1 x 100 mm, 1.9 µm particles) LS-UR2-2.1x50. Injection volume = 5 µL.*

- Condition the column by running the appropriate method (*Table 3 for HPLC analysis with LudgerSep-R2 column or table 4 UHPLC analysis with LudgerSep-uR2 column*) with no injection two to three times.

- Inject a water system blank and check that the baseline is stable. If not, then keep running water injections until the baseline stabilises.

- Run two or more injections of the MONOMIX standard (1 in 500 dilution) until the profiles overlap. The profiles should resemble figure 1 (TFA release) or figure 2 (HCl release). However, retention times will vary depending on the LC system used. If xylose has been added, then it elutes before fucose (See Figure 3, an example of TFA released monosaccharides run on UHPLC).

- The LC system is now ready to run the sample set. We suggest the following order (table 5):

MONOMIX dilutions for standard curve (replicate 1)
Process controls (Fetuin; GPEP; Water; Buffer) (replicate 1)
Samples (replicate 1)
MONOMIX dilutions for standard curve (replicate 2)
Process controls (Fetuin; GPEP; Water; Buffer) (replicate 2)
Samples (replicate 2)
MONOMIX dilutions for standard curve (replicate 3)
Process controls (Fetuin; GPEP; Water; Buffer) (replicate 3)
Samples (replicate 3)

Table 5. *Sample Injection Order*

6 Acceptance Criteria

Note that N-acetylglucosamine and N-acetylgalactosamine are both de-N-acetylated during the acid hydrolysis step of this process to produce glucosamine and galactosamine respectively. Glucosamine and galactosamine produce an epimer peak which is typically less than 4%. The GlcN epimer elutes immediately before the GalN peak and is not fully resolved; therefore, ***peak heights*** *rather than peak areas are used for quantitation.*

- The profiles from the MONOMIX (1 in 10 dilutions) at the start and end of the sample set should overlap with minimal drift e.g ± 0.1 min.

- The calibration curve should give R^2 values of >0.99 for GlcN, GalN, Gal, Man, Glc, Xyl (if used) and Fuc from **TFA** release, but only for GlcN and GalN for **HCl** release (as the neutral monosaccharides are degraded).

- For the **TFA** release of Fetuin, analysed following in-house SOPs, the Ludger acceptance level is that GlcN amounts are within the range 258 to 430 nmol/mg protein (where there is e.g. 34 µg fetuin protein per 50U).

- For the **TFA** release of GPEP-A2G2S2, analysed following in-house SOPs, the Ludger acceptance level is that GlcN amounts are within the range 8.38 to 13.96 nmol.

- For the **HCl** release of Fetuin, analysed following in-house SOPs, the Ludger acceptance level is that GlcN amounts are within the range 344 to 516 nmol/mg protein (where there is e.g. 34 µg fetuin protein per 50U).

- For the **HCl** release of GPEP-A2G2S2, analysed following in-house SOPs, the Ludger acceptance level is that GlcN amounts are within the range 11.17 to 16.75 nmol.

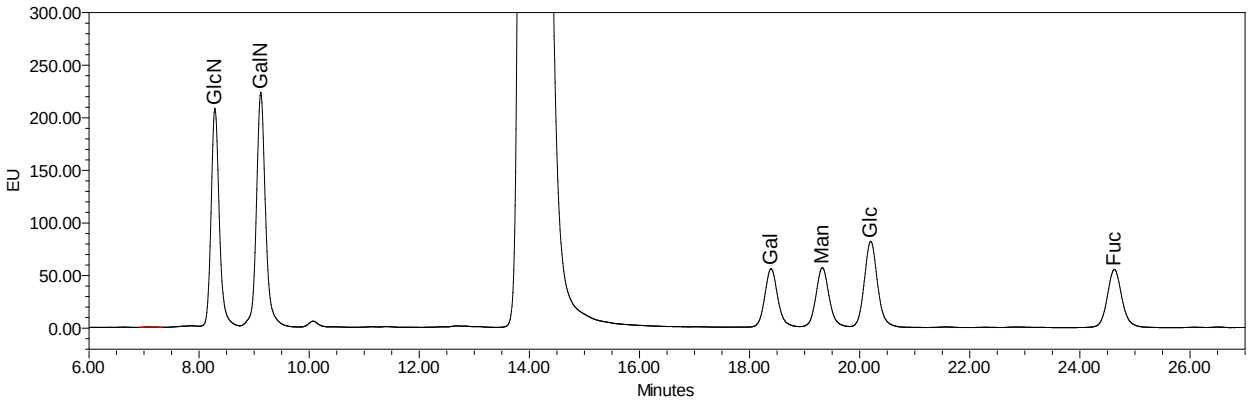


Figure 1. *Chromatogram of 2-AA labelled MONOMIX standard, from TFA release, run on the LudgerSep-R2 HPLC column.*

Note that free dye is not removed from the samples after 2-AA labelling to ensure no monosaccharides are lost in a dye clean-up stage. Free dye elutes as a large off-scale peak at about 15 minutes.

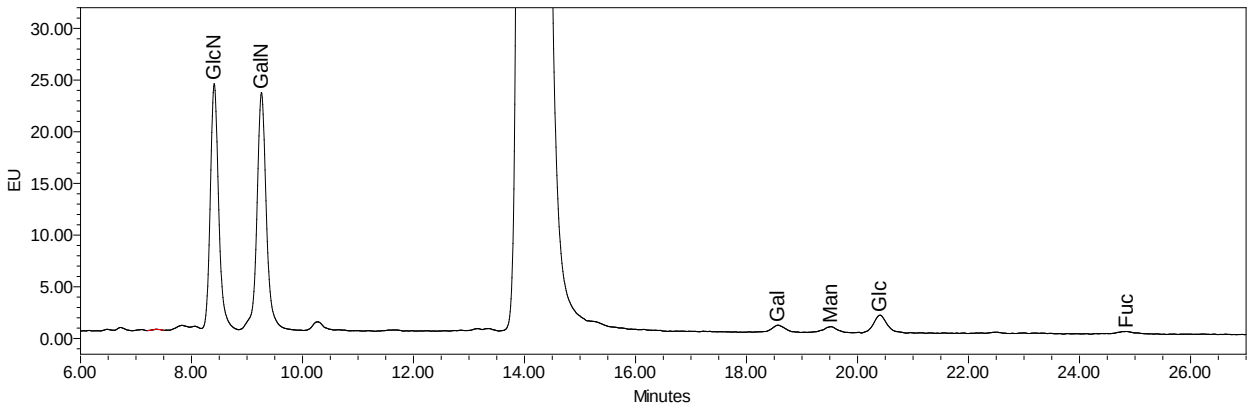


Figure 2. *Chromatogram of 2-AA labelled MONOMIX standard, from HCl release, run on the LudgerSep-R2 HPLC column.*
Note that free dye is not removed from the samples after 2-AA labelling to ensure no monosaccharides are lost in a dye clean-up stage. Free dye elutes as a large off-scale peak at about 15 minutes.

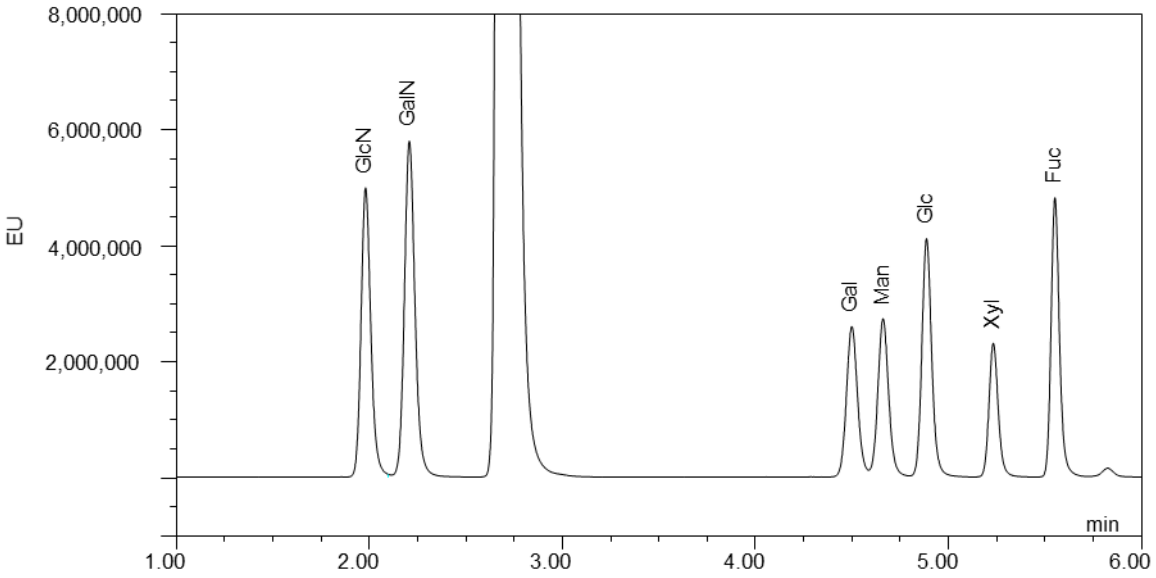


Figure 3. *Chromatogram of 2-AA labelled MONOMIX standard with added Xylose, from TFA release, run on the LudgerSep-uR2 HPLC column.*
Note that free dye is not removed from the samples after 2-AA labelling to ensure no monosaccharides are lost in a dye clean-up stage. Free dye elutes as a large off-scale peak at about 3 minutes.

Note: This chromatogram is provided as an example only. Peak width, resolution and retention are dependent on the UHPLC system setup in your laboratory.

Troubleshooting

1 Low Yield or High Sample to Sample Variability

- The sample was incompletely solubilized. The hydrolysed samples can be difficult to dissolve in the 1 % sodium acetate solution prior to labeling. In the case of a black/brown hydrolysed sample, it is clear when the sample has not dissolved. However, not all sample pellets are readily visible. To ensure good solubility of the sample, shake/sonicate the sample vials as well as vortexing them. Once dissolved, centrifuge the sample briefly.
- Variability in pipetting. Ensure that pipettes are calibrated and that the pipette tips used are the maximum recovery type.

2 Large variation in retention times for peaks on HPLC

- Old solvents. Ensure that HPLC solvents are made up fresh for each set of analyses.
- Inconsistent solvent preparation. Ensure that solvent components are dispensed accurately.

3 Mono-mix does not match that of the trace shown in the guide

- The chromatography conditions may need optimisation for each system. One common variable to assess if you are using UHPLC, is the 'strong/weak wash'. These can have a dramatic effect on the chromatography. As a general rule, the 'weak wash' uses the weakest gradient condition and a 'strong wash' uses the strongest gradient condition. You will need to assess which of these provides an SRP trace that matches the product guide. We recommend beginning LC optimisation by using the weak wash

Warranties and Liabilities

Ludger warrants that the above product conforms to the attached analytical documents. Should the product fail for reasons other than through misuse Ludger will, at its option, replace free of charge or refund the purchase price. This warranty is exclusive and Ludger makes no other warrants, expressed or implied, including any implied conditions or warranties of merchantability or fitness for any particular purpose.

Ludger shall not be liable for any incidental, consequential or contingent damages.

This product is intended for in vitro research only.

Document Revision Number

Document # LT-MONO-96-Guide-v3.0.doc

Appendix 1: Safety Data Sheets

Ludger

SAFETY DATA SHEET

Version: 2.0
Reviewed 18 June 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	**2 Molar Trifluoroacetic acid in water**
Product Catalogue Name	**LT-2MTFA-01**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]
Skin Corrosion (Category 1A)
Acute toxicity, Inhalation (Category 4)
Long-term (chronic) aquatic hazard (Category 3), H412

2.2 Label elements

Signal Word: Danger

Hazard Statement(s)

H314	Causes severe skin burns and eye damage.
H332	Harmful if inhaled
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statement(s)

P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Other hazard information:
None.

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

3. 1 Substances

Synonyms: TFA in water
Formula: TFA: $C_2HF_3O_2$
Molecular weight: TFA: 114.02 g/mol
Water: 18.02 g/mol

Component	Concentration	Classification
Name TFA	14%	Acute Tox. 4; Skin Corr. 1A; Eye Dam. 1; Aquatic Chronic 3; H332, H314, H318, H412
CAS-No. 76-05-1		
EC-No. 200-929-3		
Index-No. 607-091-00-1		

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice
Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested
Do NOT induce vomiting. Never give anything by mouth if person is unconscious. Rinse mouth with water. Consult a physician

If skin is exposed
Remove any contaminated clothing immediately. Wash area well with plenty of soap and water. Consult a physician

If eyes are exposed
Rinse thoroughly with water or eye wash solution for at least 15 minutes. Consult a physician

If inhaled
Remove effected person to a source of ventilation/ fresh air. If not breathing, give artificial respiration. Consult a physician

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of immediate medical attention and special treatment needed
No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Choose an extinguishing media appropriate to surrounding area, extinguisher media such as water, is not suitable if electrical items/ sockets are near the fire, a CO_2 extinguisher would be more suitable.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen fluoride.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if deemed necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear personal protective equipment when handling the product. Avoid breathing in vapours/ gas/ mist by ensuring adequate ventilation. Remove any unrequired staff from the area.

6.2 Environmental Precautions
Contain the spill and prevent any more leakage/ spillage. Do not let the product enter the drainage system. Discharge into the environment must be avoided

6.3 Methods and material for containment and cleaning up
Soak up spillage with inert material, such as vermiculite, collect and store in a suitable container. Arrange disposal of the waste material and clean area. Do not let any discharge enter the drainage system.

6.4 Reference to other sections
For more information regarding waste disposal, see Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin, eyes and inhalation of vapour or mist.

7.2 Conditions for safe storage, including any incompatibilities
Store the product in a dry cool place. Keep the container tightly sealed until required. Once opened and not all the product is used the container must be resealed and stored upright.

7.3 Specific end uses
No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
This product does not contain any substances that have any occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle the product in accordance with good laboratory and safety practice. User to wear personal protective equipment, such as gloves when handling the product. Wash hands before and after handling, even with the use of gloves.

Personal Protective Equipment
Eye / face protection
Wear laboratory glasses or safety goggles. Use equipment for eye protection tested and approved under appropriate standards such as NIOSH (US) or EN 166 (EU).

Skin protection
Handle with gloves, check gloves before using for any tears/ holes. Remove used gloves using the proper glove removal technique, so that the outer side of the glove does not touch the skin, to avoid skin contact with the product. Dispose of used gloves as contaminated waste, see section 13 for information. Gloves must satisfy the specifications of the EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection
Wear laboratory coat or similar covering over clothing.

Respiratory protection
Handle the material under an extraction cabinet or fume hood. If respirators are required, they should be tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Thermal hazards
No data available.

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Clear, liquid
Odour	pungent
Odour threshold	No data available
pH	1.0 at 1 g/l at 20 °C
Freezing/Melting Point	Melting point/range: -15.4 °C - lit
Initial boiling point and boiling range	72.4 °C - lit
Flash Point	> 100 °C - closed cup - Tested according to Annex V of Directive 67/548/EEC.
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	130.0 hPa at 20.0 °C 142.7 hPa at 25.0 °C
Relative Density	1.489 g/cm3 at 20 °C
Solubility in water and solvents	Soluble
Partition coefficient	log Pow: -2.10
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available.

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
No data available

10.5 Incompatible materials
Strong bases, metals, oxidizing agents, alcohols, epoxides, steel (all types and surface treatments), aluminium. Reacts with Alkali metals.

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen fluoride Other decomposition products - No data available. In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
TFA: LC50 Inhalation – Rat – 4hr - 10,000mg/m3
Remarks: Sense organs and special senses (Nose, Eye, Ear and Taste): Eye: Conjunctive irritation. Behavioural: Somnolence (general depressed activity). Lungs, Thorax or respiration: Dyspnea.

Skin corrosion/irritation
No data available.

Serious eye damage/irritation
No data available.

Respiratory or skin sensitisation
No data available.

Germ cell mutagenicity
No data available.

Carcinogenicity
IARC: No components of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogenic by IARC.

Reproductive toxicity
No data available.

STOT-single exposure
No data available.

STOT-repeated exposure
No data available.

Aspiration hazard.
No data available.

Potential Health Hazards

Inhalation	May be harmful if inhaled. Destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion	May be harmful if swallowed, causes burns.
Skin	May be harmful if absorbed through skin. Causes skin burns.
Eyes	Causes eye burns.

Signs and symptoms of exposure
Product is harmful to tissue of the mucous membranes and upper respiratory tract, eyes and skin. Can cause spams, inflammation and edema of the larynx and bronchi, pneumonitis and pulmonary edema. Coughing, wheezing, laryngitis, shortness of breath, headaches, nausea and vomiting.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish - LC50 - Danio rerio (zebra fish) - > 1,000 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 55.00 mg/l - 24 h
Toxicity to algae - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability
Biodegradability Result: - Not readily biodegradable. (OECD Test Guideline 301D) Remarks: No data available

12.3 Bioaccumulative potential
No bioaccumulation is to be expected (log Pow <= 4).

12.4. Mobility in soil
No data available.

12.5. Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects
Harmful to aquatic life with long lasting effects.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Contact waste professional waste disposal company that is licensed to carry such waste material for the disposal of waste product. This product cannot go into the drainage systems.

Contaminated packaging
Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
TFA: ADR/RID: 2699 IMDG: 2699 IATA: 2699

14.2 UN Proper Shipping Name
TFA: ADR/RID: TRIFLUOROACETIC ACID
IMDG: TRIFLUOROACETIC ACID
IATA: Trifluoroacetic Acid

14.3 Transport hazard class(es)
TFA: ADR/RID: 8 IMDG: 8 IATA: 8

14.4 Packing group
TFA: ADR/RID: I IMDG: I IATA: I

14.5 Environmental hazards
TFA: ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available.

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available.

15.2 Chemical Safety Assessment
No data available.

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 2.1
Date reviewed: 6th July 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	**Hydrochloric Acid 6M (aq)**
Product Catalogue Name	**LT-6MHCL-01**
CAS Number	**7647-01-0**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Corrosive to metals (Category 1), H290
Skin irritation (Category 2), H315
Eye irritation (Category 2), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

2.2 Label elements

Signal Word: Danger Warning

Hazard Statement(s)

H290	May be corrosive to metals.
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation.

Precautionary Statement(s)

P302 + P352	IF ON SKIN (or hair): wash with plenty of water
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Other hazard information:
None.

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

3. 1 Substances

Synonyms: None
Formula: HCl
H_2O
Molecular Weight: HCl: 36.46g/mol
Water: 18.02 g/mol

Component		Classification	Concentration
Name	Water	-	75-80%
CAS-No.	7732-18-5		
EC-No.	231-791-2		
2nd Name	Hydrochloric Acid	Met. Corr. 1; Skin Corr. 1B; Eye Irrit. 2; STOT SE 3; H290, H314, 315, H319, H335 Concentration limits: Eye Irrit. 2; H319: 10 % ≤ C < 25 % STOT SE 3; H335: C ≥ 10 % Skin Corr. 1B; H314: C ≥ 25 % Skin Irrit. 2; H315: 10 % ≤ C < 25 %	20-25%
CAS-No.	7647-01-0		
EC-No.	231-595-7		
Index-No.	017-002-01-X		

For the full text of the H-statements mentioned in this section, Section 2.

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice
Consult a physician. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested
Do NOT induce vomiting. Do not give anything by mouth if person is unconscious. Rinse mouth well with water.

If skin is exposed
Remove contaminated clothing and shoes immediately. Wash area well with plenty of soap and water. Consult a physician.

If eyes are exposed
Rinse thoroughly with water or eye wash, for at least 15 minutes. Remove contact lenses if present and continue rinsing. Consult a physician.

If inhaled
Remove person to a source of fresh air/ ventilation. If not breathing, give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed
Burning sensation, coughing and difficulties breathing. This product is destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin.

4.3 Indication of immediate medical attention and special treatment needed
No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Select an extinguisher that media is compatible with the surrounding of the fire, such as water spray, dry chemical and carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Hydrogen Chloride gas

5.3 Advice for firefighters
If necessary, fire fighters are to wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear personal protective equipment. Avoid breathing in vapours, mist or gas by ensuring adequate ventilation. Move any unrequired staff away from the spill area.

6.4 Environmental Precautions
Prevent any further leakage if practical and safe to do so. Do not let the product enter the drainage system.

6.5 Methods and material for containment and cleaning up
Soak up the spillage by using an inert absorbent material, such as vermiculite. Collect the waste material and store in a suitable container with a lid, arrange for collection and disposal.

6.4 Reference to other sections
For information on disposal see Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin, eyes and inhalation of vapour or mist.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool, dry, well ventilated place. Containers that have been opened must be resealed and kept upright.

7.3 Specific end uses
No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hydrochloric Acid	7647-01-0	TWA	5 ppm 8 mg/m3	Europe. Commission Directive 2009/39/EC establishing a first list of inductive occupational limit values.
	Remarks	Indicative		
		STEL	10 ppm 15 mg/m3	Europe. Commission Directive 2009/39/EC establishing a first list of inductive occupational limit values.
		Indicative		
		TWA	1 ppm 2 mg/m3	UK. EH40 WEL- Workplace Exposure Limits

		Indicative		
		STEL	5 ppm 8 mg/m3	UK. EH40 WEL- Workplace Exposure Limits

8.3 Exposure controls

Appropriate engineering controls
Handle the product following good laboratory and safety practice. Wash hands before and after handling the product, even with wearing gloves.

Personal Protective Equipment
Eye / face protection
Wear fitted safety goggles/ glasses when handling the product. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Skin protection
Wear gloves when handling the product. Gloves must be inspected before use for tears/ holes and proper glove removal technique to be employed, to avoid skin contact with the product. Dispose of used gloves as contaminated waste (See section 13), wash and dry hands. Gloves must satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection
Wear a laboratory coat or similar covering over clothing when handling the product.

Respiratory protection
Handle the product whilst using a fume cupboard / extraction hood.

Thermal hazards
No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid Colour: Clear
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	-30°C
Initial boiling point and boiling range	> 100°C – lit.
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available No data available
Vapour Density	No data available
Relative Density	No data available
Solubility in water	Soluble
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
No data available

10.5 Incompatible materials
Bases, Amines, Alkali metals, Metals, permanganates, e.g. potassium permanganate, Fluorine, metal acetylides, hexalithium disilicide.

10.6 Hazardous decomposition products
Other decomposition products - No data available

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Skin corrosion/irritation
No data available

Serious eye damage/irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP or EPA classification.
IARC: 3 – Group 3: Not classifiable as to its carcinogenicity to humans.

Reproductive toxicity
No data available

STOT-single exposure
Inhalation – May cause respiratory irritation.

STOT-repeated exposure
No data available

Aspiration hazard.
No data available

Potential Health Hazards

Inhalation	Harmful if inhaled. Material is destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion	Harmful if swallowed. Causes burns.
Skin	Harmful if absorbed through the skin. Causes skin burns.
Eyes	Causes burns to the eyes**.**

Signs and symptoms of exposure
Burning sensation, coughing, breathing problems, inflammation of larynx and bronchi. The product is destructive to the tissue of the mucous membranes and upper respiratory tract, eyes and skin.

Additional Information
RTECS: MW4025000

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
No data available

12.6. Other adverse effects
No data available

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Contact a licensed professional disposal company of waste chemical materials, to arrange collection and disposal of waste product.

Contaminated packaging
Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
ADR/RID: 1789 IMDG: 1789 IATA: 1789

14.2 UN Proper Shipping Name
ADR/RID: HYDROCHLORIC ACID
IMDG: HYDROCHLORIC ACID
IATA: Hydrochloric Acid

14.3 Transport hazard class(es)
ADR/RID: 8 IMDG: 8 IATA: 8

14.4 Packing group
ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards
ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 1.0
Date written: 10th February 2012
Date reviewed: 07 Mar 2017
Date reviewed: 16 Sep 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	**Sodium Acetate Solution (aq)**
Product Catalogue Name	**LT-NAOAC-01**
CAS Number	**127-09-3**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

The product does not need to be labelled in accordance with EC directives or respective national laws.

Signal Word: None

Hazard Statement(s)
None.

Precautionary Statement(s)
None.

2.3 Other hazard information:
None.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3. 1 Substances

Synonyms:	Sodium Acetate: Acetic acid sodium salt
Formula:	Sodium Acetate: $C_2H_3NaO_2$ Water: H_2O
Molecular Weight:	82.03g/mol

Component		Concentration
Name	Water	99%

CAS-No.	7732-18-5	
EC-No.	231-791-2	
2nd Name	Sodium Acetate	1%
CAS-No.	127-09-3	
EC-No.	204-823-8	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice
Consult a physician. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested
Rise mouth well with water. DO NOT give anything by mouth if person is unconscious. Consult a physician.

If skin is exposed
Wash area well with soap and water. Consult a physician.

If eyes are exposed
Rinse well with water/ eye wash for at least 15 minutes, remove contact lenses if present and continue rinsing. Consult a physician.

If inhaled
Move effected person to a source of fresh air / ventilation. If not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed
Abdominal pain, Nausea, Vomiting.

4.3 Indication of immediate medical attention and special treatment needed
No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Use a media of fire extinguisher that is suitable for the surrounds of the fire. Water spray, alcohol resistant foam, dry chemical or carbon dioxide are all compatible with the product for use as a fire extinguisher.

5.2 Special hazards arising from the substance or mixture
No data available.

5.3 Advice for firefighters
If necessary fire fighters are to wear self-breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
User to wear PPE (Personal protective clothing). Avoid contact with eyes and skin. Ensure adequate ventilation.

6.6 Environmental Precautions
Do not let the product enter the drainage system.

6.7 Methods and material for containment and cleaning up

Contain the spillage by using spill mats or an inert substance such as vermiculite. Collect the waste material and store in a suitable container with a lid. Arrange for the waste material to be collected and disposed of.

6.4 Reference to other sections
For more information on disposal see Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Wear PPE (Personal protective clothing) when handling the product.

7.2 Conditions for safe storage, including any incompatibilities
Keep refrigerated, between 2-8°C. Keep the container upright and tightly sealed once opened.

7.3 Specific end uses
No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
This product contains no substances with any occupational exposure limits.

8.4 Exposure controls

Appropriate engineering controls
Wear PPE, and wash hands before and after handling the product, even with gloves, avoid contact with skin. Handle the product in accordance with good laboratory and safety practice.

Personal Protective Equipment

Eye / face protection
Use safety glasses with side-shields conforming to EN 166. Equipment for eye protection should be tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Skin protection
Wear gloves when handling the product. Gloves should be inspected prior to use for tares and holes and proper glove removal technique should be used, to avoid the outer surface of the glove touching the skin. Dispose of gloves as contaminated solid waste, see section 13. Wash and dry hands.
Gloves should satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection
Wear a laboratory coat or similar covering over outside clothing.

Respiratory protection
No data available.

Thermal hazards
No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid

	Colour: Colourless
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	0.0°C
Initial boiling point and boiling range	100°C
Flash Point	Not applicable
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Vapour Density	No data available
Relative Density	1.528 g/cm^3
Solubility in water	Completely miscible
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available.

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
Exposure to heat.

10.5 Incompatible materials
Strong oxidizing materials.

10.6 Hazardous decomposition products
Other decomposition products – No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available.

Skin corrosion/irritation
No data available

Serious eye damage/irritation
No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity
No data available

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available

STOT-single exposure
No data available

STOT-repeated exposure
No data available

Aspiration hazard.
No data available

Potential Health Hazards

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	Causes eye irritation.

Signs and symptoms of exposure
Abdominal pain, nausea, vomiting.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
No data available

12.6. Other adverse effects
No data available

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Contact a licensed and professional waste disposal company, to arrange collection and disposal of solid and liquid waste. The product can be dissolved or mixed with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Disposed of as unused product.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
ADR/RID: - IMDG: - IATA: -

14.2 UN Proper Shipping Name
ADR/RID: Not dangerous goods
IMDG: Not dangerous goods
IATA: Not dangerous goods

14.3 Transport hazard class(es)
ADR/RID: - IMDG: - IATA: -

14.4 Packing group
ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards
ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 4.0
Date reviewed: 17 June 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	**Sodium Acetate / Boric Acid / Methanol Solution**
Product Catalogue Name	**LT-NBM-01**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
According to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Boric Acid -	see section 3
Methanol -	Flammable liquids (Category 2) Acute toxicity, Inhalation (Category 3) Acute toxicity, Dermal (Category 3) Acute toxicity, Oral (Category 3) Specific target organ toxicity – single exposure (Category 1)
Sodium Acetate –	Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

Signal Word: Danger

Hazard Statement(s)

Boric acid:		see section 3
Methanol –	H225	Highly flammable liquid and vapour.
	H301	Toxic if swallowed.
	H311	Toxic in contact with skin.
	H331	Toxic if inhaled.
	H370	Causes damage to organs.

Precautionary Statement(s)

Boric Acid –	P308+P313	IF exposed or concerned: Get medical advice/attention.
Methanol – other	P210	Keep away from heat, hot surfaces, sparks, open flames and ignition sources. No smoking.
	P280	Wear protective gloves/ protective clothing.

P301 + P310 + P330 IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 + P312 IF ON SKIN: Wash with plenty of water. Call a POISON CENTER/doctor if you feel unwell.
P304 + P340 + P311 IF INHALED: Remove person to fresh air and keep

2.3 Other hazard information:
None.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3. 1 Substances

Synonyms: Sodium Acetate: Acetic acidsodium salt
Methanol: Methyl alcohol

Formula: Sodium Acetate: $C_2H_3NaO_2$
Boric Acid: H_3BO_3
Methanol: CH_4O

Molecular Weight: Sodium Acetate: 82.03 g/mol
Boric Acid: 61.83 g/mol
Methanol: 32.04 g/mol

Component		Concentration	Classification
Name	Sodium Acetate	4%	Not a hazardous substance according to Regulation (EC) No. 1272/2008
CAS-No.	127-09-3		
EC-No.	204-823-8		
2nd Name	Boric Acid	2%	Reproduction 1B; H360FD: when C ≥ 5,5.% which does not apply here Hazard Statement: H360FD May damage fertility or the unborn child when C<5% which does not apply here
CAS-No.	10043-35-3		
EC-No.	233-139-2		
Index-No.	005-007-00-2		
Boric acid Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)			
3rd Name	Methanol	94%	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301, H331, H311, H370 Concentration limits: >= 10 %: STOT SE 1, H370; 3 - < 10 %: STOT SE 2, H371;
CAS-No.	67-56-1		
EC-No.	200-659-6		
Index-No.	603-001-00X		

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice
Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested
DO NOT induce vomiting. Rinse mouth out well with water, never give anything by mouth if the person is unconscious.

If skin is exposed
Wash the area well with plenty of soap and water.

If eyes are exposed
Rinse thoroughly for at 15 minutes with water or eye wash solution. If present and able to, remove contact lenses and continue rinsing.

If inhaled
Move effected person to a source of fresh air, if not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed
Abdominal pain, Nausea, Vomiting, dizziness, weakness, confusion, drowsiness and unconsciousness.

4.3 Indication of immediate medical attention and special treatment needed
No data available.

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Select an extinguishing media appropriate to surrounding area; compatible media for this product are water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon dioxides, Borane/boron oxides, Sodium oxides.

5.3 Advice for firefighters
Wear self-contained breathing equipment if necessary. Use water spray to cool unopened containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear PPE (Personal Protective Equipment). Avoid breathing in vapours, mist or gas by having adequate ventilation, remove any unnecessary staff from the area. Remove any sources of ignition.

6.8 Environmental Precautions
If safe to do so, prevent further leakage/ spillage and DO NOT let the product enter the drainage system.

6.9 Methods and material for containment and cleaning up
Use a spillage mat, vermiculite or similar inert material to contain and soak up the spillage. Collect the contaminated material and store in a suitable contain for transportation and disposal.

6.4 Reference to other sections
See Section 13 for more information on disposal.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin, eyes and inhalation of vapour/ mist. Keep away from any sources of ignition and make sure that there is no build-up of electrostatic charge.

7.2 Conditions for safe storage, including any incompatibilities
Store at 2-8°C, in a well-ventilated, spark free environment. Keep the container tightly sealed once opened and up right to prevent any spills.

7.3 Specific end uses
No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	STEL	250 ppm 333 mg/m3	UK. EH40 WEL- Workplace Exposure Limits.
	Remarks	Can be absorbed through skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity.		
		TWA	200 ppm 266 mg/m3	UK. EH40 WEL- Workplace Exposure Limits.
		Can be absorbed through skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity.		
		TWA	200 ppm 260 mg/m3	Europe. Indicative occupational exposure limits values.
		Identifies the possibility of significant uptake through the skin. Indicative.		

The other components in the mixture have no occupational exposure limit values.

8.5 Exposure controls

Appropriate engineering controls
Wear PPE (Personal Protective Equipment), and wash hands before and after handling the product, avoid contact with skin and eyes.

Personal Protective Equipment
Eye / face protection
Wear Safety goggles/glasses with side-shields. These must conform to government standards such as NIOSH (US) or EN166 (EU).

Skin protection
Handle the product wearing gloves. These must be checked before use for tares/ holes. For removal of used gloves, the proper glove removal technique must be employed, to avoid contact with the outside of the glove with skin. Dispose of gloves as solid contaminated waste, wash and dry hands before and after handling the product.
The gloves used must satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection
Handle the product wearing a laboratory coat or a similar covering over the outside of their clothing.

Respiratory protection
Handle the product under a fume hood or extractor unit. If respiratory protection is required use equipment that is approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Thermal hazards
No data available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid Colour: Colourless
Odour	Pungent
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	-98°C
Initial boiling point and boiling range	64.7°C
Flash Point	9.7°C – closed Cup
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	Upper explosion limit: 36% (V) Lower explosion limit: 6% (V)
Vapour Pressure	130.3 hPa at 20.0°C 546.6 hPa at 50.0°C
Vapour Density	No data available
Relative Density	0.791 g/mL at 25°C
Solubility in water and solvents	Completely miscible
Partition coefficient	log Pow:-0.77
Auto ignition temperature	455.0°C at 1,013 hPa
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Strong Oxidizing agents, Acid chlorides, Acid anhydrides, Alkali metals, Reducing agents, Acids, Potassium.

10.6 Hazardous decomposition products
Other decomposition products – No data available.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Methanol:	LD50 Oral – Rat -5,628 mg/kg LD50 – Inhalation – Rat – 4h – 64000ppm

	LD50 Inhalation – Rat – 4h – 87.6mg/l
	LD50 Dermal – Rabbit – 15,800mg/kg
Boric Acid:	LD50 Oral – Rat – 2,660mg/kg
Sodium Acetate:	LD50 Oral – Rat – 3,530 mg/kg

Skin corrosion/irritation

Methanol:	Skin – Rabbit – Irritating to the skin – 24h
Sodium Acetate:	Skin – Rabbit – Mild skin irritation – 24h

Serious eye damage/irritation

Methanol:	Skin – Rabbit – Irritating to the eye – 24h
Sodium Acetate:	Eyes – Rabbit – Mild eye irritation

Respiratory or skin sensitisation

Methanol:	Guinea Pig – OECD Test guideline 406 – Does not cause skin sensitization.

Germ cell mutagenicity

Methanol:	Genotoxicity in vitro – Non-mammalian – Other cell types – negative
	Genotoxicity in vivo – Mouse – male and female – Intraperitoneal – negative

Carcinogenicity

IARC: No components of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity

Boric Acid:	Fetotoxicity, Presumed human reproductive toxicant

STOT-single exposure

Methanol:	Causes damage to organs.

STOT-repeated exposure

No data available.

Aspiration hazard.

No data available

Potential Health Hazards

Inhalation	Toxic if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Toxic if absorbed through skin. Causes skin irritation.
Eyes	Causes serious eye irritation.

Signs and symptoms of exposure

Abdominal pain, Nausea, Vomiting, dizziness, weakness, confusion, drowsiness and unconsciousness.

Additional Information

Methanol:	Repeated dose toxicity – Monkey – Gavage – 72h – Lowest observed adverse effect level – 2,340mg/kg
RTECS: PC1400000	
Boric Acid:	RTECS: ED4550000
Sodium Acetate:	RTECS: AJ4300010

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity

Methanol

Toxicity to fish: mortality	LD50 – Oncrohynchus mykiss (Rainbow trout) – 19,000.00mg/l – 96h
	LD50 – Lepomis macrochirus (Bluegill) – 15,400mg/l – 96h
Toxicity to daphnia and other aquatic invertebrates	EC50 – Daphnia magna (Water flea) – 24,500.00mg/l – 48h EC100 – Daphnia magna (Water flea) – 10,000.00mg/l – 24h
Toxicity to algae	Growth inhibition EC50 – Scenedesmus capricornutum (Fresh water algae) – 22,000mg/l – 96h
Boric Acid	
Toxicity to fish:	LD50 – Ptychocheilus Lucius – 279mg/l – 96h LC0 – Lepomis macrochirus (Bluegill) - >1,021mg/l – 96h
Toxicity to daphnia and other aquatic invertebrates	LC50 – Daphnia magna (Water flea) – 53.2mg/l -21d EC50 – Daphnia magna (Water flea) – 133mg/l – 48h
Sodium Acetate	
Toxicity to fish:	LC50 – Pimephales promelas (Fathead minnow) – 13,330mg/l – 120h LC50 – Lepomis macrochirus (Bluegill) – 5,000mg/l – 24h
Toxicity to daphnia and other aquatic invertebrates	EC50 – Daphnia magna (Water flea) - >1,000mg/l – 48h

12.2 Persistence and degradability

Methanol	
Biodegradability:	aerobic – Exposure time 5d – Result: 72% - rapidly biodegradable
Sodium Acetate	
Biodegradability:	Result: 99% - Readily biodegradable.

12.3 Bioaccumulative potential

Methanol	
Bioaccumulation:	Cyprinus carpio (Carp) – 72d at 20°C – 5mg/l Bioconcentration factor (BCF): 1.0

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

No data available

12.6. Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Contact a professional, licensed chemical waste disposal company. Waste product can be burnt in a chemical incinerator fitted with an afterburner and scrubber. Be aware that this product is flammable.

Contaminated packaging

Dispose as chemical contaminated solid waste.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number

ADR/RID: 1230	IMDG: 1230	IATA: 1230

14.2 UN Proper Shipping Name

ADR/RID: METHANOL	IMDG: METHANOL	IATA: Methanol

14.3 Transport hazard class(es)

ADR/RID: 3 (6.1)	IMDG: 3 (6.1)	IATA: 3 (6.1)

14.4 Packing group

ADR/RID: II	IMDG: II	IATA: II

14.5 Environmental hazards

ADR/RID: No	IMDG Marine pollutant: No	IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 2.0
Date reviewed: 17 June 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name **2AA Dye**

Product Catalogue Name **LT-2AA-02**

CAS-No. **118-92-3**

Company: Ludger Ltd
Culham Science Centre
Abingdon
Oxfordshire
OX14 3EB
Telephone: 01865 408554
Emergency Telephone: 01865 408554
Email: info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]
Serious eye damage (Category 1)

2.2 Label elements

Signal Word: Danger

Hazard Statement(s)
H318 Causes serious eye damage.

Precautionary Statement(s)
P305+P351+P338+P31 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. Immediately call a POISON CENTER/doctor.

2.3 Other hazard information:
None

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3. 1 Substances
Synonyms: anthranilic acid
2-aminobenzoic acid
Formula: $C_7H_7NO_2$
Molecular weight: 137.14 g/mol

Component	Concentration	Classification

Name	2-AA Dye	100%	Eye Dam. 1; H318
CAS-No.	118-92-3		
EC-No.	204-287-5		

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures
General Advice
Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If ingested
Rinse mouth well with water. Never give anything by mouth if person has lost consciousness. Consult a physician.

In case of skin contact
Wash well with soap and water. Consult a physician.

If eyes are exposed
Rinse well with water/ eye wash solution for at least 15 minutes. Consult a physician. Show this safety data sheet to the physician/ first responder in attendance.

If inhaled
Move effected person(s) into fresh air. If not breathing, give artificial respiration. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
To the best of our knowledge, the chemical, physical and toxicological properties have not been thoroughly investigated.

4.3 Indication of immediate medical attention and special treatment needed
No data available

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Use water spray, alcohol resistant foam, and dry chemical or carbon dioxide extinguishers.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, nitrogen oxides (NOx).

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear personal protective clothing when handling the chemical. Avoid dust formation. Avoid breathing in vapours, mist, dust or gas when clearing the chemical, work in a well ventilated area.

6.10 Environmental Precautions
Prevent any further leaking/ spillage if possible. Do not let the chemical enter the drainage system and discharge into the environment must be avoided.

6.11 Methods and material for containment and cleaning up
Gently sweep up the chemical, do not create dust, and put into a suitable container with a lid. Seal the container and arrange disposal.

6.4 Reference to other sections
See section 13 for information on disposal of the chemical.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes and the formation of dust and aerosols. Provide appropriate exhaust ventilation when handling the chemical and if dust can be formed.

7.2 Conditions for safe storage, including any incompatibilities
Keep the container in a dry, cool and well ventilated place.

7.3 Specific end uses
No data available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Contains no substances with occupational exposure limit values.

8.6 Exposure controls
Appropriate engineering controls
General advice is to always wear PPE when handling the chemical, in accordance with good laboratory practice. Wash hands after the removal of gloves.

Personal Protective Equipment
Eye / face protection
Safety glasses with side shields conforming to UN166. To have available equipment tested and approved under appropriate government standards such as NIOSH(US) or EN 166 (EU).

Skin protection
Handle with gloves. Following good laboratory practice the gloves should be checked for tears before use and proper glove removal technique to should be used when removing them. Dispose of used gloves as contaminated chemical waste. Wash and dry hands.
Gloves should be of the standard to satisfy the specifications of EU directive 89/686/EEC and the standard EN 374 derived from it.

Body Protection
Laboratory coat or a similar covering of the operators clothing.

Respiratory protection
If under extraction none is required.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Solid
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range: 144-148°C – lit.
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available

Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water and solvents (mg/l)	No data available
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
No data available

10.5 Incompatible materials
Strong oxidising agents.

10.6 Hazardous decomposition products
Other decomposition products – No data available

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral – rat – 5,410 mg/kg
Remarks: Behavioural: Somnolence (general depressed activity), excitement and ataxia.
LC50 Inhalation – rat – 4h - >5.3mg/L

Skin corrosion/irritation
Skin – rabbit – No skin irritation.

Serious eye damage/irritation
Eyes – rabbit – Moderate eye irritation.

Respiratory or skin sensitisation
No data available.

Germ cell mutagenicity
Genotoxicity in vitro – Not mutagenic in Ames test.
Histidine reversion (Ames)

Genotoxicity in vitro – Human – lymphocyte.
Mutation in mammalian somatic cells.

Genotoxicity in vivo – mouse – Intraperitioneal.
Sister chromatid exchange.

Carcinogenicity
Carcinogenicity – rat – Oral
Tumorigenic: Equivocal Tumorigenic agent by RTECS criteria. Kidney, Ureter, Bladder: Tumors

Carcinogenicity – mouse – Subcutaneous
Tumorigenic: Equivocal Tumorigenic agent by RTECS criteria. Lungs, Thorax or respiration: Bronchiogenic carcinoma. Liver: tumors.

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP or EPA classification.

IARC: 3 – Group 3: Not classifiable as to its carcinogenicity to humans (anthranilic acid)

Reproductive toxicity
Reproductive toxicity – mouse – Oral
Effects on fertility: Female fertility index (e.g. # females pregnant per #sperm positive females; # females pregnant per # females mated).

STOT-single exposure
No data available

STOT-repeated exposure
No data available

Aspiration hazard.
No data available

Potential Health Hazards

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through the skin. May cause skin irritation.
Eyes	Causes serious eye irritation.

Signs and symptoms of exposure
To the best of our knowledge, the chemical, physical and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: CB2450000

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 – Pimephales promelas (Fathead minnow) – 97 mg/l – 96h
Toxicity to daphnia and other aquatic invertebrates.	EC50 – Daphnia magna (Water flea) – 85.7 mg/l – 48h
Toxicity to algae	EC50 – Desmodesmus subspicatus (Green algae) – 31.3 mg/l – 72h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
No data available

12.6. Other adverse effects
Harmful to aquatic life.
No data available

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Waste can be burnt in a chemical incinerator equipped with an afterburner and scrubbers when first dissolved in a solvent, if impractical, seek a licensed disposal company for the disposal of waste materials.

Contaminated packaging
Treat packaging as unused product and dispose of with a licensed waste disposal company.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
ADR/RID: - IMDG: - IATA: -

14.2 UN Proper Shipping Name
ADR/RID: Not dangerous goods
IMDG: Not dangerous goods
IATA: Not dangerous goods

14.3 Transport hazard class (es)
ADR/RID: - IMDG: - IATA: -

14.4 Packing group
ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards
ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in

the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 5.0
Date reviewed: 17 June 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/ UNDERTAKING

Product Name	**sodium cyanoborohydride**
Product Catalogue Name	**LT-CYANOB-03, LT-CYANOB-05, LT-CYANOB-96**
CAS-No.	**25895-60-7**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxford OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Classification according to the Regulation (EC) No. 1272/2008 [EU-GHS/CLP]
Flammable solids (Category 1), H228
Acute toxicity, Oral (Category 2), H300
Acute toxicity, Inhalation (Category 2), H330
Acute toxicity, Dermal (Category 2), H310
Skin corrosion (Sub-category 1B), H314
Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

2.2 Label elements

Signal Word: Danger

Hazard Statement(s)
H228 Flammable solid.
H300 + H310 + H330 Fatal if swallowed, in contact with skin or if inhaled.
H314 Causes severe skin burns and eye damage.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statement(s)
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260 Do not breathe dust or mist
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P310 + P330 + P310 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/ doctor.

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Other hazard information
(EU)
EUH032 Contact with acids liberates very toxic gas.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3. 1 Substances
Synonyms: Sodium Cyanotrihydridoborate
Formula: CH3BNNa
Molecular weight 62.84 g/mol

Component	Concentration	Classification
Sodium Cyanotrihydroborate	100%	Flam. Sol. 1; Acute Tox. 2; Skin Corr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H228, H300, H330, H310, H314, H400, H410 M-Factor - Aquatic Acute: 10
CAS-No. 25895-60-7	-	
EC-No. 247-317-2		

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures
General Advice
Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the doctor/ first responder in attendance.

If Ingested
Do NOT induce vomiting. Rinse mouth well with water, unless person(s) is unconscious.

If skin is exposed
Remove contaminated clothing/shoes immediately. Wash affected area(s) with water and soap.

If eyes are exposed
Wash eye(s) with plenty of water for at least 15 minutes, if unsure seek medical advice.

If inhaled
Move into a source of fresh air, if not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed
Burning sensation, coughing, wheezing, laryngitis, shortness of breath, head ache, nausea, vomiting.
To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis.
Onset may be delayed two to four hours or longer.

4.3 Indication of immediate medical attention and special treatment needed
No Data available

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Nitrogen oxides, Hydrogen cyanide (Hydrocyanic acid), Borane/boron oxides.

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures.
Wear respiratory protection; gently sweep up to avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation, remove all sources of ignition. Evacuate personnel to a safe area; avoid breathing in dust/gas or mist.
For personal protection see section 8.

6.2 Environmental Precautions
Prevent further leakage or spillage if safe to do so. Do not let the chemical enter the drainage system and further discharge into the environment must be avoided.

6.3 Methods and material for containment and cleaning up
Contain the spill with matting if necessary and then collect using either an electrically protected vacuum cleaner or by damp brushing (not wet) and putting the collected waste into a secure dry container, do not flush with water. Dispose according to local regulations.

6.4 Reference to other sections
For disposal regulations see section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes, avoid formation of dust when handling. Provide appropriate exhaust ventilation in work areas where dust could be formed. Keep away from sources of ignition (No Smoking) and take measures to prevent the build up of electrostatic charge.

7.2 Conditions for safe storage, including any incompatibilities
Store in a cool place. Keep the container tightly closed in a dry and well-ventilated place.
Never allow the product to get into contact with water during storage as it is moisture sensitive. Do not store near acids. Handle and open the container with care. Hygroscopic. Handle when open under an inert gas.

7.3 Specific end uses
No data available

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Contains no substances with occupational exposure limit values.

Component	CAS No.	Value Form of exposure	Control parameters	Basis
sodium cyanoborohydride	25895-60-7	TWA	5 mg/m3	UK. EH40 WEL - Workplace Exposure Limits

	Remarks	Can be absorbed through skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity. Where no specific short-term exposure limit is listed, a figure three times the long-term exposure should be used

8.2 Exposure controls
Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/Face protection
Face shield and safety glasses to be worn following good laboratory practice. Eye protection should be tested and approved under appropriate government standards such as EN 166 (EU) or NIOSH (US).

Skin protection
Handle with gloves always following good laboratory practice. Gloves must be inspected before use and to be removed in proper glove removal technique (without touching the gloves outer surface) to avoid skin contact. Dispose of contaminated gloves after use as contaminated waste, in accordance with local regulations. Wash and dry hands.
Gloves to be within the specifications of EU directive 89/686/EEC and the standard EN 374 derived from it.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)
data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such

as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Form: Powder Colour: Beige
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range :> 242° C
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability (solids and gases)	The substance or mixture is a flammable solid with the subcategory 1.
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water and solvents	No data available
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
None available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
No data available

10.3 Possibility of hazardous reactions
Reacts violently with water.

10.4 Conditions to Avoid
Do not allow water to enter container because of violent reaction.
Heat, flames and sparks. Extremes of temperature and direct sunlight. Exposure to sunlight.

10.5 Incompatible materials
Do not store near acids, oxidising agents.

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx),
Hydrogen cyanide (hydrocyanic acid), Borane/boron oxides

Reacts with water to form: - Hydrogen gas
Other decomposition products - No data available
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Borane/boron oxides,
Sodium oxides

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects
Acute toxicity
No Data available

Skin corrosion/irritation
No data available

Serious eye damage/irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or conformed human carcinogen by IARC.

Reproductive toxicity
No data available

STOT (specific target organ toxicity) -single exposure
No data available

STOT (specific target organ toxicity) -repeated exposure
No data available

Aspiration hazard.
No data available

Potential health effects

Inhalation	May be fatal if inhaled. Material is extremely destructive to the tissue of the mucus membranes and upper respiratory tract.
Ingestion	May be fatal if swallowed. Causes burns.

Signs and symptoms of Exposure
Burning sensation, coughing, wheezing, laryngitis, shortness of breath, head ache, nausea, vomiting. To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed two to four hours or longer.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment
No data available

12.6. Other adverse effects
Very toxic to aquatic life with long lasting effects.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product or/and collected waste from spillage.
Burn in a chemical incinerator equipped with an afterburner and scrubber but take extra precautions when igniting as this material is highly flammable. Or to contact a licensed disposal company and arrange disposal, inform the company of the nature of the waste.

Contaminated packaging
Dispose of as the unused product, with a licensed disposal company.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
ADR/RID: 3179 IMDG: 3179 IATA: 3179

14.2 UN Proper Shipping Name
ADR/RID: FLAMMABLE SOILD, TOXIC, INORGANIC, N.O.S. (Sodium cyanotrihydroborate)
IMDG: FLAMMABLE SOILD, TOXIC, INORGANIC, N.O.S. (Sodium cyanotrihydroborate)
IATA: Flammable solid, toxic, inorganic, n.o.s. (Sodium cyanotrihydroborate)

14.3 Transport hazard class (es)
ADR/RID: 4.1 (6.1) IMDG: 4.1 (6.1) IATA: 4.1 (6.1)

14.4 Packing group
ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards
ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 1.1
Date written: 1st February 2012
Date reviewed: 02 Mar 2017
Date reviewed: 17th Sep 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	**Monosaccharide Standard mix**
Product Catalogue Name	**CM-MONO-MIX-10**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No. 1272/2008 [EU-GHS/CLP]

Not a hazardous substance according to Regulation (EC) No. 1272/2008

2.2 Label elements

The substance does not require any labelling in accordance with EC directives or respective national laws.

Signal Word: None required

Hazard Statement(s)
None required

Precautionary Statement(s)
None required

2.3 Other hazard information:
None required

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3. 1 Substances

Synonyms:	Glucosamine Hydrochloride:	D-Glucosamine hydrochloride, 2-amino-2-deoxy-D-glucose hydrochloric
	Galactosamine Hydrochloride:	D-galactosamine hydrochloride, 2-Amino-2-deoxy-D-galactose hydrochloride
	Galactose:	Galactose (alpha form), alpha-D-Galactopyranose
	Mannose:	D-(+)-Mannose, D-Mannose
	Fucose:	L-Fucose, L-Galactose,6-deoxy-
	Glucose:	Dextrose, Corn Sugar
Formula:	Glucosamine Hydrochloride:	$C_6H_{13}NO_5.HCl$
	Galactosamine Hydrochloride:	$C_6H_{13}NO_5.HCl$
	Galactose:	$C_6H_{12}O_6$
	Mannose:	$C_6H_{12}O_6$
	Fucose:	$C_6H_{12}O_5$
	Glucose:	$C_6H_{12}O_6$
Molecular Weight:	Glucosamine Hydrochloride:	215.63
	Galactosamine Hydrochloride:	215.64
	Galactose:	180.16
	Mannose:	180.16
	Fucose:	164.16
	Glucose:	180.16

Each vial of CM-MONO-MIX-10 contains 10nmols of each monosaccharide below.

Component		**Concentration**
Name	**Glucosamine Hydrochloride**	-
CAS-No.	66-84-2	
EC-No.	No data available	
Name	**Galactosamine Hydrochloride**	-
CAS-No.	1772-03-8	
EC-No.	No data available	
Name	**Galactose**	-
CAS-No.	3646-73-9	
EC-No.	No data available	
Name	**Mannose**	-
CAS-No.	3458-28-4	
EC-No.	No data available	
Name	**Fucose**	-
CAS-No.	2438-80-4	
EC-No.	No data available	
Name	**Glucose (Dextrose)**	-
CAS-No.	50-99-7	
EC-No.	No data available	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice
Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested
Rinse mouth well with water.

If skin is exposed
Wash the exposed area(s) well with plenty of soap and water.

If eyes are exposed
Flush the eye(s) with plenty of water or eye wash solution. If possible and present, remove contact lenses and continue rinsing.
If inhaled
Remove effected person(s) to a source of fresh air. If person is not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed
No data available

4.3 Indication of immediate medical attention and special treatment needed
No data available

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Water spray, dry chemical, carbon dioxide or foam, are appropriate media for extinguishing fire. Choose the most appropriate for the surrounding fire and materials.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Fire fighters to wear self-contained breathing apparatus, if deemed necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid breathing in any material. Wear laboratory gloves and protective clothing, such as a laboratory coat.

6.12 Environmental Precautions
No data available

6.13 Methods and material for containment and cleaning up
Collect the spillage with an absorbent material, such as paper towel, vermiculite, sand. Collect and store the spillage/waste material in an appropriately labelled container, arrange collection for disposal. Wash spillage area with water.

6.4 Reference to other sections
More information on disposal of the product is in Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin, inhalation of dust, mists and/or vapours associated with the material. Work with the material in a fume hood. Wear laboratory gloves, coat and glasses, in accordance with good laboratory practice and wash hands before and after handling the material.

7.2 Conditions for safe storage, including any incompatibilities
Store below - 18°C. The material is to be stored in original packaging or similar tightly closing packaging.

7.3 Specific end uses
No data available

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with work place control parameters
This product contains no substances with occupational exposure limit values.

8.7 Exposure controls

Appropriate engineering controls
User to wear personal protective equipment e.g. Laboratory gloves, glasses and coats. Wash hands and avoid contact with skin.

Personal Protective Equipment
Eye / face protection
Use Safety glasses or goggles, which have been tested and approved under appropriate government standards, such as NIOSH (US) or EN 166 (EU).

Skin protection
Handle with gloves. Wearer should check for holes/tares before use. Proper glove removal technique should be used, to avoid potential contact with skin. Gloves must satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Wash and dry hands after handling the material.

Body Protection
Wear laboratory coat or similar coverings.

Respiratory protection
Respiratory protection is not required. It is recommended where possible to handle the product under extraction, when used as part of a kit.

Thermal hazards
No data available

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Opaque crystalline powder
Odour	None
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	No data available
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water and solvents	Soluble
Partition coefficient	No data available

Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable when stored at recommended temperature. Store at -18°C.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
Avoid exposure to sources of heat and humidity.

10.5 Incompatible materials
Strong oxidising agents.

10.6 Hazardous decomposition products
No data available

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
Glucosamine Hydrochloride:
LD50 Oral - Mouse - 15,000 mg/kg
Remarks: Peripheral Nerve and Sensation:Sensory change involving peripheral nerve. (RTECS)

Galactosamine Hydrochloride:
LD50 Intraperitoneal - Mouse - 2,660 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity). Liver:Other changes.
Skin corrosion/

Glucose
LD50 Oral - Rat - 25,800 mg/kg
Remarks: Behavioral:Coma. Cyanosis Diarrhoea

No data available for the rest of monosaccharides

Skin corrosion/irritation
No data available

Serious eye damage/irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity

Galactosamine Hydrochloride:
Rat
Liver
Other mutation test systems
Rat
Other mutation test systems

Glucose
Mouse
lymphocyte
Mutation in mammalian somatic cells.

No data available for the rest of monossaccharides

Carcinogenicity
IARC: No component of this product presents at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen.

Reproductive toxicity
No data available

STOT-single exposure
No data available

STOT-repeated exposure
No data available
Aspiration hazard.
No data available

Potential Health Hazards

Inhalation	Possible allergic reaction to the material, reaction can be acute.
Ingestion	Possible allergic reaction to the material, reaction can be acute.
Skin	Possible allergic reaction to the material, reaction can be acute.
Eyes	Possible allergic reaction to the material, reaction can be acute.

Signs and symptoms of exposure
Possible hypersensitivity to material.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects
No data available

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Any waste substances should be disposed of by a licensed professional disposal company.
Contaminated packaging
Dispose of as a used product/material.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
ADR/RID: - IMDG: - IATA: -

14.2 UN Proper Shipping Name
ADR/RID: Not Dangerous Goods
IMDG: Not Dangerous Goods
IATA: Not Dangerous Goods

14.3 Transport hazard class(es)
ADR/RID: - IMDG: - IATA: -

14.4 Packing group
ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards
ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

Ludger

SAFETY DATA SHEET

Version: 1.2

Date written: 1st February 2012
Date reviewed: 12th June 2019
Date reviewed: 16th Sep 2020

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	**Xylose Standard**
Product Catalogue Name	**CM-XYL-100**
CAS-No.	**58-86-6**
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No. 1272/2008 [EU-GHS/CLP]

Not a hazardous substance according to Regulation (EC) No. 1272/2008

2.2 Label elements

The substance does not require any labelling in accordance with EC directives or respective national laws.

Signal Word: None required

Hazard Statement(s)
None required

Precautionary Statement(s)
None required

2.3 Other hazard information:
None required

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3. 1 Substances
Synonyms: Wood Sugar
Formula: $C_5H_{10}O_5$

Molecular Weight: 150.13

Component		Concentration
Name	**Xylose**	-
CAS-No.	58-86-6	
EC-No.	No data available	

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

General Advice
Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

If Ingested
Rinse mouth well with water.

If skin is exposed
Wash the exposed area(s) well with plenty of soap and water.

If eyes are exposed
Flush the eye(s) with plenty of water or eye wash solution. If possible and present, remove contact lenses and continue rinsing.

If inhaled
Remove effected person(s) to a source of fresh air. If person is not breathing give artificial respiration.

4.2 Most important symptoms and effects, both acute and delayed
No data available

4.3 Indication of immediate medical attention and special treatment needed
No data available

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Water spray, dry chemical, carbon dioxide or foam, are appropriate media for extinguishing fire. Choose the most appropriate for the surrounding fire and materials.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Fire fighters to wear self-contained breathing apparatus, if deemed necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid breathing in any material. Wear laboratory gloves and protective clothing, such as a laboratory coat.

6.14 Environmental Precautions
No data available

6.15 Methods and material for containment and cleaning up

Collect the spillage with an absorbent material, such as paper towel, vermiculite, sand. Collect and store the spillage/waste material in an appropriately labelled container, arrange collection for disposal. Wash spillage area with water.

6.4 Reference to other sections
More information on disposal of the product is in Section 13.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin, inhalation of dust, mists and/or vapours associated with the material. Work with the material in a fume hood. Wear laboratory gloves, coat and glasses, in accordance with good laboratory practice and wash hands before and after handling the material.

7.2 Conditions for safe storage, including any incompatibilities
Store below - 18°C. The material is to be stored in original packaging or similar tightly closing packaging.

7.3 Specific end uses
No data available

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with work place control parameters
This product contains no substances with occupational exposure limit values.

8.8 Exposure controls

Appropriate engineering controls
User to wear personal protective equipment e.g. Laboratory gloves, glasses and coats. Wash hands and avoid contact with skin.

Personal Protective Equipment
Eye / face protection
Use Safety glasses or goggles, which have been tested and approved under appropriate government standards, such as NIOSH (US) or EN 166 (EU).

Skin protection
Handle with gloves. Wearer should check for holes/tares before use. Proper glove removal technique should be used, to avoid potential contact with skin. Gloves must satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Wash and dry hands after handling the material.

Body Protection
Wear laboratory coat or similar coverings.

Respiratory protection
Respiratory protection is not required. It is recommended where possible to handle the product under extraction, when used as part of a kit.

Thermal hazards
No data available

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Opaque crystalline powder
Odour	None
Odour threshold	No data available
pH	4.5 - 6.0
Melting Point/ Freezing point	154-158°C
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	1.525g/cm3
Solubility in water and solvents	150.13g/l a 20° C
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

9.2 Other information
No data available

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable when stored at recommended temperature. Store at -18°C.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to Avoid
Avoid exposure to sources of moisture.

10.5 Incompatible materials
Strong oxidisers.

10.6 Hazardous decomposition products
No data available

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - > 2,200 mg/kg Remarks: (ECHA)

Skin corrosion/irritation
No data available

Serious eye damage/irritation
No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity
No data available

Carcinogenicity
IARC: No component of this product presents at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen.

Reproductive toxicity
No data available

STOT-single exposure
No data available
Acute oral toxicity - Possible damages:, Stomach/intestinal disorders, The substance has a laxative effect.

STOT-repeated exposure
No data available

Aspiration hazard.
No data available

Potential Health Hazards

Inhalation	Possible allergic reaction to the material.
Ingestion	Possible allergic reaction to the material.
Skin	Possible allergic reaction to the material.
Eyes	Possible allergic reaction to the material.

Signs and symptoms of exposure
Possible hypersensitivity to material.

Additional Information
Repeated dose toxicity - Rat - male and female - Oral - 104 Weeks - No observed adverse effect level - 2,214 mg/kg
(ECHA)
RTECS: Not available
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
Biodegradability aerobic - Exposure time 15 d
Result: 62.9 % - Readily biode

12.3 Bioaccumulative potential
No data available

12.4. Mobility in soil
No data available

12.5. Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6. Other adverse effects
No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Any waste substances should be disposed of by a licensed professional disposal company.
Contaminated packaging
Dispose of as a used product/material.

SECTION 14. TRANSPORT INFORMATION

14.1 UN Number
ADR/RID: - IMDG: - IATA: -

14.2 UN Proper Shipping Name
ADR/RID: Not Dangerous Goods
IMDG: Not Dangerous Goods
IATA: Not Dangerous Goods

14.3 Transport hazard class(es)
ADR/RID: - IMDG: - IATA: -

14.4 Packing group
ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards
ADR/RID: No IMDG Marine pollutant: No IATA: No

14.6 Special precautions for user
No data available

SECTION 15. REGULATORY INFORMATION

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and it component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.