



# QBS

**Quality in Beverages Scheme**

## **Scheme Description**

### **LGC Standards Proficiency Testing**

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QBS Scheme Description

Record of issue status and modifications

ISSUE	ISSUE DATE	DETAILS	AUTHORISED BY
9	Mar 2013	Saccharin analyte expressed as free imide. Changes to the decimal place for ascorbic acid in samples 514 and 521, and units for sample 521. New analyte tin added to samples 518 and 519.	M Whetton
10	Sept 2013	Added information about microbiology methods. New analyte colour added to sample 517 and zinc analyte included in samples 518 and 519. Sample 522 trial added. Methods listed for samples 518 and 519.	T Noblett K. Baryla
11	Sept 2014	New analyte cyclamic acid added to sample 516B and 517B. Updates to the SDPAs and DPs. Additional matrix type and analytes for sample 510. Inclusion of subcontracting information in 'Test Materials' section. Minor standardisation amendments, e.g. logo and email addresses. Inclusion of traceability information in Appendix A.	K. Baryla
12	Sept 2015	Updated methods. Added new thermophilic acidophilic bacteria sample. Headspace removed from a parameters list for sample 515. Colour removed from a parameters list for sample 517A. New methods added for CO2 in sample 515. Removed Hard copy Report information. Patulin analyte expressed as a result corrected for recovery.	K.Carey K. Baryla A. McCarthy
13	Sept 2016	A new method added to 510 and 519. Vitamin E added to sample 521. Change to reporting format for sample 522. Updated methods. Sample 507 added for pathogen detection in fruit juice.	K. Baryla K.Carey
14	Feb 2017	Inclusion of Sample 523 Vitamin C at high range. The concentrations range included for samples 516A and 516B. Methods added to sample 521.	K. Baryla
15	June 2017	Methods list updated. Inclusion of Sample 524 Carbonated water.	K. Baryla
16	Sept 2017	Arsenic added to sample 518 and 519. SDPA updated for cyclamic acid in sample 516B and 517B. Methods list updated. Sample 523 Vitamin C at high range removed from the scheme. Samples 521 and 522 included in LGC's UKAS Scope of Accreditation. Sample name changed for 517A and 517B.	K. Baryla
17	June 2018	Addition of Phosphoric acid to sample 516a	F. Bury
18	Sept 2018	Updated method details to 'ALL' for microbiology samples and amended Methods paragraph.	T.Noblett

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

### **Scheme Aims and Organisation**

The primary aim of the Quality in Beverages Scheme (QBS) is to enable laboratories performing the analysis of fruit juices, soft and carbonated drinks, mineral water and other beverages to monitor their performance and compare it with that of their peers. QBS also aims to provide information to participants on technical issues and methodologies relating to testing of beverages.

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

### **Test Materials**

Details of test materials available in QBS are given in Appendix A. 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 QBS 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 QBS 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 Appendix A

### **Methods**

Methods are listed in 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**

QBS results are returned through our electronic reporting software, PORTAL, full instructions for which are provided by email. However, participants may request result submission forms on which to report and return results if they are unable to report through electronic means. This will incur an additional charge.

QBS 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.

## APPENDIX A - Description of abbreviations used

### Assigned Value (AV)

The assigned value may be derived in the following ways:

- From the robust mean (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 as illustrated 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 (Formulation). 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.

QBS Scheme Description

**Sample 500/01**

**Microorganisms in fruit juice (500) or soft drink (501)**

**Supplied as:**

1 x vial of lyophilised material  
1 x 10mL primary diluent  
1 x 90ml secondary diluent

Analyte	Method	AV	Range	SDPA	Units	DP
Total aerobic mesophilic count	ALL	RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu ml <sup>-1</sup>	0
Enumeration of yeast	ALL	RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu ml <sup>-1</sup>	0
Enumeration of mould		RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu ml <sup>-1</sup>	0
Enumeration of lactic acid bacteria	ALL	RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu ml <sup>-1</sup>	0
Detection of <i>Escherichia coli</i>	ALL	Qual Form	0 to 10,000	NA	NA	NA

**Sample 505**

**Microbiology Filtration Test (final volume 1L)**

**Supplied as:**

1x vial of lyophilised material (diluent not supplied)

Analyte	Method	AV	Range	SDPA	Units	DP
Total aerobic mesophilic count	ALL	RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu 100 ml <sup>-1</sup>	0
Enumeration of yeast	ALL	RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu 100 ml <sup>-1</sup>	0
Enumeration of mould		RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu 100 ml <sup>-1</sup>	0
Enumeration of lactic acid bacteria	ALL	RMean	0 to 100,000	log <sub>10</sub> 0.35	cfu 100 ml <sup>-1</sup>	0
Detection of <i>Escherichia coli</i>	ALL	Qual Form	0 to 10,000	NA	NA	NA

**Sample 506**

**Microbiology Filtration Test for Thermophilic Acidophilic Bacteria (final volume 1L)**

**Supplied as:**

1x vial of lyophilised material (diluent not supplied)

Analyte	Method	AV	Range	SDPA	Units	DP
Enumeration of thermophilic acidophilic bacteria	BAT agar	RMean	0 to 1000	log <sub>10</sub> 0.35	cfu 100 ml <sup>-1</sup>	0
Detection of guaiacol producing thermophilic acidophilic bacteria	BAT agar	Qual Form	0 to 1000	NA	cfu 100 ml <sup>-1</sup>	NA

QBS Scheme Description

**Sample 507**  
**Supplied as:**

**Pathogen detection in fruit juice (Salmonella species, Listeria monocytogenes, E.coli O157)**  
 1x vial of lyophilised material  
 1x 100ml simulated fruit juice

Analyte	Method	AV	Range	SDPA	Units	DP
Detection of <i>Salmonella</i> species	ALL	Qual Form	0 to 1000	NA	cfu 25 ml <sup>-1</sup>	NA
Detection of <i>Listeria monocytogenes</i>	ALL	Qual Form	0 to 1000	NA	cfu 25ml <sup>-1</sup>	NA
Detection of <i>Escherichia coli</i> O157	ALL	Qual Form	0 to 1000	NA	cfu 25ml <sup>-1</sup>	NA

**Sample 510**  
**Supplied as:**

**Fruit juice**  
 1 x 125ml fruit juice (orange, apple, grapefruit, cranberry) test material

Analyte	Method	Range	AV	SDPA	Units	DP
Brix	Density Meter Refractometer	All	RMean	0.06	° Brix	2
Acidity (as citric acid monohydrate)	Potentiometric Titration Colorimetric Titration	All	RMean	0.03	%w/w	3
pH	pH Meter	All	RMean	0.10	-	2
Fructose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Glucose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Calcium	AAS	All	RMean	10% of AV	mg/L	2
Phosphorus	Flame Photometry	All	RMean	10% of AV	mg/L	2
Potassium	GF-AAS	All	RMean	10% of AV	mg/L	2
Magnesium	ICP-MS	All	RMean	10% of AV	mg/L	2
Sodium	ICP-OES IC	All	RMean	10% of AV	mg/L	2

**Sample 514**  
**Supplied as:**

**Vitamin C**  
 1 x 100ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Ascorbic Acid (Vitamin C)	HPLC Titration Enzymatic Test Strip	0-300	RMean	5% of AV (min 5ppm)	mg/L	0

QBS Scheme Description

**Sample 515**  
**Supplied as:**

**Carbonated drinks**  
 2 x 330ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Brix	Density Meter Refractometer	All	RMean	0.06	° Brix	2
Acidity (as citric acid monohydrate)	Potentiometric Titration Colorimetric Titration	All	RMean	0.03	%w/v	3
pH	pH Meter	All	RMean	0.10	-	2
Carbon dioxide	Zahm & Nagel Mechanical shaker Carbo QC	All	RMean	0.20	vol/vol @ 20°C	2
Fructose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Glucose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Sucrose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1



QBS Scheme Description

**516 A**  
**Supplied as:**

**Carbonated drink (degassed)**  
 1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Benzoic Acid	HPLC Spectrophotometric Capillary electrophoresis UPLC NMR	0-400	Formulation	5% of AV (min 5ppm)	mg/L	1
Caffeine	HPLC Spectrophotometric LC-MS/MS UPLC	0-400	Formulation	5% of AV (min 5ppm)	mg/L	1
Free Sulfur dioxide	Distillation Potentiometric	0-115	RMean	Robust SD	mg/L	2
Sorbic Acid (as free acid)	HPLC UPLC Spectrophotometric NMR	0-400	RMean	5% of AV (min 5ppm)	mg/L	1
Total Sulfur dioxide	Distillation Volumetric Titration	0-115	Formulation	20% of AV	mg/L	2
Phosphoric Acid	Vanadomolybdate Method (UV/Visible) Ion Chromatography ICP-MS Other	350 - 550	Rmean	5% of AV	mg/L	1

QBS Scheme Description

**516 B**

**Carbonated drink (degassed)**

**Supplied as:**

1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Acesulfame K	HPLC Capillary electrophoresis UPLC LC-MS/MS	0-350	Formulation	5% of AV (min 5ppm)	mg/L	1
Aspartame	HPLC Capillary electrophoresis UPLC LC-MS/MS	0-600	Formulation	5% of AV (min 5ppm)	mg/L	1
Cyclamic acid (as free acid)	HPLC Ion chromatography LC-MS/MS	0-400	Formulation	5% of AV (min 5ppm)	mg/L	1
Saccharin (as free imide)	HPLC Capillary electrophoresis UPLC LC-MS/MS	0-80	Formulation	15% of AV	mg/L	1
Sucralose	HPLC UPLC LC-MS/MS	0-300	Formulation	5% of AV (min 5ppm)	mg/L	1

QBS Scheme Description

517 A

Soft drink (dilutable & ready to drink)

Supplied as:

1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Acidity (as citric acid monohydrate)	Potentiometric Titration Colorimetric Titration	All	RMean	0.03	%w/v	3
Benzoic Acid	HPLC Spectrophotometric Capillary electrophoresis UPLC NMR	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Brix	Density Meter Refractometer	All	RMean	0.06	° Brix	2
Caffeine	HPLC Spectrophotometric LC-MS/MS UPLC	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Free Sulfur dioxide	Distillation Potentiometric	All	RMean	Robust SD	mg/L	2
pH	pH Meter	All	RMean	0.10	-	2
Sorbic Acid (as free acid)	HPLC UPLC Spectrophotometric NMR	All	RMean	5% of AV (min 5ppm)	mg/L	1
Total Sulfur dioxide	Distillation Volumetric Potentiometric	All	RMean or Formulation*	20% of AV	mg/L	2

\* RMean is used when analyte is naturally present in the test material. Formulation is used when analyte is added to the test material during production process.

QBS Scheme Description

**517 B**

**Soft drink (dilutable & ready to drink)**

**Supplied as:**

1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Acesulfame K	HPLC Capillary electrophoresis UPLC LC-MS/MS	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Aspartame	HPLC Capillary electrophoresis UPLC LC-MS/MS	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Cyclamic acid (as free acid)	HPLC Ion chromatography LC-MS/MS	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Fructose	HPLC Enzymatic Ion chromatography Volumetric Capillary electrophoresis	All	RMean	5% of AV	g/L	1
Glucose	HPLC Enzymatic Ion chromatography Volumetric Capillary electrophoresis	All	RMean	5% of AV	g/L	1
Saccharin (as free imide)	HPLC Capillary electrophoresis UPLC LC-MS/MS	All	RMean or Formulation*	15% of AV	mg/L	1
Sucrose	HPLC Enzymatic Ion chromatography Volumetric Capillary	All	RMean	5% of AV	g/L	1

QBS Scheme Description

Analyte	Method	Range	AV	SDPA	Units	DP
	electrophoresis					

\* RMean is used when analyte is naturally present in the test material. Formulation is used when analyte is added to the test material during production process.

**518 Heavy Metals (fruit juice)**

**Supplied as:** 1 x 100ml fruit juice test material (type varies by round, see application form)

Analyte	Method	Range	AV	SDPA	Units	DP
Antimony	AAS Flame Photometry GF-AAS ICP-MS ICP-OES	All	RMean	15% of AV	µg/L	2
Arsenic		All	RMean	15% of AV	µg/L	2
Cadmium		All	RMean	15% of AV	µg/L	2
Iron		All	RMean	15% of AV	mg/L	2
Lead		All	RMean	15% of AV	µg/L	2
Tin		All	RMean	15% of AV	mg/L	2
Zinc		All	RMean	15% of AV	mg/L	2

**519 Heavy Metals & Minerals (soft drink)**

**Supplied as:** 1 x 100ml soft drink test material

Analyte	Method	Range	AV	SDPA	Units	DP
Antimony	AAS Flame Photometry GF-AAS ICP-MS ICP-OES IC	All	RMean	15% of AV	µg/L	2
Arsenic		All	RMean	15% of AV	µg/L	2
Cadmium		All	RMean	15% of AV	µg/L	2
Iron		All	RMean	15% of AV	mg/L	2
Lead		All	RMean	15% of AV	µg/L	2
Tin		All	RMean	15% of AV	mg/L	2
Zinc		All	RMean	15% of AV	mg/L	2
Calcium		All	RMean	10% of AV	mg/L	2
Phosphorus		All	RMean	10% of AV	mg/L	2
Potassium		All	RMean	10% of AV	mg/L	2
Magnesium		All	RMean	10% of AV	mg/L	2
Sodium		All	RMean	10% of AV	mg/L	2

QBS Scheme Description

**520** **Patulin (apple juice)**  
**Supplied as:** 1 x 60ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Patulin (corrected for recovery)	HPLC	All	RMean	Robust SD	µg/L	2

**521** **Vitamins (soft drink)**  
**Supplied as:** 1 x 250ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Nicotinamide (Vitamin B3)	HPLC	All	RMean	Robust SD	mg/L	2
Pantothenic acid (Vitamin B5)		All	RMean	Robust SD	mg/L	2
Pyridoxine (Vitamin B6)	LC-MS	All	RMean	Robust SD	mg/L	2
Cyanocobalamin (Vitamin B12)	LC-MS/MS	All	RMean	Robust SD	µg/L	2
Ascorbic acid (Vitamin C)	ELISA	All	RMean	Robust SD	mg/L	0
DL-α-Tocopherol (Vitamin E)		All	RMean	Robust SD	mg/L	2

**522** **Stevia (soft drink)**  
**Supplied as:** 1 x 125ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Total steviol glycosides (as steviol equivalents)	JECFA 2010 HPLC	All	RMean	Robust SD	mg/L	2
Rebaudioside A (as steviol equivalents)	USP-Food Chemicals Codex	All	RMean	Robust SD	mg/L	2

QBS Scheme Description

**Sample 524\***  
**Supplied as:**

**Carbonated water**  
 2 x 500ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Carbon dioxide	Zahm & Nagel Mechanical shaker Carbo QC	All	RMean	0.20	vol/vol @ 20°C	2
Conductivity (20°)	Conductivity meter	All	RMean	7.5%	µS/cm	2
pH	pH Meter	All	RMean	0.10	-	2
Dry residue (180°)	Gravimetric	All	RMean	10% of AV	mg/L	0
Calcium	AAS Flame Photometry GF-AAS ICP-MS ICP-OES IC	All	RMean	10% of AV	mg/L	1
Magnesium		All	RMean	10% of AV	mg/L	1
Potassium		All	RMean	10% of AV	mg/L	2
Sodium		All	RMean	10% of AV	mg/L	1
Bicarbonate		All	RMean	10% of AV	mgCa/L	0
Chloride		All	RMean	10% of AV	mg/L	1
Sulfate		All	RMean	10% of AV	mgSO <sub>4</sub> /L	1

\* **Not currently included in LGC's UKAS Scope of Accreditation**