# Scheme Description

## Chocolate and Cocoa (QCS) Proficiency Testing Scheme

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UKAS PROFICIENCY TESTING
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## RECORD OF ISSUE STATUS AND MODIFICATIONS

| Issue | Issue Date | Details | Authorised by |
|---|---|---|---|
| 22 | Apr 2022 | Added total dietary fibre as an analyte to sample 715 | L.Fielding |
| 23 | Sept 2022 | Update of samples 715 energy SDPA to 1%<br>Addition of lactose in sample 715 | L.Fielding |
| 24 | Sept 2023 | SPDA update for 715 water activity<br>710 and 714 updated to x2 vials and x1 matrix samples.<br>Microbiology samples updated to state Range cfu/g and 'Reporting units'. Cocoa added to scheme name. 713 updated to vial and matrix.<br>Added elements in 719 and changed the name of the sample to accommodate the changes. | L.Fielding<br>M.Bell<br>S. Xystouris |
| 25 | Dec 2023 | Samples CT-710 and CT-713 amended to be ready-to-test samples. Added additional CT-714-M sample as ready-to-test version. | N Mason |
| 26 | July 2024 | Addition of Nickel in sample 718 and 719.<br>Remove PT-CT-714 from SD. Added samples 721 and 722 in cocoa liquor matrix. All micro formats ready-to-test. | S. Xystouris<br>R. Connolly<br>T.Noblett |
| 27 | Jan 2025 | Update of SDPA for pH in 716<br>Update 720 range format and units. | R. Connolly<br>M.Bell |
| 28 | July 2025 | Sample 718 mass changed to 30g.<br>Clarified SDPA for sample 715.<br>Added new sample 723 for cocoa liquor<br>Format updated for sample 720.<br>Added new analytes to sample 723 for cocoa liquor<br>Clarified difference in samples A & B for pathogens | S. Bladowska<br>R. Connolly<br>S.Xystouris<br>M.Bell<br>S. Bladowska<br>T.Noblett |
| 29 | Nov 2025 | Added sample 724. | M.Bell |
| 30 | March 2026 | Changed format of sample CT722 from matrix only to vial plus matrix | T.Noblett |
| 31 | May 2026 | Changed accreditation status of sample CT721<br>New UKAS logo updated | T.Noblett |
| 32 | July 2026 | Added Microbiology samples CT725 and CT726.<br>Changed the name of 723 as a result of adding fineness as a new analyte | M.Bell<br>S. Xystouris<br>S. Bladowska |

Notes: Where this document has been translated, the English version shall remain the definitive version

## SCHEME INFORMATION

### Scheme Aims and Organisation

The primary aim of the Chocolate and Cocoa Proficiency Testing Scheme (QCS) is to enable laboratories performing the analysis of chocolate and related products to monitor their performance and compare it with that of their peers. QCS also aims to provide information to participants on technical issues and methodologies relating to testing of chocolate and related products.

The QCS scheme year operates from January to December. Further information about QCS, including test material availability, round despatch dates and reporting deadlines, are available on the current QCS application form.

### Test Materials

Details of test materials available in QCS are given in the 'Samples Available' section. The test parameters are continually reviewed to ensure they meet the needs of current laboratory testing and regulatory requirements.

Test material batches are tested for homogeneity for at least one test parameter where deemed appropriate. Details of homogeneity tests performed and results are given in the QCS Scheme Reports.

Some aspects of the scheme, such as test material production, homogeneity testing and stability assessment, can from time to time be subcontracted. When subcontracting occurs, it is placed with a competent subcontractor and LGC is responsible for this work. The planning of the scheme, the evaluation of performance and the authorisation of the final report will never be subcontracted.

### Statistical Analysis

Information on the statistics used in QCS can be found in the General Protocol and in the Scheme Report. Methods for determining assigned values and the values for SDPA used for individual samples are given in the 'Samples Available' section.

### Methods

Methods are listed PORTAL. Please select the most appropriate method from the list. If none of the methods are appropriate, then please report your method as 'Other' and record a brief description in the Comments Section in PORTAL.

### Results and Reports

QCS results are returned through our electronic reporting software, PORTAL, full instructions for which are provided by email.

QCS reports will be available on the website within 10 working days of round closure. Participants will be emailed a link to the report when it is available.

## DESCRIPTION OF ABBREVIATIONS USED

### Assigned Value (AV)

The assigned value may be derived in the following ways:

- From the robust mean (median) of participant results (RMean). This is the median of participant results after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. Generally, the assigned value will be set using results from all methods, unless the measurement is considered method-dependant, in which case the assigned value will be set by method and indicated in the report tables. For some analytes, where there is a recognised reference method for that type of measurement, this may be used as the assigned value for a particular analyte i.e. it would be applied to results obtained by any method.

  *Traceability: Assigned values which are derived from the participant results, or a sub-set of the results are not traceable to an international measurement standard. The uncertainty of assigned values derived in this way is estimated from the participant results, according to ISO 13528.*

- From a formulation value (Form). This denotes the use of an assigned value derived from sample preparation details, where known and exact quantities of analyte have been used to prepare the sample.

  *Traceability: Assigned values calculated from the formulation of the test sample are traceable, via an unbroken metrological traceability chain, to an international measurement standard. The measurement uncertainty of the assigned value is calculated using the contributions from each calibration in the traceability chain.*

- From a qualitative formulation (Qual Form). This applies to qualitative tests where the assigned value is simply based on the presence/absence of the analyte in the test material.

  *Traceability: Assigned values calculated from the qualitative formulation of the test sample are traceable to a certified reference standard or a microbiological reference strain.*

- From expert labs (Expert). The assigned value for the analyte is provided by an 'expert' laboratory.

  *Traceability: Assigned values provided by an 'expert' laboratory may be traceable to an international measurement standard, according to the laboratory and the method used. The uncertainty of measurement for an assigned value produced in this way will be provided by the laboratory undertaking the analysis. Details of traceability and the associated uncertainty will be provided in the report for the scheme/round.*

### Range

This indicates the concentration range at which the analyte may be present in the test material.

### SDPA

The SDPA represents the 'standard deviation for proficiency assessment' which is used to assess participant performance for the measurement of each analyte. This may be a fixed value (as stated), a percentage (%) of the assigned value or based on the robust standard deviation of the participant measurement results, either across all methods or by method depending on whether the measurement made is method dependent (see assigned value).

### Units
This indicates the units used for the assessment of data and in which participants should report their results. For some analytes in some schemes participants may have a choice of which units to report their results, however, the units stipulated in this scheme description are the default units to which any results reported using allowable alternative results will be converted to.

### DP
This indicates the number of decimal places to which participants should report their measurement results.

## SAMPLES AVAILABLE

## MICROBIOLOGY

**Sample PT-CT-710(A&B)** **Presence/absence of Salmonella in Chocolate**
Supplied as: 2 x 25g of grated chocolate
NOTE: Samples A & B represent two different samples

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Detection of *Salmonella* species | All | Qual Form | 0 to 1,000 | NA | Detected/Not detected 25g | NA |

**Sample PT-CT-713** **Enumeration of Indicator Organisms in Cocoa Powder**
Supplied as: 10g of cocoa powder

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Total aerobic mesophilic count | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Enterococci | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Enterobacteriaceae | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Coliforms | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of yeast Enumeration of mould | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |

**Sample PT-CT-714(A&B)** **Presence/absence of Salmonella in Cocoa Powder**
Supplied as: 2 x 25g of cocoa powder matrix
NOTE: Samples A & B represent two different samples

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Detection of *Salmonella* species | All | Qual Form | 0 to 1,000 | NA | Detected/Not detected 25g | NA |

**Sample PT-CT-717** **Enumeration of Indicator Organisms in Chocolate**
Supplied as: 10g of chocolate

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Total aerobic mesophilic count | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Enterococci | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Enterobacteriaceae | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Enumeration of Coliforms | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of yeast Enumeration of mould | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |

**Sample PT-CT-720** **Presence/absence of Salmonella in cocoa powder**
Supplied as: 1 x 10ml vial plus minimum 375g cocoa powder matrix

| Analyte | Method | AV | Range cfu/375g | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Detection of *Salmonella* species | All | Qual Form | 0 to 100 | NA | Detected/Not detected 375g | NA |

**Sample PT-CT-721** **Presence/absence of Salmonella in cocoa liquor**
Supplied as: 25g of cocoa liquor

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Detection of *Salmonella* species | All | Qual Form | 0 to 1,000 | NA | Detected/Not detected 25g | NA |

**Sample PT-CT-722*** **Enumeration of Indicator Organisms in cocoa liquor**
Supplied as: 1 x 10ml vial plus 10g cocoa liquor

| Analyte | Method | AV | Range cfu/g | SDPA | Reporting units | DP |
|---|---|---|---|---|---|---|
| Total aerobic mesophilic count | All | RMean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Enterococci | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Enterobacteriaceae | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of Coliforms | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |
| Enumeration of yeast Enumeration of mould | All | Rmean | 0 to 100,000 | $\log_{10}$ 0.35 | cfu/g | 0 |

**Sample PT-CT-724*** **Presence/absence of Salmonella in Chocolate**
Supplied as: 1 x 10ml vial plus minimum 375g Chocolate matrix

| Analyte | Method | AV | Range cfu/375g | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Detection of *Salmonella* species | All | Qual Form | 0 to 100 | NA | Detected/Not detected 375g | NA |

*Not included in LGC's UKAS Scope of Accreditation

**Sample PT-CT-725*** **Presence/absence of Salmonella in Cocoa liquor**
Supplied as: 1 x 10ml vial plus minimum 375g Cocoa liquor matrix

| Analyte | Method | AV | Range cfu/375g | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Detection of *Salmonella* species | All | Qual Form | 0 to 100 | NA | Detected/Not detected 375g | NA |

**Sample PT-CT-726*** **Presence/absence of Enterobacteriaceae in Cocoa Powder**
Supplied as: 2 x 10ml vial plus minimum 50g Cocoa Powder matrix

| Analyte | Method | AV | Range cfu/g | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Detection of Enterobacteriaceae | All | Qual Form | 0 to 100 | NA | Detected/Not detected 25g | NA |

*Not included in LGC's UKAS Scope of Accreditation

## CHEMISTRY

**Sample PT-CT-715** **Chocolate analysis**
Supplied as: 150g of chocolate

| Analyte | Method | AV | Range | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Water activity | Water activity meter | RMean | <0.2<br>0.2 to 0.8<br>>0.8 | 0.050<br>0.020<br>0.010 | $A_w$ | 3 |
| Moisture | All | RMean | All | 0.20 | % | 2 |
| Energy | All | RMean | All | 1% | kcal or kJ/100g | 0 |
| Fat | All | RMean | All | 0.40 | % | 2 |
| Saturates | All | RMean | All | Robust SD | % | 2 |
| Total nitrogen | All | RMean | All | 4% of AV | % | 2 |
| Carbohydrate | All | RMean | All | Robust SD | % | 2 |
| Total sugars | HPLC, HPAEC-PAD | RMean | All | 2.00 | % | 2 |
| Fructose | HPLC, HPAEC-PAD | RMean | All | Robust SD | % | 2 |
| Glucose | HPLC, HPAEC-PAC | RMean | All | Robust SD | % | 2 |
| Sucrose | HPLC, HPAEC-PAD | RMean | All | Robust SD | % | 2 |
| Lactose* | HPAEC-PAD, HPLC, Polarimeter, Other | RMean | All | Robust SD | as % lactose monohydrate | 2 |
| Salt (from sodium) | All | RMean | All | Robust SD | % (NaCl) | 2 |

| Analyte | Method | AV | Range | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Sodium | All | RMean | All | Robust SD | % | 3 |
| Butyric acid | GC, GC-MS, GC-FID | RMean | All | Robust SD | % | 2 |
| Theobromine | All | RMean | 0 to 0.5 >0.5 | 10% of AV Robust SD | % | 2 |
| Total dietary fibre | All | Rmean | All | 0.5 | % | 2 |

**Sample PT-CT-716** **Cocoa Powder analysis**
Supplied as: 150g of cocoa powder

| Analyte | Method | AV | Range | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| pH | All | RMean | All | 0.1 | - | 2 |
| Energy | All | RMean | All | Robust SD | kcal or kJ/100g | 0 |
| Fat | All | RMean | All | 0.40 | % | 2 |
| Saturates | All | RMean | All | Robust SD | % | 2 |
| Total nitrogen | All | RMean | All | 4% of AV | % | 2 |
| Carbohydrate | All | RMean | All | Robust SD | % | 2 |
| Total sugars | All | RMean | All | 2.00 | % | 2 |
| Fructose | All | RMean | All | Robust SD | % | 2 |
| Glucose | All | RMean | All | Robust SD | % | 2 |
| Sucrose | All | RMean | All | 20% | % | 2 |
| Salt (from sodium) | All | RMean | All | Robust SD | % (NaCl) | 2 |
| Sodium | All | RMean | All | Robust SD | % | 2 |
| Ash | All | RMean | All | 0.25 | % | 2 |
| Moisture | All | RMean | All | 0.30 | % | 2 |
| Theobromine | All | RMean | All | 0.20 | % | 2 |
| Caffeine | All | RMean | All | Robust SD | mg/100g | 2 |

**Sample PT-CT-718** **Elements in cocoa powder**
Supplied as: 30g cocoa powder

| Analyte | Method | Range | AV | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Total Arsenic* | All | All | RMean | Robust SD | mg/kg | 3 |
| Cadmium | All | All | RMean | Robust SD | mg/kg | 3 |
| Lead | All | All | RMean | Robust SD | mg/kg | 3 |
| Nickel* | All | All | RMean | Robust SD | mg/kg | 3 |

**Sample PT-CT-719*** **Elements in chocolate including Cd and Pb**
Supplied as: 20g dark chocolate

| Analyte | Method | Range | AV | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Cadmium | All | All | RMean | Robust SD | mg/kg | 3 |
| Lead | All | All | RMean | Robust SD | mg/kg | 3 |
| Iron | All | All | RMean | Robust SD | mg/kg | 2 |
| Calcium | All | All | RMean | Robust SD | mg/kg | 1 |
| Chromium | All | All | RMean | Robust SD | mg/kg | 3 |
| Nickel | All | All | RMean | Robust SD | mg/kg | 2 |

**Sample PT-CT-723*** **Cocoa liquor analysis**
Supplied as: 100g of cocoa liquor

| Analyte | Method | AV | Range | SDPA | Units | DP |
|---|---|---|---|---|---|---|
| Moisture | All | RMean | All | 0.20 | % | 2 |
| Free fatty acids | All | RMean | All | Robust SD | g/100g as oleic acid | 2 |
| Total Fat | All | RMean | All | 0.40 | % | 2 |
| Carbohydrate | All | RMean | All | Robust SD | % | 2 |
| Protein | All | RMean | All | Robust SD | % | 2 |
| Fineness | All | RMean | All | Robust SD | % | 2 |

*Not included in LGC's UKAS Scope of Accreditation