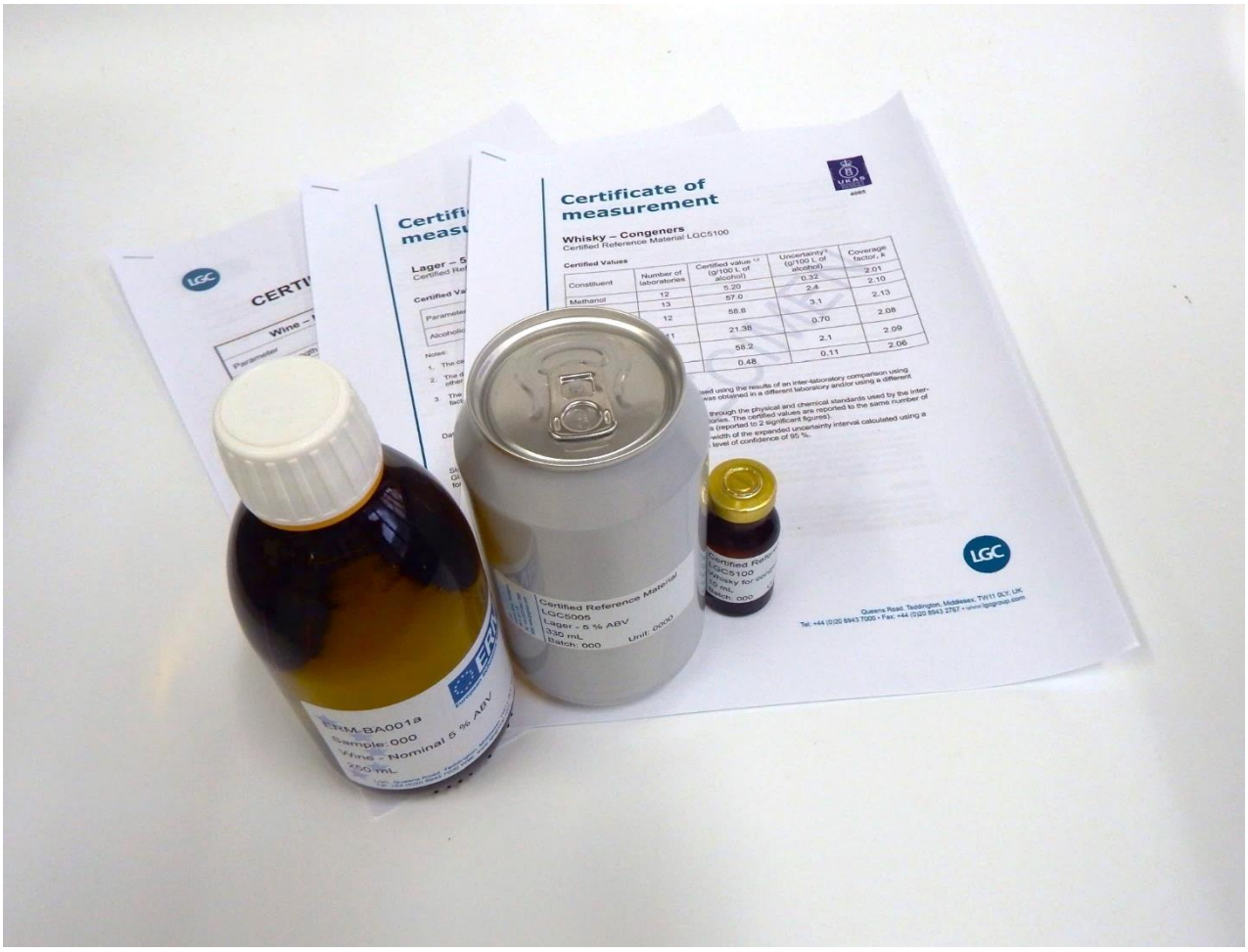
LGC NML

Reference Materials
Catalogue 2026

www.uknml.com



Our Branding

The National Measurement Laboratory (NML) Reference Materials are currently sold under two brands; ERM and LGC. LGC's certified reference materials were branded on release as ERM products between 2006 and 2017. ERM was a joint project between LGC, BAM (https://www.bam.de) and JRC (https://ec.europa.eu/jrc) which is no longer active. All materials released since summer 2017 have been branded as LGC products.

Our UKAS Accreditation

Many of our reference materials and methods of producing them are within our scope for United Kingdom Accreditation Service (UKAS) accreditation, either for reference material production (accredited to ISO 17034:2016) and/or for our calibration methods (accredited to ISO/IEC 17025:2017).

This accreditation provides independent evidence that the reference materials at the NML have been prepared according to best practice. Accredited reference materials display the National Accreditation Symbol alongside them. Questions regarding accreditation for specific reference materials can be sent to measurement@lgcgroup.com.

Disclaimer

The National Measurement Laboratory (NML) for chemical and bio-measurement, hosted at LGC, plays a leading role internationally to develop best practice and standardise measurements.

Our science supports manufacture and trade, protects consumers, furthers skills development and enhances quality of life.

Serving as the UK's Designated Institute for chemical and bio-measurement, we provide expert advice to government, industry, healthcare (NHS), academia and support the work of the Government Chemist.

The UK's National Measurement Laboratory (for chemical and bio-measurement) at LGC produces reference materials (RMs) used worldwide. Our portfolio of 120 RMs includes reference materials, certified reference materials, and quality control materials.

Reference Material

As defined in ISO Guide 30:2015, 2.1.1

"Material, sufficiently homogeneous and stable with respect to one or more specified properties, which has been established to be fit for its intended use in a measurement process"

Certified Reference Material

As defined in ISO Guide 30:2015, 2. 1. 2

"A reference material characterized by a metrologically valid procedure for one or more specified properties, accompanied by a reference material certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability"

Quality Control Material

A material which can be used for demonstrating that a measurement system is under statistical control, performs as expected and provides reliable results; it is a material where the trueness of the measurement result is not critical as long as it is consistent

Department for Science, Innovation & Technology

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Clinical Purity Materials

ERM-AC021	Sirolimus
ERM-AC022	Tacrolimus
ERM-AC200	Digoxin

Forensic Ethanol Materials

LGC5409	Aqueous ethanol - 20 mg/100 mL
ERM-AC510	Aqueous ethanol - 50 mg/100 mL
ERM-AC511	Aqueous ethanol - 67 mg/100 mL
LGC5401	Aqueous ethanol - 80 mg/100 mL
LGC5402	Aqueous ethanol - 107 mg/100 mL
LGC5403	Aqueous ethanol - 200 mg/100 mL

Environment

Ash Materials

LGC6180	Pulverised fuel ash

Carbon Isotope Ratio Materials

ERM-AE672	Glycine - absolute carbon isotope ratio
LGC171-KT	Glycine solutions - absolute carbon isotope ratio

Drinking Water Materials

LGC6012	Hard drinking water - anions
LGC6013	Soft drinking water - anions
LGC6026	Hard drinking water - metals
LGC6027	Soft drinking water - metals
LGC6028	Hard drinking water - low level metals

Environment Purity Materials

ERM-AC820	3,3',4,4'-tetrachlorobiphenyl (PCB77)
ERM-AC821	3,3',4,4',5-pentachlorobiphenyl (PCB 126)
ERM-AC822	3,3',4,4',5,5'-hexachlorobiphenyl (PCB 169)
ERM-AC823	Polychlorinated biphenyls in 2,2,4 -Trimethylpentane (iso-octane)
LGC1801	Nicotine

Fresh Water Materials

LGC6020	River water - anions
LGC6025	River water - anions

Environment

Miscellaneous Water Materials

LGC6016	Estuarine water - metals
LGC6177	Landfill leachate - metals

Sediment Materials

LGC6187	River sediment - metals
LGC6188	River sediment - PAHs
LGC6189	River sediment - extractable metals

Sewage Sludge Materials

ERM-CC136	Sewage sludge - metals
LGC6181	Sewage sludge - extractable metals
LGC6182	Sewage sludge - PAHs
LGC6184	Sewage sludge - PCBs

Soil Materials

ERM-CC135	Contaminated brickworks soil - metals
LGC6115	Contaminated soil PCBs and PAHs
LGC6145	Contaminated clay loam soil - extractable metal, PAHs and inorganics
LGCQC3013	Loamy sand soil 2 - total petroleum hydrocarbons

Food & Beverage

Alcohol Solutions

LGC5404	Reference spirit - 5 % ABV
LGC5405	Reference spirit - 15% ABV
LGC5406	Reference spirit - 40 % ABV
LGC5412	Reference spirit - 40 % ABV
LGC5407	Reference spirit - 70 % ABV
ERM-BA001	Wine - nominal 5 % ABV
ERM-BA002	Wine - nominal 10 % ABV
ERM-BA003	Wine - nominal 15 % ABV
LGC5000	Brandy - 40 % ABV
LGC5005	Lager - 5 % ABV
LGC5014	Beer - 3.7% ABV
LGC5100	Whisky - congeners

Drink Products

ERM-BD011	Orange juice – 1 °Brix
LGC7113	Fruit squash – total SO_2

Food & Beverage Purity Materials

ERM-AC301	Butylated hydroxyanisole
ERM-AC303	Leucomalachite green
LGC1110	*pp'*-DDE
LGC1205	Malathion
LGC7300	Butylated hydroxytoluene
LGC7302	Saccharin
LGC7305	Potassium sorbate
LGC7330	Selenomethionine

Food & Beverage

Fruit and Vegetable Products

LGC7114	Kale powder - nitrate
LGC7161	Tomato paste - metals
LGC7162	Strawberry leaves

Animal Feeding Stuffs

LGC7173	Poultry feed – proximates and elements

Processed Food Products

ERM-BC210	Wheat flour - selenium and selenomethionine
ERM-BD016	Sugar confectionery - sugars
ERM-BD213	Yeast – total chromium and Cr(III)
LGC7016	Chocolate confectionery
LGC7103	Sweet digestive biscuit
LGCQC101-KT	Chocolate mousse dessert - peanut protein
LGCQC1020	Peanut flour
LGC7155	Processed meat - proximates, chloride, hydroxyproline & metals
LGC7421	Allergen reference material - skimmed milk powder
LGC7422	Allergen reference material - egg white powder
LGC7424	Allergen reference material - almond powder
LGC7425	Allergen reference material - hazelnut powder – partially defatted
LGC7426	Allergen reference material - walnut powder – partially defatted
LGC746-KT	Allergen kit – milk, egg, almond, hazelnut and walnut

Industrial

Enthalpy of Fusion Materials

LGC2601	Indium
LGC2603	Naphthalene
LGC2604	Benzil
LGC2605	Acetanilide
LGC2606	Benzoic acid
LGC2607	Diphenylacetic acid
LGC2608	Lead
LGC2609	Tin
LGC2610	Biphenyl
LGC2611	Zinc
LGC2612	Aluminium
LGC2613	Phenyl salicylate

Flash Point Materials

ERM-FC032	*n*-Nonane
ERM-FC033	*n*-Decane

Gypsum Materials

LGC2700	Natural gypsum
LGC2701	Natural anhydrite
LGC2702	Blended gypsum
LGC2703	Desulfurised gypsum

Melting Point Materials

ERM-FC021	Carbazole
ERM-FC023	*p*-Anisic acid
ERM-FC024	Diphenylacetic acid
LGC2405	Benzoic acid
LGC2408	2-Chloroanthraquinone
ERM-FC026	Acetanilide
ERM-FC027	Benzil
ERM-FC028	Naphthalene
ERM-FC029	4-Nitrotoluene
ERM-FC030	Phenyl salicylate

Miscellaneous materials

ERM-AC316	Solvent yellow 124
ERM-EF212	Petrol - sulfur
ERM-DZ002	Electronic cigarette liquid - nicotine & water
LGCQC5050	Colloidal gold nanoparticle - nominal diameter 30 nm

Clinical

Blood and Serum Materials

Human blood - sirolimus ERM®- DA111

Batch: a
Unit size: 1 mL

The material was prepared by Analytical Services International Ltd (London, UK) by spiking blank pooled human blood with an acetonitrile solution of ERM®-AC021a (pure sirolimus) to achieve a nominal sirolimus concentration of approximately 10 µg/L.

The intended use of this material is for the calibration of instruments, the validation of new methods, and monitoring the performance of methods used in clinical laboratories to determine the sirolimus content of human blood samples. It can also be used in the training and evaluation of staff. This material is a primary measurement standard according to the definition given in ISO 15194.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Sirolimus	9.24 ± 0.52 µg/kg

Additional information:	
Sirolimus	9.73 ± 0.55 µg/L

Frozen human serum - digoxin, high level ERM®- DA200

Batch: a
Unit size: 1 mL

Human serum from donors was supplied by Scipac (Sittingbourne, UK), and prepared by Cardiff Bioanalytical Services Ltd (CBS), Cardiff, UK. The serum had been filtered to remove particulates below 0.2 µm. Digoxin in methanol was added to give a final target concentration near the upper decision level in serum digoxin monitoring (2.0 µg/L). The material was subjected to one freeze-thaw cycle and filtered through a 0.2 µm Pall filter to remove oxalates.

This material is intended for use in the validation of new methods, and monitoring the performance of methods, commonly used in clinical laboratories to determine the digoxin content of human serum samples. It can also be used in the training and evaluation of staff. The material is clinically relevant since it closely matches the upper decision level for digoxin monitoring.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Digoxin	2.08 ± 0.15 µg/kg

Additional information:			
Digoxin	2.74 ± 0.19 nmol/L	Digoxin	2.14 ± 0.15 µg/L

Frozen human serum - digoxin, low level ERM®- DA201

Batch: a
Unit size: 1 mL

Human serum from donors was supplied by Scipac (Sittingbourne, UK), and prepared by Cardiff Bioanalytical Services Ltd (CBS), Cardiff, UK. The serum had been filtered to remove particulates below 0.2 µm. Digoxin in methanol was added to give a final target concentration near the lower decision level in serum digoxin monitoring (0.8 µg/L). The material was subjected to one freeze-thaw cycle and filtered through a 0.2 µm Pall filter to remove oxalates.

UKAS REFERENCE MATERIALS
4005

This material is intended for use in the validation of new methods, and monitoring the performance of methods commonly used in clinical laboratories to determine the digoxin content of human serum samples. It can also be used in the training and evaluation of staff. The material is clinically relevant since it closely matches the lower decision level for digoxin monitoring.

Certified value:	
Digoxin	0.845 ± 0.050 µg/kg

Additional information:			
Digoxin	1.110 ± 0.065 nmol/L	Digoxin	0.868 ± 0.051 µg/L

Frozen human serum ERM®- DA250

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.

UKAS REFERENCE MATERIALS
4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine and electrolytes in human blood samples.

Certified values:			
Creatinine	39 ± 3 mg/kg	Magnesium	47 ± 3 mg/kg
Calcium	123 ± 5 mg/kg	Potassium	277 ± 14 mg/kg
Lithium	6.6 ± 0.4 mg/kg	Sodium	3370 ± 110 mg/kg

Calculated values:			
Creatinine	358 ± 21 µmol/L	Magnesium	2.0 ± 0.1 mmol/L
Calcium	3.2 ± 0.2 mmol/L	Potassium	7.3 ± 0.4 mmol/L
Lithium	1.0 ± 0.06 mmol/L	Sodium	151 ± 5 mmol/L

Frozen human serum ERM®- DA251

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine and electrolytes in human blood samples.

4005

Certified values:			
Creatinine	22 ± 2 mg/kg	Magnesium	19 ± 2 mg/kg
Calcium	71 ± 3 mg/kg	Potassium	136 ± 7 mg/kg
Lithium	4.5 ± 0.3 mg/kg	Sodium	2740 ± 80 mg/kg

Calculated values:			
Creatinine	197 ± 11 µmol/L	Magnesium	0.8 ± 0.08 mmol/L
Calcium	1.8 ± 0.1 mmol/L	Potassium	3.5 ± 0.2 mmol/L
Lithium	0.7 ± 0.04 mmol/L	Sodium	121 ± 4 mmol/L

Frozen human serum ERM®- DA252

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine in human blood samples.

4005

Certified value:	
Creatinine	3.1 ± 0.5 mg/kg

Calculated value:	
Creatinine	27.5 ± 4.3 µmol/L

Additional information:			
Calcium	58 mg/kg	Calcium	1.5 mmol/L
Lithium	1.3 mg/kg	Lithium	0.19 mmol/L
Magnesium	8.1 mg/kg	Magnesium	0.34 mmol/L
Potassium	67 mg/kg	Potassium	1.7 mmol/L
Sodium	2400 mg/kg	Sodium	106 mmol/L

Frozen human serum ERM®- DA253

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine in human blood samples.

4005

Certified value:	
Creatinine	50 ± 2 mg/kg

Calculated value:	
Creatinine	449 ± 16 µmol/L

Additional information:			
Calcium	96 mg/kg	Calcium	2.5 mmol/L
Lithium	8.4 mg/kg	Lithium	1.2 mmol/L
Magnesium	35 mg/kg	Magnesium	1.5 mmol/L
Potassium	238 mg/kg	Potassium	6.2 mmol/L
Sodium	3260 mg/kg	Sodium	145 mmol/L

Frozen human serum – testosterone, high level ERM®- DA345

Batch: a
Unit size: 0.8 mL

Time expired human blood serum from donors to the National Blood Transfusion Service, Bristol was prepared at the University Hospital in Wales using their standard method for the General Chemistry EQA (External Quality Assessment) samples for the WEQAS scheme. Female blood serum was used and testosterone in methanol added to bring the concentration within the normal range for male human serum. The material was screened to ensure it was negative for HIV and Hepatitis B and C, then mixed and sterile filtered to 0.2 µm. Gentamicin was added as a preservative.

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of testosterone in human blood samples.

4005

Certified value:	
Testosterone	5.39 ± 0.16 µg/kg

Calculated value:	
Testosterone	19.09 ± 0.56 nmol/L

Frozen human serum – testosterone, low level ERM®- DA346

Batch: a
Unit size: 0.8 mL

Time expired human blood serum from donors to the National Blood Transfusion Service, Bristol was prepared at the University Hospital in Wales using their standard method for the General Chemistry EQA (External Quality Assessment) samples for the WEQAS scheme. Female blood serum was used with a concentration within the normal range for female human serum. The material was screened to ensure it was negative for HIV and Hepatitis B and C, then mixed and sterile filtered to 0.2 µm. Gentamicin was added as a preservative.

4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of testosterone in human blood samples.

Certified value:	
Testosterone	0.25 ± 0.04 µg/kg

Calculated value:	
Testosterone	0.89 ± 0.12 nmol/L

Frozen human serum – Elements and Selenomethionine LGC8211

Batch: 001
Unit size: 1.1 mL

Human serum from a single donor was prepared from blood obtained at the Royal Surrey County Hospital (Guildford, UK). Five donations were taken, with a minimum of 13 weeks between each donation. The blood was allowed to clot at rom temperature, centrifuged, and the serum pipetted into an acid washed container which was then stored frozen at (-80 +40/-10) °C. Each batch of serum collected was added directly into the same bottle. The 'clean' serum was mixed thoroughly and then dispensed.

4005

This material is intended for use in the calibration of instruments and the validation and performance monitoring of methods used for the determination of calcium, copper, iron, magnesium, potassium, selenium, zinc and selenomethionine in human serum samples. It can also be used in the training and evaluation of staff.

Certified values:			
Copper	1130 ± 33 µg/kg	Selenomethionine	25.0 ± 1.6 µg/kg
Zinc	658 ± 33 µg/kg	Calcium	87.0 ± 2.2 mg/kg
Iron	515 ± 22 µg/kg	Magnesium	20.28 ± 0.58 mg/kg
Selenium	64.1 ± 3.0 µg/kg	Potassium	142.0 ± 3.7 mg/kg

Additional information:			
Copper	18.18 ± 0.53 µmol/L	Selenomethionine	0.1304 ± 0.0086 µmol/L
Zinc	10.30 ± 0.52 µmol/L	Calcium	2.220 ± 0.071 mmol/L
Iron	9.44 ± 0.41 µmol/L	Magnesium	0.853 ± 0.031 mmol/L
Selenium	0.830 ± 0.038 µmol/L	Potassium	3.71 ± 0.13 mmol/L

Human Blood – Tacrolimus (incurred) LGC8272

Batch: 001
Unit size: 1.2 mL

The material was prepared by Analytical Services International (St George's, University of London, UK) using pooled blood from patients who had been receiving tacrolimus for treatment. EDTA was added as an anticoagulant on collection of the samples. The collected material was mixed, filtered by sieving to remove any possible blood clots.

This material is intended for use in the calibration of instruments, the validation of new methods, and monitoring the performance of methods used in clinical laboratories to determine the tacrolimus content of human blood samples. It can also be used in the training and evaluation of staff.

This material is a secondary calibrator according to the definition given in ISO 15194:2009.

4005

Certified value:	
Tacrolimus	6.53 ± 0.43 µg/kg

Calculated value:	
Tacrolimus	6.86 ± 0.45 µg/L

Blood – hip replacement wear metals – Cr and Co LGC8276

Batch: 001
Unit size: 1.8 mL

The material was prepared by the UK's Trace Elements External Quality Assessment Scheme (TEQAS), (Guildford, UK) by adding the elements of interest to equine blood containing EDTA at a concentration of 1 mg/mL.

This material is intended for use in the calibration of instruments and the validation of new methods commonly used in clinical laboratories to determine the metal content of human blood samples. It can also be used for monitoring the performance of methods and in the training and evaluation of staff.

4005

Certified values:			
Chromium	6.69 ± 0.28 µg/kg	Cobalt	6.78 ± 0.20 µg/kg

Indicative values:			
Molybdenum	9 µg/kg	Nickel	5 µg/kg
Titanium	10 µg/kg		

Additional information:			
Chromium	7.07 ± 0.29 µg/L	Chromium	135.9 ± 5.6 nmol/L
Cobalt	7.16 ± 0.22 µg/L	Cobalt	121.6 ± 3.6 nmol/L

Clinical Purity Materials

Sirolimus
ERM®- AC021

Batch: a
Unit size: 0.1 g

This material was produced from a batch of sirolimus in powder form kindly donated by Pfizer, Inc (New York, USA). The purity was assessed by combining data from HPLC-UV, Karl Fischer, TGA, TLC and qNMR.

This material is intended for use in the calibration of instruments, quality control and the validation of methods to determine the immunosuppressant drug sirolimus. It can also be used in the training and evaluation of staff.

4005

Certified value:	
Purity	98.89 ± 0.64 % mass

Tacrolimus
ERM®- AC022

Batch: a
Unit size: 0.1 g

This material was produced from a batch of tacrolimus monohydrate in powder form kindly donated by Sandoz International GmbH. The purity was assessed by combining data from HPLC-UV, Karl Fischer, TGA, TLC and qNMR.

This material is intended for use in the calibration of instruments, quality control and the validation of methods to determine the immunosuppressant drug tacrolimus. It can also be used in the training and evaluation of staff.

4005

Certified value:	
Purity	97.65 ± 0.68 % mass

Digoxin
ERM®- AC200

Batch: a
Unit size: 0.5 g

A batch of digoxin was obtained from a commercial supplier of reagents. The purity was assessed by combining data from HPLC-UV, Karl Fischer, ICP-OES, ICP-MS and GC/MS.

This material is intended for use in the validation, calibration and monitoring of methods to determine digoxin content, including methods commonly used in clinical laboratories for digoxin in human blood samples. It can be used in the training and evaluation of staff.

4005

Certified value:	
Purity	98.0 ± 0.5 % mass

Forensic Ethanol Materials

Aqueous ethanol – 20 mg/100 mL LGC5409

Batch: 004
Unit size: 50 mL

This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 20 mg/100mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.

4005

0423

Certified value:	
Ethanol content	19.9 ± 0.6 mg/100 mL

Aqueous ethanol - 50 mg/100 mL ERM®- AC510

Batch: a
Unit size: 25 mL

This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 50 mg/100mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.

4005

0423

Certified value:	
Ethanol content	49.6 ± 0.6 mg/100 mL

Aqueous ethanol - 67 mg/100 mL ERM®- AC511

Batch: a
Unit size: 25 mL

This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 67 mg/100mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.

4005

0423

Certified value:	
Ethanol content	66.9 ± 0.6 mg/100 mL

Aqueous ethanol - 80 mg/100 mL LGC5401

Batch: 039
Unit size: 25 mL

This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 80 mg/100mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.

4005

0423

Certified value:	
Ethanol content	80.1 ± 0.6 mg/100 mL

Aqueous ethanol - 107 mg/100 mL LGC5402

Batch: 026
Unit size: 25 mL

This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 107 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.

4005 0423

Certified value:	
Ethanol content	106.9 ± 0.6 mg/100 mL

Aqueous ethanol – 200 mg/100 mL LGC5403

Batch: 024
Unit size: 25 mL

This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 200 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.

4005 0423

Certified value:	
Ethanol content	199.8 ± 0.7 mg/100 mL

Environment

Ash Materials

Pulverised fuel ash
LGC6180

Batch: 001
Unit size: 50 g

Pulverised fuel ash is a waste product of coal-fired power stations. This material was obtained from a disposal site near Camarthan Bay in South Wales, UK. The material was dried and ground to less than 250 µm particle size.

This material is intended for use in development, validation or quality control of analytical methods for the determination of the extractable metal content in ash- based material. The material may also be applicable to other matrices where suitable reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Assessed values: *Extractable metal content*			
Aluminium	25700 ± 6300 mg/kg	Magnesium	3660 ± 440 mg/kg
Arsenic	91.7 ± 14.1 mg/kg	Manganese	259 ± 40 mg/kg
Barium	676 ± 92 mg/kg	Nickel	48.4 ± 12.5 mg/kg
Calcium	6415 ± 530 mg/kg	Potassium	6170 ± 1680 mg/kg
Chromium	43.8 ± 11.7 mg/kg	Sodium	1230 ± 480 mg/kg
Cobalt	18.5 ± 4.3 mg/kg	Vanadium	105 ± 15 mg/kg
Copper	67.9 ± 11.2 mg/kg	Zinc	115 ± 21 mg/kg
Lead	48.6 ± 11.3 mg/kg		

Indicative values: *Extractable metal content*			
Antimony	12 mg/kg	Lithium	46 mg/kg
Beryllium	2.3 mg/kg	Mercury	0.5 mg/kg
Boron	25 mg/kg	Selenium	2 mg/kg
Iron	32900 mg/kg	Titanium	610 mg/kg

Indicative values: *Total metal content*			
Aluminium	131000 mg/kg	Magnesium	8500 mg/kg
Antimony	16 mg/kg	Manganese	410 mg/kg
Arsenic	100 mg/kg	Molybdenum	5 mg/kg
Barium	1300 mg/kg	Nickel	110 mg/kg
Beryllium	6 mg/kg	Potassium	29600 mg/kg
Calcium	9200 mg/kg	Selenium	3 mg/kg
Chromium	140 mg/kg	Sodium	5100 mg/kg
Cobalt	41 mg/kg	Tin	7 mg/kg
Copper	130 mg/kg	Titanium	4400 mg/kg
Iron	52400 mg/kg	Vanadium	260 mg/kg
Lead	110 mg/kg	Zinc	260 mg/kg
Lithium	130 mg/kg		

Carbon Isotope Ratio Materials

Glycine – absolute carbon isotope ratio
ERM®- AE672

Batch: a
Unit size: 0.5 g

The material was prepared from a single batch of commercially available high purity glycine and dispensed as ≥ 0.5 g units.

This material is intended for use in the calibration of instruments, the validation of new methods and the monitoring of the performance of methods used for the determination of carbon isotope ratios. It can also be used for the training and evaluation of staff.

4005

Certified value:	
$\mathbf{n(^{13}C)/n(^{12}C)\ (ratio)}$	0.010648 ± 0.000031

Additional information:	
$\delta_{13}C_{VPDB\text{-}LSVEC}$	- 42.12 ± 0.42 (‰)

Glycine solution– absolute carbon isotope ratio
LGC171-KT

Batch: 001
Unit size: 0.5 g

The materials were prepared using commercially available high purity glycines dissolved in 0.08 M phosphoric acid. For each solution the glycine mass concentration is approximately 150 g/L.

This reference material kit is primarily intended for use in the calibration of instruments for the determination of bulk absolute carbon isotope ratios. The kit can also be used for validation of new methods, monitoring of the performance of methods and for the training and evaluation of staff.

4005

Certified values: $n(^{13}C)/n(^{12}C)\ ratio$			
LGC1711	0.010642 ± 0.000030	LGC1712	0.010821 ± 0.000030
LGC1713	0.011227 ± 0.000032		

Indicative values: $\delta_{13}C_{VPDB\text{-}LSVEC}$			
LGC1711	-42.13 ± 0.26 (‰)	LGC1712	-24.62 ± 0.23 (‰)
LGC1713	+12.55 ± 0.21 (‰)		

Drinking Water Materials

Hard drinking water - anions
LGC6012

Batch: 004
Unit size: 250 mL

Hard drinking water was sourced from the Teddington (Greater London, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and preserved with the addition of copper sulfate to a final concentration of 1 mg/L as copper. High purity salt standards were used to spike the base material to reach the target levels, which reflect the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of anions in hard drinking water.
The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Ammonium	0.412 ± 0.024 mg/L	Nitrate	49.4 ± 1.1 mg/L
Chloride	246.5 ± 5.8 mg/L	Sulfate	246.9 ± 8.8 mg/L
Fluoride	1.36 ± 0.11 mg/L		

Additional information:			
pH	8.0	Hardness	265 mg/L as $CaCO_3$
Conductivity	1580 µS/cm	Density	0.99814 g/cm^3

Soft drinking water - anions
LGC6013

Batch: 004
Unit size: 250 mL

Soft drinking water was sourced from the Bury (Greater Manchester, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and preserved with the addition of copper sulfate to a final concentration of 1 mg/L as copper. High purity salt standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of anions in soft drinking water.
The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Ammonium	0.441 ± 0.015 mg/L	Nitrate	48.89 ± 0.91 mg/L
Chloride	243.4 ± 7.0 mg/L	Sulfate	248.1 ± 8.4 mg/L
Fluoride	1.449 ± 0.099 mg/L		

Additional information:			
pH	7.2	Hardness	37 mg/L as $CaCO_3$
Conductivity	1380 µS/cm	Density	0.99789 g/cm^3

Hard drinking water UK-metals
LGC6026

Batch: 003
Unit size: 250 mL

Hard drinking water was sourced from Lichfield (Staffordshire, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and acidified by addition of nitric acid to give a final concentration of approximately 0.1% nitric acid and pH <2.0. High purity metal standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

UKAS REFERENCE MATERIALS
4005

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of metals in hard drinking water. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

Certified values:			
Aluminium	199.9 ± 6.1 µg/L	Lithium	11.24 ± 0.58 µg/L
Antimony	4.99 ± 0.17 µg/L	Magnesium	18.50 ± 0.76 mg/L
Arsenic	10.00 ± 0.31µg/L	Manganese	48.4 ± 1.5 µg/L
Barium	116.1 ± 3.5 µg/L	Molybdenum	4.77 ± 0.25 µg/L
Beryllium	5.08 ± 0.26 µg/L	Nickel	19.00 ± 0.72 µg/L
Boron	983 ± 26 µg/L	Potassium	5.30 ± 0.15 mg/L
Cadmium	4.98 ± 0.15 µg/L	Selenium	10.19 ± 0.59 µg/L
Calcium	77.1 ± 2.2 mg/L	Sodium	24.60 ± 0.79 mg/L
Chromium	50.0 ± 1.9 µg/L	Strontium	491 ± 20 µg/L
Cobalt	4.88 ± 0.17 µg/L	Thallium	5.11 ± 0.42 µg/L
Copper	2017 ± 56 µg/L	Uranium	4.95 ± 0.40 µg/L
Iron	198.4 ± 5.5 µg/L	Vanadium	4.96 ± 0.15 µg/L
Lead	9.98 ± 0.14 µg/L	Zinc	621 ± 19 µg/L

Soft drinking water – metals
LGC6027

Batch: 001
Unit size: 250 mL

Soft drinking water was sourced from the Bury (Lancashire, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.2 µm in-line filters and acidified by addition of nitric acid to give a final concentration of approximately 0.1% nitric acid and pH <2.0. High purity metal standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

4005

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of metals in soft drinking water.
The material may also be applicable to other similar matrices where more clearly matched reference materials are not available.

Certified values:			
Aluminium	196.1 ± 7.3 µg/L	Manganese	49.9 ± 1.1 µg/L
Antimony	5.21 ± 0.24 µg/L	Molybdenum	4.62 ± 0.40 µg/L
Arsenic	10.00 ± 0.35 µg/L	Nickel	20.01 ± 0.50 µg/L
Barium	115.7 ± 3.5 µg/L	Selenium	10.21 ± 0.39 µg/L
Beryllium	5.09 ± 0.22 µg/L	Strontium	496 ± 24 µg/L
Boron	1006 ± 49 µg/L	Thallium	4.88 ± 0.32 µg/L
Cadmium	5.09 ± 0.24 µg/L	Uranium	4.95 ± 0.26 µg/L
Chromium	49.9 ± 1.1 µg/L	Vanadium	4.93 ± 0.21 µg/L
Cobalt	4.87 ± 0.17 µg/L	Zinc	613 ± 19 µg/L
Copper	1995 ± 66 µg/L	Calcium	8.53 ± 0.16 mg/L
Iron	200.0 ± 2.6 µg/L	Magnesium	1.026 ± 0.035 mg/L
Lead	10.15 ± 0.20 µg/L	Potassium	0.367 ± 0.023 mg/L
Lithium	10.41 ± 0.64 µg/L	Sodium	4.36 ± 0.29 mg/L

Hard drinking water – metals (lower levels) LGC6028

Batch: 001
Unit size: 250 mL

Hard drinking water was sourced from the Tamworth (Staffordshire, UK) potable mains supply. The water was filtered through a set of 8 µm, 1.2 µm and 0.45 µm in-line filters and acidified by addition of nitric acid to give a final concentration of approximately 0.1% nitric acid and pH <2.0. High purity metal standards were used to spike the base material to reach the target levels, reflecting the regulatory limits in the European Drinking Water Directive and the UK Water Supply (Water Quality) Regulations 2016.

UKAS REFERENCE MATERIALS
4005

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of metals in hard drinking water. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

Certified values:			
Aluminium	20.1 ± 1.3 µg/L	Molybdenum	2.20 ± 0.13 µg/L
Antimony	5.02 ± 0.18 µg/L	Nickel	4.85 ± 0.21 µg/L
Arsenic	4.98 ± 0.18 µg/L	Selenium	5.13 ± 0.31 µg/L
Barium	92.8 ± 3.1 µg/L	Strontium	193.8 ± 7.8 µg/L
Beryllium	2.05 ± 0.12 µg/L	Thallium	4.98 ± 0.33 µg/L
Boron	76.2 ± 3.7 µg/L	Uranium	4.90 ± 0.30µg/L
Cadmium	0.970 ± 0.042 µg/L	Vanadium	1.908 ± 0.098 µg/L
Chromium	9.76 ± 0.43 µg/L	Zinc	58.2 ± 2.0 µg/L
Cobalt	4.66 ± 0.15 µg/L	Calcium	79.6 ± 1.7 mg/L
Copper	36.0 ± 1.7 µg/L	Magnesium	13.30 ± 0.48 mg/L
Lead	1.033 ± 0.025 µg/L	Potassium	4.91 ± 0.11 mg/L
Lithium	10.44 ± 0.56 µg/L	Sodium	23.47 ± 0.64 mg/L
Manganese	4.74 ± 0.23 µg/L		

Indicative value:	
Iron	20 µg/L

Environment Purity Materials

3,3',4,4'–Tetrachlorobiphenyl (PCB77)
ERM®- AC820

Batch: a
Unit size: 0.02 g

A batch of PCB 77, obtained from a commercial supplier was mixed, dried over P_2O_5 and dispensed as 0.02 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis for PCB 77 in environmental and other relevant matrices.

4005

Certified value:	
Purity	99.8 + 0.2/- 0.3 mass %

3,3',4,4',5–Pentachlorobiphenyl (PCB 126)
ERM®- AC821

Batch: a
Unit size: 0.02 g

A batch of PCB 126, obtained from a commercial supplier was mixed, dried over P_2O_5 and dispensed as 0.02 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis for PCB 126 in environmental and other relevant matrices.

4005

Certified value:	
Purity	98.9 ± 0.3 mass %

3,3',4,4',5,5'–Hexachlorobiphenyl (PCB 169)
ERM®- AC822

Batch: a
Unit size: 0.02 g

A batch of PCB 169, obtained from a commercial supplier was mixed, dried over P_2O_5 and dispensed as 0.02 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis of PCB 169 in environmental and other relevant matrices.

4005

Certified value:	
Purity	99.4 + 0.6 / - 1.3 mass %

Polychlorinated biphenyls in 2,2,4–Trimethylpentane (iso-octane)
ERM®- AC823

Batch: a
Unit size: 1.2 mL

This material was prepared by a commercial manufacturer to a specification produced by LGC. High purity PCB (polychlorinated biphenyl) standards were combined gravimetrically to produce a solution containing 15 PCB congeners in 2,2,4-Trimethylpentane (iso-octane).

This material is intended for method validation purposes and for checking instrument calibration for the measurement of polychlorinated biphenyls.

4005

Certified values:	
2,4,4’ – Trichlorobiphenyl (PCB28)	703 ± 15 µg/kg
2,2’,5,5’ – Tetrachlorobiphenyl (PCB52)	706 ± 7 µg/kg
2,2’,4,5,5’ – Pentachlorobiphenyl (PCB101)	696 ± 7 µg/kg
2,3’,4,4’,5 – Pentachlorobiphenyl (PCB 118)	712 ± 9 µg/kg
2,2’,3,4,4’,5’ – Hexachlorobiphenyl (PCB138)	678 ± 37 µg/kg
2,2’,4,4’,5,5 – Hexachlorobiphenyl (PCB153)	702 ± 8 µg/kg
2,2’,3,4,4’,5,5’ – Heptachlorobiphenyl (PCB180)	700 ± 9 µg/kg

Indicative values:	
2,4',5 - Trichlorobiphenyl (PCB31)	697 µg/kg
3,3',4,4 '- Tetrachlorobiphenyl (PCB77)	697 µg/kg
2,3,3',4',6 - Pentachlorobiphenyl (PCB110)	690 µg/kg
2,2',3,4',5',6 - Hexachlorobiphenyl (PCB149)	695 µg/kg
2,3,3',4',5,6 - Hexachlorobiphenyl (PCB163)	689 µg/kg
2,2',3,3',4,4',5 - Heptachlorobiphenyl (PCB170)	693 µg/kg
2,2',3,4',5,5',6 - Heptachlorobiphenyl (PCB187)	693 µg/kg
2,2',3,3',4,4',5,5' - Octachlorobiphenyl (PCB194)	693 µg/kg

Calculated values:	
2,4,4’ – Trichlorobiphenyl (PCB28)	487 ± 10 µg/L
2,2’,5,5’ – Tetrachlorobiphenyl (PCB52)	489 ± 5 µg/L
2,2’,4,5,5’ – Pentachlorobiphenyl (PCB101)	481 ± 5 µg/L
2,3’,4,4’,5 – Pentachlorobiphenyl (PCB 118)	493 ± 7 µg/L
2,2’,3,4,4’,5’ – Hexachlorobiphenyl (PCB138)	469 ± 26 µg/L
2,2’,4,4’,5,5 – Hexachlorobiphenyl (PCB153)	486 ± 6 µg/L
2,2’,3,4,4’,5,5’ – Heptachlorobiphenyl (PCB180)	484 ± 7 µg/L

Nicotine
LGC1801

Batch: 004
Unit size: 0.6 mL

A batch of nicotine was obtained from a commercial supplier and purified by vacuum distillation to provide the bulk material of purity > 99 %. The purity was assessed by combining data from HPLC, GC, Karl Fischer and TGA.

This material is intended for use as a reference material in the calibration of instruments, and the quality control and validation of methods used to determine the presence and quantity of nicotine.

4005

Certified value:	
Purity	99.57 ± 0.32 mass %

Fresh Water Materials

River water – anions LGC6020

Batch: 002
Unit size: 250 mL

A supply of water was taken from Menethorpe Beck, Yorkshire, UK. A soluble copper salt solution was added (as a biocide) to provide a copper concentration of 2.7 mg/L. The levels of phosphate and fluoride were adjusted by spiking the base material with high purity salts to achieve the target concentrations. The solution was thoroughly mixed and filtered sequentially through 8 µm, 1.2 µm and 0.45 µm membrane filters and 250 mL aliquots were sub-sampled into tamper evident screw-cap amber glass bottles.

The primary intended use of this material is for the development, validation, or quality control of analytical methods for the determination of anions in river water.

4005

Certified values:			
Chloride	33.1 ± 1.2 mg/L	Fluoride	0.273 ± 0.023 mg/L
Nitrate (as NO_3^-)	28.2 ± 1.2 mg/L	Sulfate (as SO_4^{2-})	82.8 ± 2.4 mg/L

Indicative value:	
Phosphate (as PO_4^{3-})	0.003 - 0.300 mg/L

River water – anions LGC6025

Batch: 001
Unit size: 250 mL

A supply of water was taken from from Menethorpe Beck, Yorkshire, UK. The water was filtered sequentially through 8.0 µm and 0.2 µm membrane filters before the addition of a soluble copper salt solution (as a biocide) to provide a copper concentration of 1 mg/L. The levels of phosphate and fluoride were adjusted by spiking the base material with high purity salts to achieve the target concentrations.

The primary intended use of this material is for the development, validation, or quality control of analytical methods for the determination of anions in river water.

4005

Certified values:			
Chloride	31.3 ± 1.3mg/L	Fluoride	1.248 ± 0.074 mg/L
Nitrate (as NO_3^-)	38.0 ± 1.6 mg/L	Sulfate (as SO_4^{2-})	66.2 ± 1.8 mg/L

Indicative value:	
Phosphate (as PO_4^{3-})	0.08 - 1.61 mg/L

Miscellaneous Water Materials

Estuarine water trace metals LGC6016

Batch: 001
Unit size: 50 mL

Estuarine water was collected from the Severn Estuary, UK, near Avonmouth (a heavily industrialised area). The water was filtered through a 0.45 µm membrane filter and then stabilised by the addition of concentrated nitric acid to achieve a pH of 2.

This material is intended for use in development, validation or quality control of analytical methods for the determination of elements in estuarine water.

4005

Certified values:			
Cadmium	101 ± 2 µg/kg	Manganese	976 ± 31 µg/kg
Copper	190 ± 4 µg/kg	Nickel	186 ± 3 µg/kg
Lead	196 ± 3 µg/kg		

Indicative values:			
Calcium	220 mg/L	Sodium	4700 mg/L
Magnesium	570 mg/L	Zinc	55 µg/L
Potassium	180 mg/L		

Landfill leachate – trace metals LGC6177

Batch: 001
Unit size: 50 mL

A supply of leachate originating from a landfill site in Loughborough, Leicestershire, UK was collected, initially filtered through a 0.7 µm membrane filter and then stabilised with the addition of concentrated nitic acid to provide a pH of 2. The solution was then filtered through a 0.45 µm membrane filter and thoroughly mixed.

This material is intended for use in development, validation or quality control of analytical methods for the determination of metals in landfill leachate. This material may also be applicable to other matrices where more closely matched reference materials are not available.

4005

Assessed values:			
Boron	9.8 ± 0.5 mg/L	Manganese	0.14 ± 0.02 mg/L
Calcium	74.8 ± 1.7 mg/L	Nickel	0.21 ± 0.02 mg/L
Chromium	0.18 ± 0.02 mg/L	Phosphorus	11.5 ± 1.5 mg/L
Iron	3.8 ± 0.2 mg/L	Potassium	780 ± 14 mg/L
Magnesium	73.5 ± 2.7 mg/L	Sodium	1750 ± 29 mg/L

Sediment Materials

River sediment
LGC6187

Batch: 001
Unit size: 80 g

River sediment obtained from a monitoring station lagoon on the River Elbe close to the Czech-German border. The material was air-dried at 40 °C, and ground to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 80 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of extractable metals in river sediment. The material may also be applicable to other matrices where more closely matched reference materials are not available.

4005

Certified value:			
Arsenic	24.0 ± 3.2 mg/kg	Mercury	1.4 ± 0.1 mg/kg
Cadmium	2.7 ± 0.3 mg/kg	Nickel	34.7 ± 1.7 mg/kg
Chromium	84.0 ± 9.4 mg/kg	Selenium	1.2 ± 0.2 mg/kg
Copper	83.6 ± 4.1 mg/kg	Tin	6.8 ± 1.8 mg/kg
Iron	23600 ± 1500 mg/kg	Vanadium	38.3 ± 6.5 mg/kg
Lead	77.2 ± 4.5 mg/kg	Zinc	439 ± 26 mg/kg
Manganese	1240 ± 60 mg/kg		

Indicative value:	
Weight loss on ignition	12 g/100 g

River sediment – PAHs
LGC6188

Batch: 001
Unit size: 30 g

A river sediment was taken from a monitoring station lagoon on the river Elbe close to the Czech- German border. The material was allowed to settle and coarse filtered on site to remove large particles then transported to a laboratory for preparation. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 30 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using a ^{60}Co source at a dosing rate of 25 kGy.

UKAS REFERENCE MATERIALS
4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of polyaromatic hydrocarbons (PAHs) in sediments. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Assessed values:	
Phenanthrene	0.74 ± 0.29 mg/kg
Anthracene	0.231 ± 0.081 mg/kg
Fluoranthene	1.52 ± 0.32 mg/kg
Pyrene	1.24 ± 0.50 mg/kg
Chrysene	0.63 ± 0.16 mg/kg
Benzo[*a*]anthracene	0.60 ± 0.19 mg/kg
Benzo[*b*]fluoranthene	0.68 ± 0.18 mg/kg
Benzo[*k*]fluoranthene	0.323 ± 0.084 mg/kg
Benzo[*a*]pyrene	0.51 ± 0.16 mg/kg
Dibenzo[*a,h*]anthracene	0.086 ± 0.023 mg/kg
Benzo[*g,h,i*]perylene	0.35 ± 0.12 mg/kg

Indicative values:			
Acenaphthylene	0.05 mg/kg	Naphthalene	0.2 mg/kg
Acenaphthene	0.03 mg/kg	Loss on drying	2.0 g/100g
Fluorene	0.05 mg/kg	Indeno[1,2,3-*cd*]pyrene	0.4 mg/kg

River sediment – extractable metals LGC6189

Batch: 001
Unit size: 30 g

A river sediment was taken from a monitoring station lagoon on the river Elbe, in the Czech Republic, close to the Czech-German border. The material was allowed to settle and coarse filtered on site to remove large particles then transported to a laboratory for preparation. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, divided into 30 g sub-samples and packaged in amber glass bottles with screw caps. The bottled material was then radiation sterilised using a ^{60}Co source at a dosing rate of 25 kGy.

This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of extractable metals in sediments. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Assessed values:			
Arsenic	26 ± 2 mg/kg	Molybdenum	1.2 ± 0.1 mg/kg
Cadmium	3.3 ± 0.5 mg/kg	Nickel	34 ± 3 mg/kg
Chromium	93 ± 8 mg/kg	Lead	87 ± 6 mg/kg
Copper	87 ± 8 mg/kg	Zinc	460 ± 30 mg/kg
Manganese	1120 ± 60 mg/kg		

Indicative values:			
Barium	280 mg/kg	Selenium	1.2 mg/kg

Information values:			
Loss on Drying	1.6 g / 100 g	Conductivity	1470 µS / cm
pH	7.1	Loss on Ignition	9.35 g / 100 g
SiO_2	50 %	MgO	1 %
Al_2O_3	10 %	P_2O_5	2 %
CaO	4 %	SO_3	1 %
Fe_2O_3	5 %	K_2O	2 %
Quartz SiO_2	Major	Kaolinite Clay	Small
Albite $NaAlSi_3O_8$	Minor	Muscovite Clay	Small
Calcite $CaCO_3$	Minor		

Sewage sludge – metals ERM®- CC136

Batch: a
Unit size: 25 g

Aged sewage sludge collected from a disused sewage works site at Heathrow in London, UK. The material was dried and sterilised at 130 °C for 3 hours and ground to less than 250 µm particle size.

This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of extractable metals in sewage sludge. The material may also be applicable to other matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values: *Extractable Metal Content*			
Aluminium	15100 ± 5400 mg/kg	Magnesium	2820 ± 540 mg/kg
Barium	633 ± 195 mg/kg	Manganese	544 ± 32 mg/kg
Chromium	399 ± 32 mg/kg	Nickel	130 ± 10 mg/kg
Cobalt	23.2 ± 3.6 mg/kg	Potassium	2030 ± 844 mg/kg
Copper	464 ± 21 mg/kg	Sodium	397± 64 mg/kg
Iron	22200 ± 2780 mg/kg	Zinc	890 ± 140 mg/kg
Lead	341 ± 18 mg/kg		

Additional Information: *Total Metal Content*			
Aluminium	31100 mg/kg	Magnesium	4200 mg/kg
Arsenic	19 mg/kg	Manganese	600 mg/kg
Barium	910 mg/kg	Mercury	4 mg/kg
Beryllium	1.3 mg/kg	Molybdenum	14 mg/kg
Cadmium	39 mg/kg	Nickel	136 mg/kg
Calcium	37500 mg/kg	Potassium	8700 mg/kg
Chromium	400 mg/kg	Selenium	2 mg/kg
Cobalt	30 mg/kg	Sodium	3600 mg/kg
Copper	480 mg/kg	Titanium	2800 mg/kg
Iron	25900 mg/kg	Vanadium	73 mg/kg
Lead	330 mg/kg	Zinc	850 mg/kg
Lithium	23 mg/kg		

Additional Information: *Extractable Metal Content*			
Arsenic	21 mg/kg	Lithium	9 mg/kg
Beryllium	0.7 mg/kg	Molybdenum	12 mg/kg
Boron	23 mg/kg	Selenium	1 mg/kg
Cadmium	30 mg/kg	Titanium	168 mg/kg
Calcium	28800 mg/kg	Vanadium	42 mg/kg

Sewage sludge – extractable metals
LGC6181

Batch: 001
Unit size: 100 g

Digested sewage sludge of mixed origin was taken from a city water treatment plant immediately after discharge from a digestion tank. The material was air-dried at 40 °C and ground to a particle size of less than 100 µm. The material was sieved, homogenised and packaged. The bottled material was then radiation sterilised.

This material is intended for use in development, validation or quality control of analytical methods for the determination of extractable metals in sewage sludge. The material may also be applicable to other matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values: *Extractable Metal Content*			
Arsenic	7.8 ± 0.9 mg/kg	Manganese	454 ± 23 mg/kg
Cadmium	5.8 ± 0.3 mg/kg	Mercury	4.9 ± 0.4 mg/kg
Chromium	78 ± 8 mg/kg	Nickel	45 ± 3 mg/kg
Copper	354 ± 18 mg/kg	Silver	55 ± 5 mg/kg
Iron	40300 ± 2300 mg/kg	Vanadium	20 ± 2 mg/kg
Lead	105 ± 8 mg/kg	Zinc	1100 ± 50 mg/kg

Indicative value: *Extractable Metal Content*	
Tin	20 mg/kg

Sewage sludge – PAHs
LGC6182

Batch: 001
Unit size: 30 g

Digested sewage sludge of mixed origin was taken from a city water treatment plant immediately after discharge from a digestion tank. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised and packaged in 30 g portions. The bottled material was then radiation sterilised.

4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of PAHs in sewage sludge. The material may also be applicable to other matrices where more closely matched reference materials are not available.

Assessed values:	
Naphthalene	0.20 ± 0.13 mg/kg
Fluorene	0.159 ± 0.068 mg/kg
Anthracene	0.162 ± 0.067 mg/kg
Fluoranthene	1.35 ± 0.26 mg/kg
Pyrene	1.26 ± 0.43 mg/kg
Chrysene	0.76 ± 0.18 mg/kg
Benzo[*a*]anthracene	0.56 ± 0.21 mg/kg
Benzo[*b*]fluoranthene	0.71 ± 0.14 mg/kg
Benzo[*a*]pyrene	0.406 ± 0.087 mg/kg
Indeno[1,2,3-*cd*]pyrene	0.36 ± 0.15 mg/kg
Benzo[*ghi*]perylene	0.46 ± 0.27 mg/kg

Indicative values:	
Acenaphthylene	0.04 mg/kg
Dibenzo[*a,h*]anthracene	0.09 mg/kg
Acenaphthene	0.09 mg/kg
Benzo[*k*]fluoranthene	0.3 mg/kg
Phenanthrene	0.8 mg/kg
Loss on drying	6.6 g/100g

Sewage sludge – PCBs
LGC6184

Batch: 001
Unit size: 30 g

Digested sewage sludge of mixed origin, taken from a city water treatment plant in the Czech Republic, immediately after discharge from a digestion tank. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of less than 100 µm. The material was sieved, homogenised, and packaged in 30 g portions. The bottled material was then radiation sterilised using a ^{60}Co source at a dosing rate of 25 kGy.

UKAS REFERENCE MATERIALS
4005

This material is intended for use in development, validation or quality control of analytical methods for the determination of polychlorinated biphenyls in sewage sludge. The material may also be applicable to other matrices where suitable reference materials are not available.

Certified values:			
PCB 101	37 ± 3 µg/kg	PCB 153	112 ± 8 µg/kg
PCB 118	17 ± 2 µg/kg		

Assessed values:			
PCB 28	28 ± 8 µg/kg	PCB 170	37 ± 5 µg/kg
PCB 52	14 ± 4 µg/kg	PCB 180	78 ± 10 µg/kg
PCB 138	77 ± 7 µg/kg	PCB 187	35 ± 5 µg/kg
PCB 149	63 ± 6 µg/kg	PCB 194	13 ± 3 µg/kg

Indicative values:			
PCB 31	18 µg/kg	PCB 110	26 µg/kg
PCB 77	3 µg/kg		

Contaminated brick works soil
ERM®- CC135

Batch: a
Unit size: 50 g

This material is a contaminated soil that was obtained from a brickworks site in Hackney, London. A suitable quantity of soil was heat sterilised at 130 °C for 3 hours. This was then dried and ground to 100 µm. The sample was homogenised, and 50 g units were sub-sampled into amber glass bottles with screw caps.

This material is intended for use as a reference material in the development, validation or quality control of analytical methods for the determination of extractable metals and total metals in soils. The material may also be applicable to other matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values: *Extractable metal content*			
Aluminium	22700 ± 4600 mg/kg	Potassium	5100 ± 920 mg/kg
Barium	134 ± 10 mg/kg	Magnesium	7000 ± 580 mg/kg
Beryllium	1.4 ± 0.4 mg/kg	Manganese	348 ± 18 mg/kg
Calcium	21900 ± 520 mg/kg	Sodium	362 ± 44 mg/kg
Cobalt	20 ± 4 mg/kg	Nickel	277 ± 13 mg/kg
Chromium	336 ± 28 mg/kg	Lead	391 ± 16 mg/kg
Copper	105 ± 5 mg/kg	Selenium	0.9 ± 0.3 mg/kg
Iron	40900 ± 2700 mg/kg	Vanadium	78 ± 11 mg/kg
Mercury	3.2 ± 0.4 mg/kg	Zinc	316 ± 41 mg/kg

Certified values: *Total metal content*			
Barium	305 ± 37 mg/kg	Magnesium	9400 ± 1200 mg/kg
Calcium	23400 ± 2900 mg/kg	Manganese	390 ± 40 mg/kg
Chromium	455 ± 59 mg/kg	Sodium	1700 ± 270 mg/kg
Copper	107 ± 5 mg/kg	Nickel	291 ± 22 mg/kg
Iron	47500 ± 4600 mg/kg	Lead	411 ± 26 mg/kg
Mercury	2.9 ± 0.6 mg/kg	Vanadium	139 ± 18 mg/kg
Potassium	16300 ± 2600 mg/kg	Zinc	345 ± 49 mg/kg

Additional material information: *Extractable metal content*	
Lithium	20 mg/kg
Molybdenum	20 mg/kg
Tin	35 mg/kg
Titanium	200 mg/kg

Additional material information: *Total metal content*	
Aluminium	50000 mg/kg
Beryllium	2 mg/kg
Cobalt	28 mg/kg
Lithium	54 mg/kg
Molybdenum	26 mg/kg
Tin	37 mg/kg
Titanium	3400 mg/kg
Selenium	1 mg/kg

Contaminated soil – PCBs and PAHs LGC6115

Batch: 001
Unit size: 50 g

This material was blended from three soils sourced from the Czech Republic. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of ≤ 200 µm. The material was sieved, homogenised and packaged. The bottled material was then radiation sterilised using ^{60}Co at a dose of 5-15 kGy.

This material is intended for use in the validation of methods for the determination of PCBs and PAHs in soil materials.

4005

Certified values:			
PCB101	93 ± 7 µg/kg	Benzo[*a*]anthracene	36 ± 1 mg/kg
PCB118	116 ± 4 µg/kg	Benzo[*a*]pyrene	0.13 ± 0.02 mg/kg
Phenanthrene	178 ± 6 mg/kg	Benzo[*ghi*]perylene	0.33 ± 0.06 mg/kg
Fluoranthene	312 ± 7 mg/kg		

Assessed values			
PCB138	16 ± 5 µg/kg	PCB180	9.6 ± 6.1 µg/kg
PCB153	19 ± 7 µg/kg		

Indicative values:			
Acenaphthene	3 mg/kg	Al_2O_3	13 g/100 g
Acenaphthylene	1 mg/kg	CaO	1.9 g/100 g
Anthracene	3 mg/kg	Fe_2O_3	4.9 g/ 100 g
Benzo[*b*]fluoranthene	6 mg/kg	K_2O	3.8 g/100 g
Benzo[*k*]fluoranthene	3 mg/kg	MgO	2.3 g/100 g
Chrysene	20 mg/kg	MnO	0.1 g/100 g
Dibenzo[*ah*]anthracene	0.2 mg/kg	P_2O_5	1.1 g/100 g
Fluorene	50 mg/kg	SO_3	0.2 g/100 g
Indeno[123-*cd*]pyrene	0.4 mg/kg	SiO_2	55 g/100 g
Naphthalene	4 mg/kg	TiO_2	0.75 g/100 g
Pyrene	120 mg/kg	Quartz SiO_2	Major
Soil textural class (UK)	Sandy Loam	Albite $NaAlSi_3O_8$	Minor
Loss on drying	1.76 % w/w	Kaolinite Clay	Small
pH	6.8	Muscovite Clay	Small
Conductivity	149 µS / cm	Unidentified crystalline material	Small
Loss on ignition	5.0 g/ 100 g		

Contaminated clay loam soil – extractable metals, PAHs and inorganics
LGC6145

Batch: 001
Unit size: 50 g

This material was blended from two soils, sourced from the Czech Republic and one soil sourced from the UK. The material was air-dried at 40 °C, manually crushed then ground in a ceramic ball-mill to a particle size of ≤ 200 µm. The material was sieved, homogenised, and packaged in 50 g sub-samples. The bottled material was then radiation sterilised using ^{60}Co at a dose of 5-15 kGy.

This material is intended for use in validating methods for the determination of metals in soil materials. The metal content of this material has been certified using CRC-ICP-MS techniques (following aqua-regia extraction according to ISO 11466) but is suitable for use with other appropriate analytical techniques for the determination of the quantity of metals. The material is also of use for validating methods for the determination of selected PAHs, water soluble sulfate and water soluble chloride in soil materials, where assessed values are given.

Certified values:			
Arsenic	38.7 ± 1.2 mg/kg	Nickel	39.0 ± 2.5 mg/kg
Cadmium	0.65 ± 0.07 mg/kg	Selenium	1.81 ± 0.13 mg/kg
Chromium	47.6 ± 1.8 mg/kg	Vanadium	53.9 ± 2.3 mg/kg
Copper	62.2 ± 3.6 mg/kg	Zinc	137 ± 6 mg/kg
Lead	45.1 ± 2.3 mg/kg		

Assessed values:	
Phenanthrene	325 ± 26 mg/kg
Chrysene	45 ± 9 mg/kg
Benzo[*b*]fluoranthene	12 ± 3 mg/kg
Indeno[1,2,3-*cd*] pyrene	0.97 ± 0.28 mg/kg
Water soluble chloride	65 ± 9 mg/kg
Water soluble sulfate	5.3 ± 0.7 g/L

Indicative values:			
Acenaphthene	1 mg/kg	Al_2O_3	21 g/100 g
Fluorene	100 mg/kg	CaO	0.8 g/100 g
Fluoranthene	600 mg/kg	Fe_2O_3	5.6 g/ 100 g
Pyrene	200 mg/kg	K_2O	3.0 g/100 g
Benzo[*a*]anthracene	60 mg/kg	MgO	1.7 g/100 g
Benzo[*k*]fluoranthene	6 mg/kg	SO_3	4.7 g/100 g
Benzo[*a*]pyrene	0.3 mg/kg	SiO_2	47 g/100 g
Dibenzo[*a,h*]anthracene	0.3 mg/kg	TiO_2	0.7 g/100 g
Benzo[*ghi*]perylene	0.7 mg/kg	Soil textural class (UK)	Clay Loam
Acenaphthylene	1 mg/kg	Loss on drying	2.7 %
Anthracene	5 mg/kg	pH	5.2
Naphthalene	4 mg/kg	Loss on ignition	4 %
Easily liberated cyanide	<20 mg/kg	Quartz SiO_2	Major
Total cyanide	600 mg/kg	Kaolinite Clay	Minor
Total sulfur	16 g/kg	Muscovite Clay	Minor
Unidentified crystalline material		Small	

Loamy sand soil 2 – total petroleum hydrocarbons LGCQC3013

Batch: 001
Unit size: 100 g

This material was prepared from a soil sample obtained from a contaminated electricity sub-station site in the UK. The TPH contamination is derived from cable insulating oil which had leaked into the soil. The soil was first dried in calibrated fan-assisted drying ovens at (30 ± 4) °C and then any large particles broken down using a pestle and mortar. The product was then milled and sieved to obtain a powder with a particle size of < 150 µm. The material was then homogenised by gentle rotation for 50 hours and bottled into 100 g units in screw cap amber glass bottles.

This material is intended for use as a quality control material for analytical methods used in the investigation of soil for TPH contamination. The material may also be applicable to other similar matrices where suitable quality control materials are not available.

Indicative values: *Textural classification - loamy sand soil*			
Sand: 2.00 – 0.063 mm	87 %	Clay: < 0.002 mm	7 %
Silt: 0.063 – 0.002 mm	6 %		

Indicative value:	
TPH (C_{10} – C_{40})	4100 mg/kg

Food & Beverage

Alcohol Solutions

Reference spirit – 5 % ABV
LGC5404

Batch: 022
Unit size: 25 mL

A suitable supply of ethanol was obtained, checked for purity and diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 5 % ABV.

The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance.

UKAS REFERENCE MATERIALS
4005

Certified values:	
Alcoholic strength	4.97 ± 0.03 % ABV
Density (in air)	990.04 ± 0.04 kg/m^3

Reference spirit – 15 % ABV
LGC5405

Batch: 012
Unit size: 25 mL

A suitable supply of ethanol was obtained, checked for purity and diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 15% ABV.

The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance.

UKAS REFERENCE MATERIALS
4005

Certified values:	
Alcoholic strength	14.99 ± 0.04 % ABV
Density (in air)	977.93 ± 0.05 kg/m^3

Reference spirit – 40 % ABV
LGC5406

Batch: 020
Unit size: 25 mL

A suitable supply of ethanol was obtained, checked for purity and diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 40 % ABV.

The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance.

UKAS REFERENCE MATERIALS
4005

Certified values:	
Alcoholic strength	40.05 ± 0.04 % ABV
Density (in air)	946.91 ± 0.06 kg/m^3

Reference spirit – 40% ABV
LGC5412

Batch: 004
Unit size: 50 mL

A suitable supply of ethanol was obtained, checked for purity and diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 40 % ABV.

The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance.

4005

Certified values:	
Alcoholic strength	40.05 ± 0.04 % ABV
Density (in air)	946.90 ± 0.06 kg/m^3

Reference spirit – 70 % ABV
LGC5407

Batch: 007
Unit size: 25 mL

A suitable supply of ethanol was obtained, checked for purity and diluted volumetrically with water to produce a solution with a nominal ethanol concentration of 70 % ABV.

The primary use of this reference material is for checking the calibration of automatic density meters commonly used in industry to determine alcoholic strength, and for checking analyst and method performance.

4005

Certified values:	
Alcoholic strength	70.07 ± 0.03 % ABV
Density (in air)	884.33 ± 0.07 kg/m^3

Wine – nominal 5 % ABV
ERM®- BA001

Batch: a
Unit size: 250 mL

A suitable supply of wine was obtained from a commercial source. The wine was stabilised with the addition of sodium metabisulfite and citric acid and thoroughly mixed.

This material is intended for use as a reference material for the validation and quality control of methods for the determination of alcohol content in alcoholic beverages.

4005

Certified value:	
Alcoholic strength	5.37 ± 0.05 % ABV

Wine – nominal 10 % ABV
ERM®- BA002

Batch: a
Unit size: 250 mL

A suitable supply of wine was obtained from a commercial source. The wine was stabilised with the addition of sodium metabisulfite and citric acid and thoroughly mixed.

This material is intended for use as a reference material for the validation and quality control of methods for the determination of alcohol content in alcoholic beverages.

4005

Certified value:	
Alcoholic strength	10.12 ± 0.04 % ABV

Wine – nominal 15 % ABV
ERM®- BA003

Batch: a
Unit size: 250 mL

A suitable supply of wine was obtained from a commercial source. The wine was stabilised with the addition of sodium metabisulfite and citric acid and thoroughly mixed.

This material is intended for use as a reference material for the validation and quality control of methods for the determination of alcohol content in alcoholic beverages.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Alcoholic strength	14.47 ± 0.10 % ABV

Brandy – 40 % ABV
LGC5000

Batch: 004
Unit size: 50 mL

A suitable supply of commercial brandy was obtained, mixed and dispensed in 50 mL portions.

This material is intended to be used for calibration of density meters and the validation of methods for the determination of alcoholic strength in obscured spirits by the UK statutory method of distillation and density measurement.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Apparent alcoholic strength	37.834 + 0.034 / - 0.035 % ABV
Actual alcoholic strength	40.075 + 0.070 / - 0.067% ABV
Apparent density (in air)	950.376 ± 0.056 kg/m^3

Lager – 5 % ABV
LGC5005

Batch: 003
Unit size: 330 mL

Unfiltered 4.8 % ABV lager, packed in 330 mL plain white ring-pull aluminium cans, was purchased from a UK brewery. The material was treated sing a batch pasteuriser at 20 pasteurisation units by an external organisation.

The primary use of this reference material is in the development, validation or quality control of methods for the determination of alcohol in alcoholic beverages.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Alcoholic strength	4.83 ± 0.06 % ABV

Beer – 3.7% ABV
LGC5014

Batch: 001
Unit size: 440 mL

Unfiltered 3.4 % ABV pale ale, packed in 440 mL plain white ring-pull aluminium cans, was purchased from a UK brewery. The material was treated using a bath pasteuriser at 20 pasteurisation units by an external organisation.

The primary use of this reference material is in the development, validation or quality control of methods for the determination of alcohol in alcoholic beverages.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Alcoholic strength	3.69 ± 0.07 % ABV

Whisky – congeners
LGC5100

Batch: 002
Unit size: 10 mL

A suitable supply of whisky was obtained from a commercial source. The whisky was mixed by shaking and sub-divided into nominally 10 mL aliquots.

This material is intended for use in development, validation or quality control of analytical methods for the determination of congeners in spirit samples.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Methanol	5.20 ± 0.32 g/100 L	2-Methyl propanol	58.8 ± 3.1 g/100 L
Propanol	57.0 ± 2.4 g/100 L	2-Methyl butanol	21.38 ± 0.70 g/100 L
Butanol	0.48 ± 0.11 g/100 L	3-Methyl butanol	58.2 ± 2.1 g/100 L

Indicative values:			
Ethyl acetate	16 g/100 L of alcohol	Furfural	0.82 g/100 L of alcohol
Apparent alcohol content	40.06 % ABV		

Drink Products

Orange juice
ERM®- BD011

Batch: a
Unit size: 3 mL

Commercially obtained orange juice was diluted with water. The solution was thoroughly mixed and dispensed as nominal 3 mL units into crimp-topped amber glass vials.

This material is intended for use in the development, validation, or quality control of analytical methods for the determination of degrees Brix or refractive index of sugar solutions and food extracts. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

4005

Certified values:			
Degrees brix	1.26 ± 0.08	Refractive index	1.3348 ± 0.0002

Fruit squash – total SO_2
LGC7113

Batch: 001
Unit size: 55 mL

The material was prepared using a commercially sourced cranberry and raspberry squash containing a base level of total SO_2 at 120 mg/L. The contents of approximately 50 bottles were combined in a plastic carboy, thoroughly mixed and then the material was spiked with sodium metabisulfite to give a final concentration of approximately 240 mg/kg.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of total SO_2 in beverages. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

4005

Certified value:	
Total Sulfur Dioxide	255 ± 41 mg/L

Food & Beverage Purity Materials

Butylated hydroxyanisole (BHA)
ERM®- AC301

Batch: a
Unit size: 0.5 g

A batch of butylated hydroxyanisole, obtained from a commercial supplier of chemical reagents, was ground to pass a 710 µm sieve, mixed, dried over P_2O_2 and dispensed as 0.5 g units into screw-capped amber glass vials. The purity was assessed by combining data from HPLC-UV, DSC and GC.

This material is primarily intended for use as a calibration standard in methods of analysis for BHA in foodstuffs and other relevant matrices.

4005

Certified value:	
Purity	99.2 ± 0.6 mass %

Leucomalachite green
ERM®- AC303

Batch: a
Unit size: 0.1 g

A batch of leucomalachite green was obtained from a commercial supplier of chemical reagents and its purity was certified by LGC. The purity was determined by combining data from HPLC-UV and DSC.

The primary use of this reference material is for the calibration of methods for the determination of leucomalachite green in fish and other relevant matrices.

4005

Certified value:	
Purity	98.8 ± 0.8 mass %

***p,p'*-DDE**
LGC1110

Batch: 001
Unit size: 0.25 g

A batch of *p,p'*-DDE with a nominal purity of 99 % was obtained from a commercial supplier, ground to pass a 710 µm sieve, and dried under vacuum. The purity was assessed by combining data from GC-FID, HPLC-UV and DSC.

This material is intended for use in the preparation of solutions for the calibration of analytical instruments used in pesticide residue and formulation analysis.

4005

Certified value:	
Purity	99.6 ± 0.4 mass %

Malathion
LGC1205

Batch: 001
Unit size: 0.25 g

A batch of malathion was dried at ambient temperature under vacuum. The purity was assessed by combining data from GC-FID and HPLC-UV.

This material is intended for use as a calibration standard in methods of analysis for malathion in food, environmental and other relevant matrices.

Certified value:	
Purity	99.4 ± 0.6 mass %

Butylated hydroxytoluene (BHT)
LGC7300

Batch: 001
Unit size: 0.5 g

A batch of butylated hydroxytoluene, obtained from a commercial supplier of chemical reagents, was ground to pass a 710 µm sieve, mixed and dispensed. The purity was determined by combining data from HPLC-UV and DSC.

This material is intended for use as a calibration standard in methods of analysis for BHT in foodstuffs and other relevant matrices.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	99.8 + 0.2 / - 1.4 mass %

Saccharin
LGC7302

Batch: 001
Unit size: 0.5 g

A batch of saccharin, obtained from a commercial supplier of chemical reagents, was ground to pass 710 µm sieve, mixed and dispensed. The purity was determined by combining data from HPLC-UV, DSC and volumetric titration with sodium hydroxide solution standardised against potassium hydrogen phthalate.

This material is intended for use as a calibration standard in methods of analysis for saccharin in foodstuffs, beverages and other relevant matrices.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	99.6 + 0.4 / - 0.6 mass %

Potassium sorbate
LGC7305

Batch: 001
Unit size: 0.5 g

A batch of potassium sorbate, obtained from a commercial supplier of chemical reagents, was ground to pass 710 µm sieve, mixed, dried over P_2O_5 and dispensed. The purity was determined by combining data from HPLC-UV and DSC.

This material is intended for use as a calibration standard in methods of analysis for potassium sorbate in foodstuffs and other relevant matrices.

Certified value:	
Purity	99.8 ± 1.6 mass %

Selenomethionine enriched with ^{76}Se
LGC7330

Batch: 001
Unit size: 0.01 g

A quantity of ^{76}Se-enriched selenomethionine was prepared from ^{76}Se -enriched selenium obtained from a commercial supplier. The isotopic abundance was determined by ICP-MS.

The primary use of this material is as a spike material for the determination of selenomethionine by species-specific isotope dilution with HPLC-ICP-MS, in combination with a standard of selenomethionine with natural isotopic composition.

Assessed value:	
^{76} Se Isotopic Abundance	99.8 +0.2 / -3.1 m/m %

Fruit and Vegetable Products

Kale powder - nitrate
LGC7114

Batch: 001
Unit size: 10 g

Dry, ground kale powder was sourced from a commercial supplier. The bulk material was combined, mixed and bottled in 10 g portions. The bottled material was irradiated using gamma irradiation at a dose of ~23 kGy.

This reference material is primarily intended for use in the development, validation or quality control of analytical methods for the determination of nitrate in green vegetables. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Assessed value:	
Nitrate as (NO_3)	3198 ± 79 mg/kg

Tomato paste - metals
LGC7161

Batch: 002
Unit size: 50 g

A commercial tomato paste was spiked with appropriate quantities of cadmium, iron, lead, and tin, taking into account the base levels of the purchased material. The target concentrations of cadmium, lead and tin in the tomato paste were based on Commission Regulation (EC) No 1881/2006 and within the range of LGC's CMCs. The material was mixed thoroughly and dispensed in 50 – 55 g portions. The filled bottles were irradiated at a dose of 14.0 to 18.7 kGy.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of cadmium, iron, lead and tin in a fruit or vegetable-based material. It may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Cadmium	0.1113 ± 0.0030 mg/kg	Lead	0.3224 ± 0.0089 mg/kg
Iron	40.63 ± 0.67 mg/kg	Tin	215.8 ± 1.8 mg/kg

Additional information:	
Total Solids	291 g/kg

Strawberry leaves
LGC7162

Batch: 001
Unit size: 20 g

The raw material was collected from a private strawberry farm in the Czech Republic. The leaves were cut and then jet milled to pass a 250 µm nylon sieve. The resulting powder was homogenised for 72 hours before bottling in 20 g portions in 60 mL bottles. The bottled material was radiation sterilised by ^{60}Co at a dose of 25 kGy.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of elements in vegetation. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

Certified values:			
Calcium	1.53 ± 0.07 g/100 g	Phosphorus	0.260 ± 0.023 g/100 g
Magnesium	0.377 ± 0.017 g/100 g	Potassium	1.96 ± 0.10 g/100 g
Nitrogen	2.01 ± 0.06 g/100 g	Sulfur	0.174 ± 0.016 g/100 g

Certified values:			
Arsenic	0.28 ± 0.07 mg/kg	Manganese	171 ± 10 mg/kg
Barium	107 ± 10 mg/kg	Mercury	0.027 ± 0.006 mg/kg
Cadmium	0.17 ± 0.04 mg/kg	Molybdenum	0.32 ± 0.08 mg/kg
Cobalt	0.47 ± 0.11 mg/kg	Nickel	2.6 ± 0.7 mg/kg
Chromium	2.15 ± 0.34 mg/kg	Strontium	64 ± 6 mg/kg
Iron	818 ± 48 mg/kg	Zinc	24 ± 5 mg/kg
Lead	1.8 ± 0.4 mg/kg		

Indicative values:			
Total aluminium	0.1 g/100 g	Total sodium	210 mg/kg
Extractable aluminium	0.06 g/100 g	Extractable sodium	65 mg/kg
Copper	10 mg/kg	Selenium	0.04 mg/kg
Lithium	0.7 mg/kg	Vanadium	1.8 mg/kg

Poultry feed
LGC7173

Batch: 004
Unit size: 50 g

A sample of poultry feed, purchased from a commercial animal feed manufacturer, was ground to pass a 1 mm sieve, thoroughly mixed and vacuum-sealed in sachets as 50 g portions.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of proximates and elements in animal feeding stuffs. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Assessed values:			
Moisture	10.70 ± 0.36 g/100 g	Iron	148 ± 27 mg/kg
Nitrogen	2.559 ± 0.062 g/100 g	Magnesium	2037 ± 81 mg/kg
Oil	4.95 ± 0.23 g/100 g	Manganese	90 ± 13 mg/kg
Ash	7.224 ± 0.091 g/100 g	Phosphorus	6590 ± 370 mg/kg
Crude Fibre	3.75 ± 0.38 g/100 g	Potassium	7480 ± 310 mg/kg
Calcium	17800 ± 1200 mg/kg	Sodium	1180 ± 130 mg/kg
Copper	14.0 ± 4.0 mg/kg	Zinc	78 ± 15 mg/kg

Indicative values:			
Starch	41 g/100 g	Chloride	0.23 g/100 g

Processed Food Products

Wheat flour selenium and selenomethionine
ERM®-BC210

Batch: a
Unit size: 15 g

Selenised wheat was obtained from a UK university. The grain was cleaned with water, milled at a temperature between 18 °C and 20 °C, and 60 % relative humidity, and sieved twice to a final particle size of 140 µm. The bulk was thoroughly homogenised, freeze dried to a moisture approximately 5 % (m/m) and sub-sampled in portions of 15g. The bottles material was irradiated at a dose of 25-40 kGy.

The primary use of this certified reference material is for the validation of methods for the determination of selenium and selenomethionine in food materials and dietary supplements. The material may also be applicable to other similar matrices where suitable reference materials are not available.

4005

Certified values:			
Total selenium	17.23 ± 0.91 mg/kg	Selenomethionine	27.4 ± 2.6 mg/kg

Sugar confectionery - sugars
ERM®-BD016

Batch: a
Unit size: 14 g

A commercial supply of sugar confectionery was ground, thoroughly mixed and dispensed as 14 g units into 30 mL amber glass bottles with tamper evident caps.

This material is intended for use in development, validation or quality control of analytical methods for the determination of sugars in foodstuffs. The material may also be applicable to other similar matrices where suitable reference materials are not available.

4005

Certified values:			
Glucose	5.74 ± 0.48 g/100 g	Sucrose	44.8 ± 1.4 g/100 g
Fructose	2.89 ± 0.30 g/100 g	Maltose	17.7 ± 1.1 g/100 g

Yeast – total chromium and Cr(III)
ERM®-BD213

Batch: a
Unit size: 7 g

The powder form of a commercially available food supplement of chromium-enriched yeast was donated by PharmaNord ApS (Vejle, Denmark). The bulk was dispensed as 7 g units in 15 mL amber glass bottles sealed by means of tamper-proof polycone-lined polyethylene screw caps.

The primary intended use of this reference material is for the validation and performance monitoring of new and existing methods for the quantification of total chromium in yeast. The material can also be used for the performance monitoring of procedures for the quantification of chromium species in yeast. The material may also be applicable to other similar matrices where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Total chromium	305.5 ± 5.0 mg/kg

Indicative value:	
Cr(III)	302 ± 47 mg/kg

Chocolate confectionery
LGC7016

Batch: 003
Unit size: 15 g

Commercially obtained milk chocolate was ground to pass a 1 mm sieve, thoroughly mixed and sub-sampled in screw-capped amber bottles as 15 g units. The units were irradiated at a dose level of 5 - 15 kGy to prolong the shelf-life.

This material is intended for use in development, validation or quality control of analytical methods for the determination of constituents in chocolate.

UKAS REFERENCE MATERIALS
4005

Assessed values:			
Lactose	7.06 ± 0.96 g/100 g	Butyric acid in fat	0.677 ± 0.071 g/100 g
Sucrose	46.5 ± 2.3 g/100 g	Nitrogen	1.274 ± 0.024 g/100 g
Total fat	29.64 ± 0.35 g/100 g		

Indicative values:			
Fructose	0.2 g/100 g	Glucose	0.2 g/100 g

Calculated values:			
Milk fat in fat	19.6 g/100 g	Milk fat in sample	5.8 g/100 g

Additional information: *Fat content by*	
Acid digestion followed by solvent extraction	29.6 g/100 g
NMR	31.9 g/100 g
Soxhlet	29.6 g/100 g
Alkaline digestion followed by solvent extraction	28.9 g/100 g

Sweet digestive biscuit
LGC7103

Batch: 003
Unit size: 48 g

A commercial supply of wholemeal digestive biscuits was ground, thoroughly mixed and dispensed in 48 g units into foil pouches and vacuum sealed.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of proximates, sugars and elements in food.

UKAS REFERENCE MATERIALS
4005

Assessed values:			
Moisture	2.88 ± 0.76 g/100 g	Ash at 550°C	1.599 ± 0.077 g/100 g
Nitrogen	1.073 ± 0.032 g/100 g	Sucrose	13.89 ± 0.53 g/100 g
Total Fat	21.17 ± 0.45 g/100 g	Chloride	0.302 ± 0.018 g/100 g
Sodium	5010 ± 400 mg/kg	Phosphorus	900 ± 140 mg/kg
Potassium	1580 ± 170 mg/kg	Manganese	5.49 ± 0.60 mg/kg
Magnesium	254 ± 59 mg/kg	Zinc	6.41 ± 0.99 mg/kg

Indicative values:			
Glucose	0.23 g/100 g	Calcium	480 mg/kg
Fructose	0.25 g/100 g	Copper	1.5 mg/kg
Starch	48 g/100 g	Iron	18 mg/kg

Chocolate mousse dessert – peanut protein
LGCQC101-KT

Batch: 001
Unit size: 2 x 5 g

The materials were prepared by mixing commercial, dry food ingredients to make a paste. Peanut protein was added to LGCQC1012 using a commercial defatted peanut flour (57 g/100 g protein content). Each material was divided into foil sachets with low gas-permeability in 5 g portions, and nitrogen flushed before sealing.

The materials are intended for use as quality control materials for analytical methods used in the determination of peanut protein in foods. They are not suitable for establishing method bias.

Indicative values:	
LGCQC1011	<1 mg/kg (negative control)
LGCQC1012	10 mg/kg (positive control)

Additional Information:	
LGCQC1012 (peanut concentration)	13 mg/kg
LGCQC1012 (peanut protein content)	3 mg/kg

Peanut flour
LGCQC1020

Batch: 001
Unit size: 1 g

The material is a commercially light roasted, partially defatted, peanut flour. The flour was manufactured by the Golden Peanut Company (LLC, Alpharetta, USA) and was obtained from Byrd Mill (Ashland, USA).

This material is intended for use as a quality control material for analytical methods used in the investigation of food samples for peanut and peanut protein. As the material is assigned indicative values only, it is not suitable for establishing method bias.

Indicative values:			
Total nitrogen	9.1 g/100 g	Water	4.8 g/100 g

Calculated values:	
Protein	49.7 g/100 g

Processed meat - proximates, chloride, hydroxyproline & metals
LGC7155

Batch: 003
Unit size: 50 g

The material was prepared using a commercial pork-based processed meat. After thorough mincing and mixing, it was sealed in sachets in 50 g portions and irradiated to sterilise using a dose of 18 kGy.

The material is intended for use in the development, validation or quality control of analytical methods for the determination of major constituents and selected additional analytes in meat and meat products. The material may also be applicable to other similar matrices and procedures where more closely matched reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified values:			
Moisture	55.13 ± 0.43 g/100 g	Hydroxyproline	0.359 ± 0.025 g/100 g
Nitrogen	2.202 ± 0.046 g/100 g	Magnesium	11.02 ± 0.73 mg/100 g
Total fat	24.23 ± 0.59 g/100 g	Phosphorus	236 ± 13 mg/100 g
Ash	3.229 ± 0.059 g/100 g	Potassium	187.4 ± 8.3 mg/100 g
Chloride	1.377 ± 0.072 g/100 g	Sodium	1110 ± 63 mg/100 g

Indicative values:			
Calcium	8 mg/100g	Nitrate (as NO_3)	0.6 to 25.1 mg/kg
Iron	0.6 mg/100g		

Calculated value:	
Salt (NaCl)	2.27 ± 0.12 g/100 g

Allergen reference material - skimmed milk powder
LGC7421

Batch: 001
Unit size: 1.1 g

The raw material was sourced by the University of Manchester from a reputable supplier to minimise the risk of contamination, and was described as organic skimmed milk powder, produced in Austria from Austrian or EU pasteurised, skimmed milk. The skimmed milk powder was packaged as received without further processing by combining and mixing before weighing in (1.1 ± 0.1) g portions into amber glass vials. The vials were closed under argon with a rubber stopper and a crimp cap. Each unit was sealed inside a metallised sachet to minimise changes in water content.

The material is intended for use in (a) method development: e.g. in the generation of allergen kit calibrator extract solutions, (b) method validation: e.g. in the generation of external check calibrator extract solutions for allergen measurements, (c) recovery estimates: to spike food matrices either by way of an extract, but preferably by addition of the raw material itself to assess allergen recovery in real life situations for which no other RMs are available.

LGC7421 can also be used in the quality control of methods for the determination of nitrogen and water in food ingredients and processed food products.

4005

Assessed values:			
Nitrogen	5.40 ± 0.17 g/100 g	Water	4.22 ± 0.40 g/100 g

Allergen reference material - egg white powder
LGC7422

Batch: 001
Unit size: 1.1 g

The raw material was sourced by the University of Manchester from a reputable supplier to minimise the risk of contamination and was described as 'Origin: Austria'. The hens' egg white powder was packaged as received by combining and mixing before weighing in (1.1 ± 0.1) g portions into amber glass vials. The vials were closed under argon with a rubber stopper and a crimp cap. Each unit was sealed inside a metallised sachet to minimise changes in water content.

The material is intended for use in (a) method development: e.g. in the generation of allergen kit calibrator extract solutions, (b) method validation: e.g. in the generation of external check calibrator extract solutions for allergen measurements, (c) recovery estimates: to spike food matrices either by way of an extract, but preferably by addition of the raw material itself to assess allergen recovery in real life situations for which no other RMs are available.

LGC7422 can also be used in the quality control of methods for the determination of nitrogen and water in food ingredients and processed food products.

4005

Assessed values:			
Nitrogen	13.49 ± 0.41 g/100 g	Water	6.01 ± 0.53 g/100 g

Allergen reference material - almond powder LGC7424

Batch: 001
Unit size: 1.1 g

The raw material was sourced by the University of Manchester from a reputable supplier to minimise the risk of contamination, and was described as: 'Origin: California, USA. Blanched ground almonds. The almond powder was packaged as received by combining and mixing before weighing in (1.1 ± 0.1) g portions into amber glass vials. The vials were closed under argon with a rubber stopper and a crimp cap. Each unit was sealed inside a metallised sachet to minimise changes in water content.

The material is intended for use in (a) method development: e.g. in the generation of allergen kit calibrator extract solutions, (b) method validation: e.g. in the generation of external check calibrator extract solutions for allergen measurements, (c) recovery estimates: to spike food matrices either by way of an extract, but preferably by addition of the raw material itself to assess allergen recovery in real life situations for which no other RMs are available.

LGC7424 can also be used in the quality control of methods for the determination of nitrogen and water in food ingredients and processed food products.

UKAS REFERENCE MATERIALS
4005

Assessed values:			
Nitrogen	4.19 ± 0.13 g/100 g	Water	4.22 ± 0.45 g/100 g

Allergen reference material - hazelnut powder – partially defatted LGC7425

Batch: 001
Unit size: 1.1 g

The raw material was sourced by the University of Manchester from a reputable supplier to minimise the risk of contamination, and was described as follows: 'Origin: South Island New Zealand *Corylus avellana*. Fine ground flour produced from the "cake" after the oil (fats) have been cold pressed out of raw hazelnut'. The hazelnut powder was packaged as received without further processing by combining and mixing before weighing in (1.1 ± 0.1) g portions into amber glass vials. The vials were closed under argon with a rubber stopper and a crimp cap. Each unit was sealed inside a metallised sachet to prevent changes in water content.

The material is intended for use in (a) method development: e.g. in the generation of allergen kit calibrator extract solutions, (b) method validation: e.g. in the generation of external check calibrator extract solutions for allergen measurements, (c) recovery estimates: to spike food matrices either by way of an extract, but preferably by addition of the raw material itself to assess allergen recovery in real life situations for which no other RMs are available.

LGC7425 can also be used in the quality control of methods for the determination of nitrogen and water in food ingredients and processed food products.

UKAS REFERENCE MATERIALS
4005

Assessed values:			
Nitrogen	4.99 ± 0.16 g/100 g	Water	8.6 ± 1.1 g/100 g

Allergen reference material - walnut powder – partially defatted LGC7426

Batch: 001
Unit size: 1.1 g

The raw material was sourced by the University of Manchester from a reputable supplier to minimise the risk of contamination and was described as 'Origin: Italy. *Juglans regia* cultivar Lara. Lipid content 27 g/100g'.

The walnut powder was prepared by grinding using a centrifugal mill to pass a 0.5 mm sieve. The sieved material was combined and mixed before weighing in (1.1 ± 0.1) g portions into amber glass vials. The vials were closed under argon with a rubber stopper and a crimp cap. Each unit was sealed inside a metallised sachet to minimise changes in water content.

The material is intended for use in (a) method development: e.g. in the generation of allergen kit calibrator extract solutions, (b) method validation: e.g. in the generation of external check calibrator extract solutions for allergen measurements, (c) recovery estimates: to spike food matrices either by way of an extract, but preferably by addition of the raw material itself to assess allergen recovery in real life situations for which no other RMs are available.

LGC7426 can also be used in the quality control of methods for the determination of nitrogen and water in food ingredients and processed food products.

UKAS REFERENCE MATERIALS
4005

Assessed values:			
Nitrogen	6.15 ± 0.19 g/100 g	Water	6.11 ± 0.65 g/100 g

Allergen kit – milk, egg, almond, hazelnut and walnut LGC746-KT

Batch: 001
Unit size: Kit

Each kit contains:
•One vial of each:
LGC7421 Skimmed milk powder
LGC7422 Egg white powder
LGC7424 Almond powder
LGC7425 Hazelnut powder – partially defatted
LGC7426 Walnut powder – partially defatted

•Five bottles of:
LGC7461 Chocolate paste – no added allergenic ingredients.
LGC7462 Chocolate paste with added allergenic ingredients

The allergen food ingredients (LGC7421, LGC7422, LGC7424, LGC7425 and LGC7426) are intended for use in method development: e.g. allergen kit calibrator extract solutions, method validation: e.g. external check calibrator extract solutions, and recovery estimates e.g. by spiking food matrices for which no RMs are available. They can also be used in the quality control of methods for the determination of nitrogen and water in food ingredients and processed food products.

UKAS REFERENCE MATERIALS
4005

The blank matrix (LGC7461) is intended for use (a) as a 'no-template' control to provide assurance of absence of in-lab allergen cross contamination (either environmentally, from personnel, or in reagents) and (b) a material to assist method limit of detection calculation (as 3.3 times the standard deviation of a 'blank' dataset).

The incurred matrix (LGC7462) is intended for use (a) to optimise analytical recovery from a chocolate-type matrix, (b) inform risk assessors of the possible 'true' estimate of allergen in a questioned product, and(c) in checking in-house quality control materials.

Assessed values:			
LGC7421	Skimmed milk powder	Nitrogen	5.40 ± 0.17 g/100 g
		Water	4.22 ± 0.40 g/100 g
LGC7422	Egg white powder	Nitrogen	13.49 ± 0.41 g/100 g
		Water	6.01 ± 0.53 g/100 g
LGC7424	Almond powder	Nitrogen	4.19 ± 0.13 g/100 g
		Water	4.22 ± 0.45 g/100 g
LGC7425	Hazelnut powder- partially defatted	Nitrogen	4.99 ± 0.16 g/100 g
		Water	8.6 ± 1.1 g/100 g
LGC7426	Walnut powder- partially defatted	Nitrogen	6.15 ± 0.19 g/100 g
		Water	6.11 ± 0.65 g 100 g

Assessed values:			
LGC7461	Chocolate paste-no added allergenic ingredients	Milk protein	<0.05 mg/kg
		Egg white protein	<0.05 mg/kg
		Hazelnut protein	<0.04 mg/kg
LGC7462	Chocolate paste with added allergenic ingredients	Milk protein	10.0 ± 1.8 mg/kg
		Egg white protein	10.0 ± 1.5 mg/kg

Indicative values:			
LGC7462	Chocolate paste with added allergenic ingredients	Almond protein	9.7 ± 1.9 mg/kg
		Hazelnut protein	9.8 +10.5/-5.1 mg/kg
		Walnut protein	10.0 ± 2.3 mg/kg

Calculated values: *Protein content*	
LGC7421 Skimmed milk powder	34.4 ± 1.1 g/100g
LGC7422 Egg white powder	84.3 ± 2.6 g/100g
LGC7424 Almond powder	21.24 ± 0.68 g/100g
LGC7425 Hazelnut powder – partially defatted	26.45 ± 0.85 g/100g
LGC7426 Walnut powder – partially defatted	32.6 ± 1.0 g/100g

Industrial

Enthalpy of Fusion Materials

Indium
LGC2601

Batch: 003
Unit size: 0.5 g

A suitable supply of indium was obtained with a nominal purity of 99.9999 mol %. The material was dispensed into units weighing > 0.5 g in amber screw-capped glass vials.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

UKAS REFERENCE MATERIALS
4005

Certified values:	
Enthalpy of fusion	28.69 ± 0.09 J/g
Melting temperature	156.60 ± 0.07 °C

Naphthalene
LGC2603

Batch: 002
Unit size: 0.5 g

A suitable supply of pure material was obtained and purified by zone refining. The material was dispensed as 0.5 g portions into amber glass vials.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	18.923 ± 0.083 kJ/mol
Melting temperature	80.25 ± 0.03 °C

Benzil
LGC2604

Batch: 002
Unit size: 0.5 g

The bulk material was purified by repeated fractional freezing from the melt. It was ground and sieved to particles less or equal to 710 µm and was homogenised by tumbling and rolling on a laboratory mill. It was then sub-divided, by riffling, into a number of sub-fractions. From those sub-fractions, 0.5 g aliquots were transferred into amber glass vials.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	23.26 ± 0.10 kJ/mol
Melting temperature	94.85 ± 0.02 °C

Acetanilide
LGC2605

Batch: 005
Unit size: 0.5 g

A suitable supply of pure material was obtained. The material was dispensed as 0.5 g portions into amber glass vials. Differential scanning calorimetry (DSC) and adiabatic calorimetry were used to access the purity of the material; the measured mole fraction of purity was 99.98 % and 99.996 % respectively.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	21.793 ± 0.085 kJ/mol
Melting temperature	114.34 ± 0.02 °C

Benzoic acid
LGC2606

Batch: 002
Unit size: 0.5 g

The bulk material was purified by repeated fractional freezing from the melt. It was ground and sieved to particles less than or equal to 710 µm and was homogenised by tumbling and rolling on a laboratory mill. It was then sub-divided, by riffling, into a number of sub-fractions. From those sub-fractions, 0.5 g aliquots were transferred into amber glass vials. Using adiabatic calorimetry, the measured mole fraction of purity was 99.994 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	17.98 ± 0.04 kJ/mol
Melting temperature	122.35 ± 0.03 °C

Diphenylacetic acid
LGC2607

Batch: 006
Unit size: 0.5 g

A suitable supply of pure material was obtained. It was dispensed as 0.5 g portions into amber glass vials. The purity of the material was assessed by adiabatic calorimetry; the measured mole fraction was 99.98 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	31.16 ± 0.13 kJ/mol
Melting temperature	147.19 ± 0.03 °C

Lead
LGC2608

Batch: 001
Unit size: 0.5 g

A suitable supply of pure material was obtained. The material was dispensed as 0.5 g portions into amber glass vials. Using adiabatic calorimetry, the measured mole fraction was 99.9995 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	4.765 ± 0.012 kJ/mol
Melting temperature	327.47 ± 0.02 °C

Tin
LGC2609

Batch: 002
Unit size: 0.5 g

A suitable supply of tin, with a nominal purity of 99.9999 %, was obtained from a commercial supplier in pellet form. The material was dispensed into units weighing > 0.5 g in amber screw-capped glass vials, with each vial containing 3 – 4 pellets.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

UKAS REFERENCE MATERIALS
4005

Certified values:	
Enthalpy of fusion	60.27 ± 0.16 J/g
Melting temperature	231.93 ± 0.08 °C

Biphenyl
LGC2610

Batch: 001
Unit size: 0.5 g

A suitable supply of biphenyl was obtained and purified by repeated fractional freezing from the melt. The purified material was ground and sieved to a particle size of ≤ 710 µm and was homogenised by tumbling and rolling on a laboratory mill. The material was sub-sampled as 0.5 g portion into amber-glass vials. Using adiabatic calorimetry, the measured mole fraction was 99.992 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	18.60 ± 0.11 kJ/mol
Melting temperature	68.93 ± 0.02 °C

Zinc
LGC2611

Batch: 001
Unit size: 0.5 g

A suitable supply of pure material was obtained. The material was dispensed as 0.5 g portions into amber glass vials. Using adiabatic calorimetry, the measured mole fraction was 99.99998 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	7.103 ± 0.034 kJ/mol
Melting temperature	419.53 ± 0.02 °C

Aluminium
LGC2612

Batch: 001
Unit size: 0.5 g

A suitable supply of pure material was obtained. The material was dispensed as 0.5 g portions into amber glass vials. Using adiabatic calorimetry, the measured mole fraction was 99.9995 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	10.827 ± 0.052 kJ/mol
Melting temperature	660.33 ± 0.05 °C

Phenyl Salicylate
LGC2613

Batch: 001
Unit size: 0.5 g

A commercial supply of phenyl salicylate was obtained and purified by fractional crystallisation. The purified material was ground to pass a 710 µm sieve, dried under vacuum and then dispensed as 0.5 g portions into amber glass vials. Using adiabatic calorimetry, the measured mole fraction was 99.994 %.

This material is intended for the calibration of differential scanning calorimeters and similar instruments.

Certified values:	
Enthalpy of fusion	19.18 ± 0.08 kJ/mol
Melting temperature	41.79 ± 0.03 °C

Flash Point Materials

_n_-Nonane
ERM®-FC032

Batch: a
Unit size: 100 mL

A supply of *n*-nonane, of nominally 99 % purity, was obtained from a commercial supplier. 100 mL portions of this solution were sub-sampled into amber glass bottles fitted with PTFE-coated chlorobutyl septa and aluminium tear seals.

This material is intended for use in validation work, or in quality control procedures, for the determination of non-equilibrium flashpoint determined by the Abel closed cup method as described in the Institute of Petroleum Standard IP170/95,and also published as British Standard BS2000:Part 170:1995.

4005

Certified values:	
Non-equilibrium flashpoint	32.5 ± 0.5 °C

_n_-Decane
ERM®-FC033

Batch: a
Unit size: 100 mL

A supply of *n*-decane, of nominally 99 % purity, was obtained from a commercial supplier. 100 mL portions of this solution were sub-sampled into amber glass bottles fitted with PTFE-coated chlorobutyl septa and aluminium tear seals.

This material is intended for use in validation work, or as a quality control procedure, for the determination of non-equilibrium flashpoint determined by the Abel closed cup method as described in the Institute of Petroleum Standard IP170/95, and also published as British Standard BS2000: Part 170:1995.

4005

Certified values:	
Non-equilibrium flashpoint	50.0 ± 0.9 °C

Gypsum Materials

Natural Gypsum – major oxides and trace elements
LGC2700

Batch: 001
Unit size: 75 g

Natural gypsum, in the form of small chippings, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was prepared using a jaw crusher fitted with hardened chromium steel jaws to provide a powder, nominally 3 mm maximum diameter. The crushed material was dried at 30 °C in a calibrated drying oven. After drying, the material was milled until the powder passed a calibrated 75 µm stainless steel sieve mesh. The material was sub-sampled in aliquots of approximately 75 g into screw capped amber glass bottles.

UKAS REFERENCE MATERIALS
4005

This reference material is intended for use in the validation of new methods, and for monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes.

Assessed values:	
Aluminium (as Al_2O_3)	2.872 ± 0.056 g/100 g
Calcium (as CaO)	26.31 ± 0.36 g/100 g
Iron (as Fe_2O_3)	1.150 ± 0.062 g/100 g
Phosphorus (as P_2O_5)	0.0367 ± 0.0052 g/100 g
Potassium (as K_2O)	0.830 ± 0.024 g/100 g
Silicon (as SiO_2)	10.93 ± 0.22 g/100 g
Sodium (as Na_2O)	0.183 ± 0.018 g/100 g
Sulfur (as SO_3)	34.67 ± 0.60 g/100 g
Titanium (as TiO_2)	0.1480 ± 0.0075 g/100 g
Loss on ignition	19.78 ± 0.71 g/100 g
Nickel	9.5 ± 2.0 mg/kg
Vanadium	21.3 ± 3.2 mg/kg
Zinc	19.3 ± 3.8 mg/kg

Indicative values:			
Magnesium (as MgO)	3.2 g/100 g	Cobalt	3.8 mg/kg
Manganese (as MnO)	0.030 g/100 g	Copper	5.0 mg/kg
Strontium (as SrO)	0.20 g/100 g	Lead	4.2 mg/kg
Arsenic	2.4 mg/kg	Thallium	0.18 mg/kg
Barium	170 mg/kg	Mercury	< 2 µg/kg
Chromium	15 mg/kg		

Natural Anhydrite – major oxides and trace elements
LGC2701

Batch: 001
Unit size: 75 g

Anhydrite, in the form of coarse chippings, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was prepared using a jaw crusher fitted with hardened chromium steel jaws to provide a powder, nominally 3 mm maximum diameter. The crushed material was dried at 30 °C in a calibrated drying oven. After drying, the material was ball-milled until the powder passed a calibrated 75 µm stainless steel sieve mesh. The material was sub-sampled in aliquots of approximately 75 g into screw capped amber glass bottles.

4005

This reference material is intended for use in the validation of new methods, and for monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes.

Assessed values:	
Aluminium (as Al_2O_3)	0.045 ± 0.029 g/100 g
Calcium (as CaO)	40.82 ± 0.67 g/100 g
Iron (as Fe_2O_3)	0.0280 ± 0.0096 g/100 g
Phosphorus (as P_2O_5)	0.0069 ± 0.0040 g/100 g
Potassium (as K_2O)	0.0105 ± 0.0050 g/100 g
Silicon (as SiO_2)	0.112 ± 0.044 g/100 g
Sulfur (as SO_3)	57.8 ± 1.2 g/100 g
Loss on Ignition	0.452 ± 0.093 g/100 g

Indicative values:			
Magnesium (as MgO)	0.080 g/100 g	Cobalt	0.35 mg/kg
Manganese (as MnO)	0.0025 g/100 g	Copper	3.5 mg/kg
Sodium (as Na_2O)	0.023 g/100 g	Lead	1.6 mg/kg
Strontium (as SrO)	0.18 g/100 g	Nickel	1.9 mg/kg
Titanium (as TiO_2)	0.0066 g/100 g	Vanadium	2.6 mg/kg
Arsenic	0.16 mg/kg	Zinc	1.6 mg/kg
Chromium	4.4 mg/kg	Mercury	< 3 µg/kg

Blended Gypsum – major oxides and trace elements
LGC2702

Batch: 001
Unit size: 75 g

Blended gypsum, in the form of chippings and powders, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was dried at 30 °C in a calibrated drying oven, then ball-milled in a cleaned 250 mL capacity agate milling vessel until the powder passed a calibrated 75 µm stainless steel sieve mesh. The material was sub-sampled in aliquots of approximately 75 g into screw capped amber glass bottles.

UKAS REFERENCE MATERIALS
4005

This reference material is intended for use in the validation of new methods, and for monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes.

Certified value:	
Mercury	420 ± 35 µg/kg

Assessed values:	
Aluminium (as Al_2O_3)	1.121 ± 0.038 g/100 g
Calcium (as CaO)	31.47 ± 0.65 g/100 g
Iron (as Fe_2O_3)	0.392 ± 0.036 g/100 g
Phosphorus (as P_2O_5)	0.0177 ± 0.0079 g/100 g
Potassium (as K_2O)	0.196 ± 0.013 g/100 g
Silicon (as SiO_2)	3.01 ± 0.12 g/100 g
Sulfur (as SO_3)	41.26 ± 0.69 g/100 g
Titanium (as TiO_2)	0.0550 ± 0.0049 g/100 g
Loss on ignition	21.32 ± 0.21 g/100 g
Lead	8.4 ± 2.1 mg/kg
Nickel	4.8 ± 1.4 mg/kg
Vanadium	10.5 ± 1.5 mg/kg
Zinc	11.7 ± 3.1 mg/kg

Indicative values:			
Magnesium (as MgO)	0.92 g/100 g	Chromium	9.0 mg/kg
Manganese (as MnO)	0.011 g/100 g	Cobalt	1.8 mg/kg
Sodium (as Na_2O)	0.031 g/100 g	Copper	4.4 mg/kg
Strontium (as SrO)	0.13 g/100 g	Selenium	5.1 mg/kg
Arsenic	2.4 mg/kg	Thallium	0.18 mg/kg
Barium	43 mg/kg		

Desulfurised gypsum – major oxides and trace elements
LGC2703

Batch: 001
Unit size: 75 g

Desulfurised (DSG) gypsum, in powder form, was obtained from British Gypsum (East Leake, Leicestershire, UK). The material was dried at 30 °C in a calibrated drying oven. After drying the material was ball-milled in a cleaned 250 mL capacity agate milling vessel until the powder passed a calibrated 75 µm stainless steel sieve mesh. The material was sub-sampled in aliquots of approximately 75 g into screw capped amber glass bottles.

4005

This reference material is intended for use in the validation of new methods, and monitoring the performance of methods commonly used in laboratories to analyse samples of gypsum for quality control and environmental monitoring purposes.

Certified value:	
Mercury	646 ± 42 µg/kg

Assessed values:	
Aluminium (as Al_2O_3)	0.459 ± 0.031 g/100 g
Calcium (as CaO)	32.45 ± 0.86 g/100 g
Iron (as Fe_2O_3)	0.142 ± 0.023 g/100 g
Phosphorus (as P_2O_5)	0.0120 ± 0.0042 g/100 g
Potassium (as K_2O)	0.0340 ± 0.0075 g/100 g
Silicon (as SiO_2)	0.90 ± 0.12 g/100 g
Sulfur (as SO_3)	44.84 ± 0.55 g/100 g
Titanium (as TiO_2)	0.0325 ± 0.0046 g/100 g
Loss on ignition	21.21 ± 0.35 g/100 g
Nickel	3.2 ± 1.3 mg/kg
Vanadium	6.0 ±1.8 mg/kg
Zinc	9.5 ± 2.0 mg/kg

Indicative values:			
Magnesium (as MgO)	0.16 g/100 g	Cobalt	0.92 mg/kg
Manganese (as MnO)	0.0040 g/100 g	Copper	2.8 mg/kg
Sodium (as Na_2O)	0.022 g/100 g	Lead	3.6 mg/kg
Strontium (as SrO)	0.012 g/100 g	Selenium	11 mg/kg
Arsenic	3.5 mg/kg	Thallium	0.076 mg/kg
Chromium	7.9 mg/kg		

Melting Point Materials

Carbazole
ERM®- FC021

Batch: a
Unit size: 0.25 g

A batch of carbazole was obtained from a commercial source and then purified by recrystallisation and vacuum sublimation. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.88 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 **0423**

Certified values:	
Melting Temperature	245.41 ± 0.29 °C

_p_-Anisic acid
ERM®- FC023

Batch: a
Unit size: 0.25 g

A batch of *p*-anisic acid was obtained from a commercial source, ground to pass through a 710 µm sieve, mixed and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.97 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 **0423**

Certified values:	
Melting Temperature	183.50 ± 0.31 °C

Diphenylacetic acid
ERM®- FC024

Batch: a
Unit size: 0.25 g

A batch of diphenylacetic acid was obtained from a commercial source, ground to pass through a 710 µm sieve, mixed and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.96 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 **0423**

Certified values:	
Melting Temperature	147.26 ± 0.31 °C

Benzoic acid
LGC2405

Batch: 007
Unit size: 0.25 g

A batch of benzoic acid, obtained from a commercial source, was ultra-purified by fractional crystallisation. The material was ground to pass through a 710 µm sieve, homogenised by rolling and tumbling, and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.97 mol %. The identity of benzoic acid was confirmed by qualitative NMR.

The primary use of this reference material is in calibrating and checking apparatus used for the determining melting points of samples in glass capillary tubes.

4005

Certified values:	
Melting Temperature	122.35 ± 0.12 °C

2-Chloroanthraquinone
LGC2408

Batch: 007
Unit size: 0.25 g

A batch of 2-chloroanthraquinone was obtained from a commercial source then purified by recrystallisation, dried under vacuum, ground to pass a 710 µm sieve and mixed. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.96 mol %. The identity of the material was confirmed by qualitative NMR.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005

Certified values:	
Melting Temperature	209.73 ± 0.14 °C

Acetanilide
ERM®- FC026

Batch: a
Unit size: 0.25 g

A batch of acetanilide, obtained from a commercial source, was ground to pass through 710 µm sieve, mixed and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.95 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 0423

Certified values:	
Melting Temperature	114.19 ± 0.28 °C

Benzil
ERM®- FC027

Batch: a
Unit size: 0.25 g

A batch of benzil was obtained from a commercial source, ground to pass through a 710 µm sieve, mixed and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.96 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 0423

Certified values:	
Melting Temperature	94.90 ± 0.24 °C

Naphthalene
ERM®- FC028

Batch: a
Unit size: 0.25 g

A batch of naphthalene was obtained from a commercial source, ground to pass a 710 µm sieve, mixed and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.92 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 0423

Certified values:	
Melting Temperature	80.34 ± 0.22 °C

4-Nitrotoluene
ERM®- FC029

Batch: a
Unit size: 0.25 g

A batch of 4-nitrotoluene, obtained from a commercial source, was purified by fractional crystallisation. The material was ground to pass through a 710 µm sieve, homogenised by rolling and tumbling, and dried. The purity of the material was checked using differential scanning calorimetry (DSC) and found to be 99.93 mol %.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 0423

Certified values:	
Melting Temperature	51.66 ± 0.18 °C

Phenyl salicylate
ERM®- FC030

Batch: a
Unit size: 0.25 g

A batch of phenyl salicylate was obtained from a commercial source. The purity of the material was assessed using HPLC and found to be (99.92 + 0.08/ - 0.4) mass % at the 95 % confidence level. This was confirmed by DSC. The identity was confirmed by NMR. The water content was assessed using Karl Fischer Titration and residual solvents using TGA.

This material is intended for use in checking and calibrating apparatus used for the determination of melting points of samples in glass capillary tubes.

4005 0423

Certified values:	
Melting Temperature	41.82 ± 0.30 °C

Miscellaneous Materials

All Miscellaneous Materials

Solvent Yellow 124
(SY 124)
ERM®-AC316

Batch: a
Unit size: 0.2 g

A batch of Solvent Yellow 124 (SY124) was obtained from a commercial source and purified by column chromatography.The purified material was homogenised in propan-2-ol by stirring for 2 hours at room temperature. The solvent was subsequently removed by evaporation using a rotary evaporator and its purity was determined by HPLC-UV and GC-FID.

This material is intended for use as an analytical standard for the determination of SY124 in fuel.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Purity	95.0 ± 1.2 mass %

Petrol – sulfur
ERM®-EF212

Batch: a
Unit size: 19 mL

This material is a petroleum product containing sulfur in its natural forms, closely matching commercial petrol fuels. The absence of artificially added sulfur species avoids any effects arising from species specific analytical methods. A suitable supply of petrol was obtained in bulk from BP Oil International. The material was dispensed into 19 mL portions into clear borosilicate glass ampoules.

This material is intended for use in the development, validation or quality control of analytical methods for the determination of sulfur in petrol. The material may also be applicable to other similar matrices and procedures where more suitable reference materials are not available.

UKAS REFERENCE MATERIALS
4005

Certified value:	
Sulfur (mass fraction)	20.2 ± 1.1 mg/kg

Electronic cigarette liquid - nicotine & water ERM®-DZ002

Batch: a
Unit size: 1.2 mL

A suitable supply of electronic cigarette liquid was obtained from a commercial supplier. The liquid was bulked together, mixed thoroughly to ensure homogeneity, dispensed into amber glass ampoules under argon, and flame sealed.

The primary intended use of this material is for validation and quality control of methods for the determination of nicotine and water in electronic cigarette liquids. It can also be used in the training and evaluation of staff.

Certified values:			
Nicotine	17.12 ± 0.47 mg/g	Water	10.76 ± 0.91 g/100 g
Nicotine	18.39 ± 0.52 mg/mL		

Additional information:	
Density	1.074280 g/mL

Colloidal gold nanoparticle - nominal diameter 30 nm LGCQC5050

Batch: 001
Unit size: 5.2 mL

The starting material was a commercially prepared solution consisting of colloidal spherical gold nanoparticles (citrate stabilised) with average diameter of approximately 30 nm, suspended in water. After careful mixing, the solution was dispensed into amber glass ampoules in 5.2 mL portions and sealed under argon. The filled units were irradiated for sterilisation purposes using Co^{60} gamma irradiation at a minimum dose of 35 kGy.

This Quality Control material is intended, primarily, to evaluate and qualify methodology and/or instrument performance related to the number-based characterisation of nanoscale particles, including particle concentration and diameter. The indicative values are not suitable for establishing method bias and metrological traceability.

Assessed value:	
Number particle concentration	$(1.47 \times 10^{11}) \pm (2.8 \times 10^{10})$ NP/g

Indicative values:	
Particle modal diameter	32.7 ± 2.0 nm
Gold mass fraction	45.1 ± 1.5 mg/kg

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