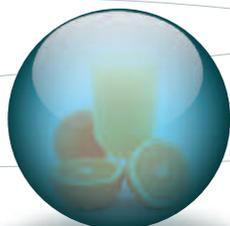
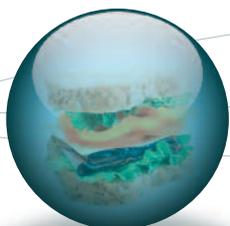


# Proficiency testing catalogue



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## LGC Standards Promoting excellence through proficiency testing

LGC Standards is a UKAS accredited international provider of proficiency testing (PT) services. We have over twenty five years experience in all aspects of providing proficiency testing services to laboratories undertaking chemical, microbiological and physical measurements.

LGC Standards operates 29 proficiency testing schemes serving over 6,000 laboratories. We produce and distribute more than 100,000 test materials and process more than 2,000,000 data points per annum.



We offer an unprecedented breadth of chemical, microbiological and physical testing schemes across a wide range of industries including meat, dairy and other food sectors, water, soil and other environmental sectors, brewing, distilling, malting, sugar, forensic, consumer safety, pharmaceutical and phytochemical sectors. Schemes are supplied on an international basis with customers in over 130 countries making LGC Standards a major international provider of proficiency testing services.

All the schemes within LGC Standards are operated in accordance with the international standard ISO/IEC 17043. LGC Standards is a UKAS (United Kingdom Accreditation Service) accredited PT provider (certificate number: 0001), our schemes currently being accredited against ISO/IEC 43-1 and ILAC G13. Please note that the AFPS, PACQS and PHYTAS schemes are currently not included in our scope of accreditation.

In addition to the variety of schemes offered, we can also provide managed solutions for in-house proficiency testing providers and training for participants and their customers.

## Aim of proficiency testing

Proficiency testing (PT) is defined in ISO/IEC 17043 as the evaluation of participant performance against pre-established criteria by means of interlaboratory comparisons.

LGC Standards Proficiency Testing provides a wide range of schemes designed to improve the quality of analysis in those sectors covered. The schemes involve the regular distribution of test materials, in order for participants to test for defined parameters, and to have their results statistically analysed. Participation provides laboratories with a means of assessing the accuracy and comparability of their results to peer laboratories over time.

When performed within the context of a comprehensive quality assurance programme, proficiency testing is an independent means of assuring the quality of test and calibration results, as described in ISO/IEC 17025.

## Quality standards

LGC Standards Proficiency Testing is committed to continual improvement in quality and efficiency through procedures based upon quality assurance. This commitment is demonstrated through certification to ISO 9001:2008 for all its activities and ISO/IEC 43-1 and ILAC G13 for the operation, management and design of proficiency testing schemes. LGC Standards Proficiency Testing is accredited by the United Kingdom Accreditation Service (UKAS) for the provision of proficiency testing schemes. A copy of our current scope is available on our website: [www.lgcpt.com](http://www.lgcpt.com)

## Benefits of proficiency testing

Proficiency testing is an essential laboratory tool as it demonstrates a laboratory's commitment to good performance and enables participants to confirm their ability to perform tests competently; essential in the laboratory accreditation process.

Participation in proficiency testing will:

- enable participants to measure their performance against others;
- give an early indication of potential problems or training requirements;
- encourage good performance and reinforce an interest in quality assurance;
- demonstrate an ability to comply with international regulations;
- provide a valuable source of information;
- provide the means to measure consistency across a group of laboratories.

## Who should participate in proficiency testing schemes?

Anyone who needs to independently demonstrate the quality of their analytical results should use PT schemes – because quality of results relates directly to quality of product, reputation in the market and, ultimately, brand value. Whether operating in the food, pharmaceutical, beverages, environmental monitoring and or other sectors, many regulators view PT schemes as an essential part of quality monitoring and many companies link PT results to their own key performance indicators in the quality assurance process.

### Who participates in LGC Standards proficiency testing schemes?

LGC Standards exports to laboratories in over 130 countries world-wide and our customer base ranges from single small enterprises to inspection organisations of global repute. Our customers include government agencies, major international food manufacturers, research organisations, commercial and contract laboratories. Currently we have over 6,000 participants across the group.

LGC Standards operates a number of bespoke schemes for multi-national companies to meet their particular requirements. These special schemes cover up to 200 laboratories.

### Why choose LGC Standards as your proficiency testing provider?

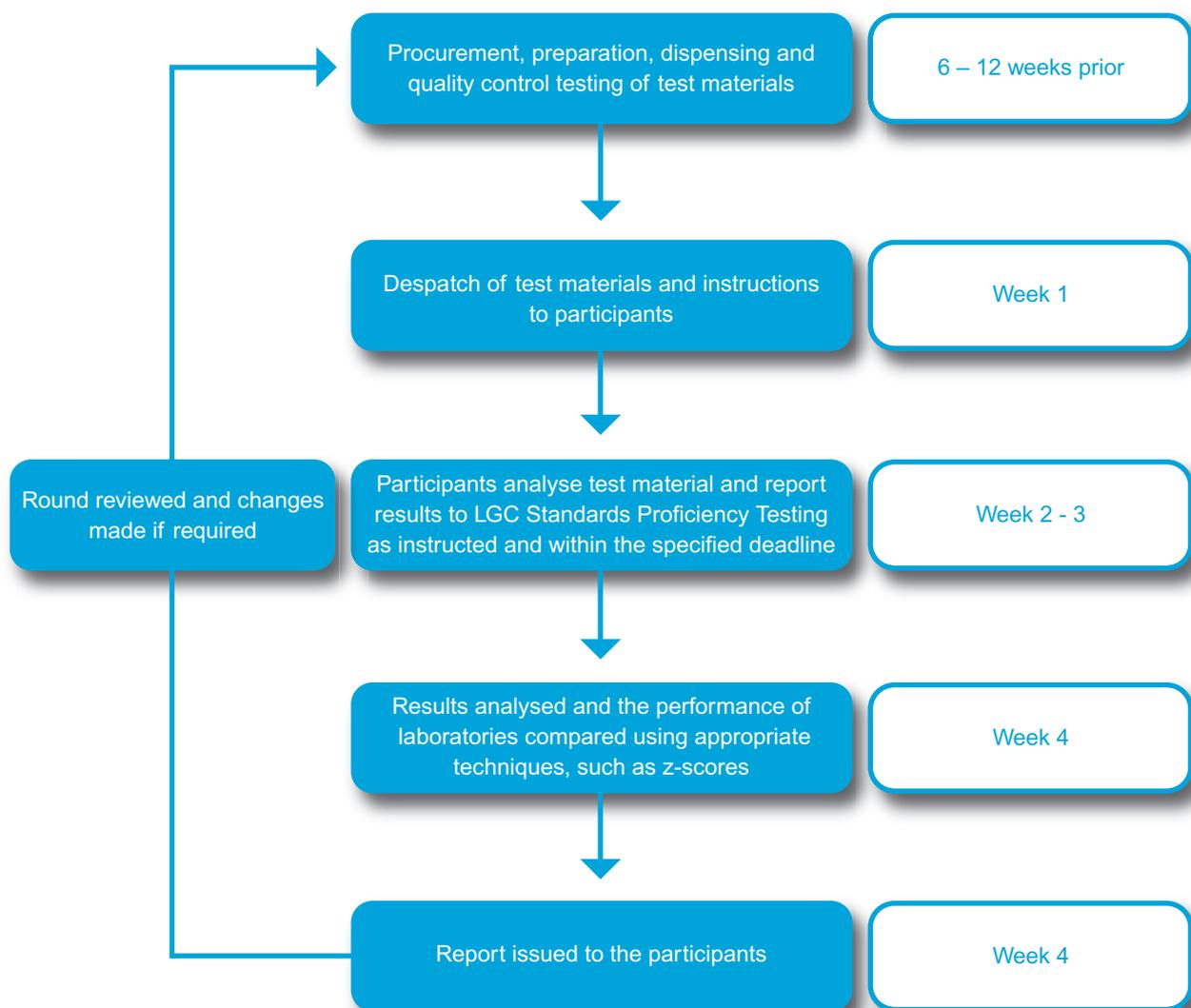
- Access to a wide range of schemes from a single supplier;
- Rapid turnaround of results;
- Access to expert support and advice;
- Local representation and support.



### Why do I need proficiency testing?

Accreditation bodies strongly recommend that laboratories participate in appropriate PT schemes as they are the only quality tool which can assess the whole quality system. PT is a truly independent measure of laboratory performance and anonymously compares performance with peer laboratories. It allows the laboratory to compare and contrast the performance of analytical methods and can assist in the validation of new methods. Participation in a PT scheme is educational and can be used as a tool for staff training, allowing laboratories to learn from both positive and negative aspects.

## Typical scheme cycle from start to finish



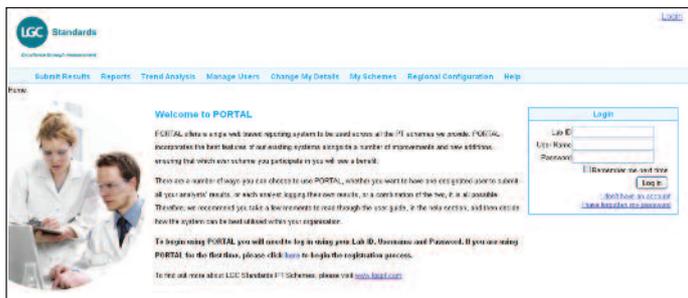
Reports are issued as soon as possible after the round closure, although the timescale between closing dates and issue of final report will vary from scheme to scheme.

# PORTAL

## Proficiency Online Reporting and Trend Analysis

*PORTAL* offers a single web based reporting system to be used across all LGC Standards PT schemes providing improved functionality and flexibility.

There are a number of ways you can choose to use *PORTAL*, whether you want to have one designated user to submit all your analysts' results, or each analyst logging their own results, or a combination of the two, it is all possible. We advise that prior to using *PORTAL* you read the user guide which is available at: [www.lgcpt.com/portal](http://www.lgcpt.com/portal) Select 'help' from the menu and decide how the system can be best utilised within your organisation.



Note: Website supports Internet Explorer version 6 or higher. Images displayed may differ from the final website.

- A single web based system encompassing all our PT schemes;
- Functional, flexible and secure;
- Results entry and reports available online 24/7 - 365 days;
- Analysis and reporting of results by method;
- Intelligent importing of previously entered data;
- Ability to compare analysts, methods or instruments;
- Customisable trending of results;
- Choice of detailed, concise and Excel reports;
- Define laboratory results and analyst results;
- Complete management of your results prior to deadlines;
- User management that ensures complete traceability;
- Enables each analyst to take ownership of their result;
- Measurement uncertainty reporting;
- Helpful support staff.

- **AFPS**  
Animal feeds scheme
- **QCS**  
Chocolate scheme
- **QDCS**  
Dairy chemistry scheme
- **QFCS**  
Food chemistry scheme
- **QGS**  
Gelatine scheme
- **QMAS**  
Meat scheme
- **QMS**  
Food microbiology scheme



## Food PT scheme selector

Scheme	Scheme year	Tests	Test material matrix
AFPS* Animal feeds scheme	April - March	Chemical and microbiological	Animal feed (Various e.g. broiler, cattle, pig), calf replacer, premix, oil and lard
QCS Chocolate scheme	January - December	Chemical and microbiological	Chocolate and cocoa powder
QDCS Dairy chemistry scheme	January - December	Chemical	Butter, cheese, cream, milk, milk powder, whey powder, yoghurt and standard solutions
QFCS Food chemistry scheme	January - December	Chemical	Cereals, *fruit/vegetables, *'ready to eat' products and standard solutions
QGS Gelatine scheme	January - December	Microbiological	Gelatine hydrolysate
QMAS Meat scheme	January - December	Chemical and microbiological	Meat and fish
QMS Food microbiology scheme	January - December	Microbiological	Oatmeal and skimmed milk powder

\*Please note that the AFPS scheme fruits/vegetables and 'ready to eat' products are currently not included in our scope of accreditation.



## Which international standards are relevant to PT?

All the PT schemes within LGC Standards Proficiency Testing are operated in accordance with the international standard ISO/IEC 17043.

The statistical analysis undertaken is in accordance with the international standard ISO 13528. LGC Standards Proficiency Testing is accredited by the United Kingdom Accreditation Service for the provision of proficiency testing schemes, currently against ISO/IEC Guide 43.1 and ILAC G13. A copy of our current scope of accreditation is available on the UKAS website ([www.ukas.com](http://www.ukas.com)).



Analyte group	Number of distributions per scheme year	See page
Comprehensive range of chemical and microbiological analysis of animal feeds covering the major analytical areas including proximate analysis, trace elements, PCB/OC pesticides, aflatoxins, <i>Salmonella</i> spp., and indicator organisms.	Four	12
Chemical parameters of relevance to the chocolate and food testing industries. Microbiological tests including pathogens and indicator organisms.	Three	13
A variety of parameters ranging from classical wet chemistry to instrumentation regularly used within dairy and food testing laboratories.	Four	14
Food additives (preservatives, sweeteners, colours), nutritional analysis and pesticides.	Three	15
Microbiological tests including pathogens and indicator organisms of relevance to gelatine.	Two	16
Proximate analysis of relevance to the meat, fish and food testing industries, and contaminants of relevance to fish products. Microorganisms of relevance to meat and fish products, including pathogens and indicator organisms.	Six	17
Comprehensive range of microorganisms of relevance to food products, including pathogens, indicator organisms and spoilage organisms.	Twelve	18



## AFPS - Animal feeds scheme

The Animal Feeds Proficiency Scheme (AFPS) is specifically designed to meet the needs of laboratories performing chemical or microbiological analysis of animal feedstuffs.

Animal feed quality is highly regulated since the majority of animals, or their products, will be converted into food for human consumption.

EC Regulation 767/2009 stipulates the requirements for the marketing and use of animal feeds, and (with reference to related regulations) requires complete traceability of feeds, personnel, and additives, and defines the compulsory labelling requirements. Measures must be taken to prevent contamination with hazardous materials above specified limits; such as PCB's, heavy metals, mycotoxins, pesticides etc. and microorganisms capable of causing human disease (zoonotic agents) such as *Salmonella* species.

Major food safety crises can occur from the contamination of animal feed causing risks to animal and human health resulting in recalls; financial damage as large quantities of product have to be destroyed; and the potential for considerable damage to the reputation of any businesses involved. Recent recalls include melamine in pet foods, numerous events of animal feed cargo rejected due to aflatoxin contamination, pork products contaminated with dioxins, and many more. Preventing these issues through reliable analysis at source backed up by independent verification through participation in a proficiency scheme, can help to save large sums of money for a very small investment.

The full range and availability of test materials in AFPS is determined on annual basis and further details can be found in the AFPS application form and scheme description.



Test material	Analytes
Animal feed (Various e.g. broiler, cattle, pig), Calf Replacer, Premix, Oil and Lard	<p><b>Chemical:</b>  <b>Proximate Analysis:</b>                      ADF (Acid detergent fibre), Ash insoluble in Hydrochloric Acid, Crude Ash, Crude Fat, Crude Fibre, Crude Protein, Moisture, NDF (Neutral Detergent Fibre), PPD (Pepsin Protein Digestibility), Starch, Sugars.</p> <p><b>Minerals and Trace Elements:</b>                      Arsenic, Cadmium, Calcium, Chloride, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Phosphorus, Potassium, Selenium, Sodium, Zinc.</p> <p><b>Fat Quality:</b>                      Eluable Fat, Fatty Acids Profile (absolute), Fatty Acids Profile (relative), Free Fatty Acids, Insoluble Impurities, Moisture, Polymeric triglycerides, Unsaponifiable Matter.</p> <p><b>PCB and OC Compounds:</b>                      PCB 28, PCB 52, PCB 101, PCB 118, PCB 138, PCB 153, PCB 180.                      cis-Chlordane, trans-Chlordane, p,p'-DDE, o,p'-DDT, p,p'-DDT, p,p'-TDE, β-Hexachlorocyclohexane, γ-Hexachlorocyclohexane, Hexachlorobenzene.</p> <p><b>Aflatoxins:</b>                      Aflatoxin B1, Aflatoxin B2, Aflatoxin G1, Aflatoxin G2, Ochratoxin.</p> <p><b>Microbiological:</b>  <b>Enumeration:</b>                      Enterobacteriaceae, Total aerobic mesophilic count, Yeast and Mould.</p> <p><b>Presence/absence:</b>  <i>Salmonella</i> species.</p>

Note: Test materials and analytes may be added or removed, please see current application form.

**QCS - Chocolate scheme**

The Quality in Chocolate Scheme (QCS) is a PT scheme intended for use by microbiologists and chemists working in the chocolate manufacturing industry.

Cacao trees were first cultivated by the Aztecs, who used the beans both as a form of currency and to produce a spiced drink known as ‘chocolatl’. Centuries later, the first chocolate company was established in North America in 1765. Over the years, many different types and flavours of chocolate have been developed and cacao derivatives are often blended with other ingredients to produce a diverse range of products. Chocolate is probably the most popular end-product; in some countries up to 90% of the population buys chocolate on a regular basis.

Chocolate products are also one of the few food commodities whose composition is controlled at EC level. For example, EC Directive 2000/36/EC ‘relating to cocoa and chocolate products intended for human consumption’, sets common rules and definitions with regard to the composition, manufacture, packaging and labelling of chocolate and cocoa products.

Test material	Analytes
Chocolate and Cocoa Powder	<b>Chemical:</b> Ash, Butyric Acid, Fat, Moisture, Theobromine, Total Nitrogen, Total Sugars.
	<b>Microbiological:</b> <b>Enumeration:</b> Coliforms, Enterobacteriaceae, Enterococci, Total aerobic mesophilic count.
	<b>Presence/absence:</b> <i>Salmonella</i> species.

Note: Test materials and analytes may be added or removed, please see current application form.

The microbiological problems associated with chocolate and cocoa products are unique to the chocolate industry, and are related to the low water activity and the high fat and sugar content. The most important microbiological risk lies in the possible presence of *Salmonella* species, which can survive in chocolate for long periods of time and may not be destroyed by processing. Levels of spoilage organisms throughout the manufacturing process are also of interest from a commercial viewpoint, to prevent taste and appearance defects.

The microbiological test materials are available in chocolate or cocoa powder matrices. Test materials may or may not contain the target organisms, along with relevant background flora.

Chemical analysis is equally important to ensure the organoleptic properties are what we expect. After all, it’s why we consume so much chocolate. Tests for moisture, fat, ash and total sugars are important to ensure the right texture and mouth feel, whilst theobromine and butyric acid from the cocoa powder are key contributors to the taste.

The chemical test materials are available in chocolate or cocoa powder matrices. Levels for each analyte are generally representative of the values typically found in the chocolate manufacturing industry and the levels can usually be assumed to be in line with the regulations governing them.

The full range and availability of test materials in QCS is determined on an annual basis and further details can be found in the QCS application form and scheme description.



## QDCS - Dairy chemistry scheme

The Quality in Dairy Chemistry Scheme (QDCS) is probably the most comprehensive proficiency testing scheme available to laboratories performing compositional and safety analysis in the dairy sector. Participation in QDCS can help give authority to the results produced by your laboratory.

For the dairy sector, EU Regulation 853/2004 introduces specific hygiene rules applying to raw milk and dairy products, including control of residual antibiotics.

QDCS provides a wide range of test materials, covering numerous relevant analytical test parameters. These include traditional 'wet' chemistry techniques, as well as determinations by infrared analysers, which are widely used in the dairy sector.

A choice of real dairy foods including butter, cheese, cream, milk, whey powder and yoghurt are available, plus lyophilised test materials for the detection of antibiotics.

Participants choose what test materials to receive at a frequency to meet their quality and accreditation needs.

The full range and availability of test materials in QDCS is determined on an annual basis and further details can be found in the QDCS application form and scheme description.



Test material	Analytes
Milk: (Freeze dried, Skimmed, UHT, Whole)	Antibiotics (penicillin and/or cephalosporin), Antibiotics (penicillin and/or sulphur-based), Calcium, Fat, Freezing Point, Lactose, Protein, Phosphatase, pH, Total Solids, Titratable Acidity.
Butter	Moisture, pH, Salt.
Cheese: (Hard, Soft)	Calcium, Fat, Moisture, pH, Protein, Salt.
Milk Powder: (Skimmed, Whole)	Ash, Fat, Insolubility Index, Minerals (calcium, potassium, copper, sodium, chloride, iron, magnesium, manganese, phosphorus, zinc). Moisture, Protein, Scorched Particles, Titratable Acidity, WPNi.
Whey Powder	Ash, Fat, Lactose, Moisture, Protein, Scorched Particles.
Whey Protein Concentrate	Ash, Bulk Density, Fat, Insolubility Index, Lactose, Moisture, pH, Protein.
Cream: (Single, Double, Whipping)	Fat, Moisture, Titratable Acidity.
Yoghurt	Fat, Protein, Total Solids.
Standard Solutions: (Buffer solution, HCl, Potassium hydrogen phthalate)	Acid Titration, COD, pH.

Note: Test materials and analytes may be added or removed, please see current application form.

## QFCS - Food chemistry scheme

The Quality in Food Chemistry Scheme (QFCS) is designed specifically for the determination of additives used extensively in food and beverage manufacturing, such as colours and preservatives, and for basic nutritional analysis. QFCS is intended to provide these parameters on a regular basis and a minimum frequency of three rounds per annum.

Natural 'additives' in the form of salting and smoking have been used for centuries. Additives are often an important part of food production, enhancing food safety by inhibiting growth of spoilage and potentially harmful organisms. Colours are often added to restore natural colour after processing, or on storage of foods, and to give the colour expected or preferred by the consumer. Sweeteners are used to replace sugar in foods in order to produce lifestyle products such as diet or light versions of favourite foods or to help consumers with medical conditions, such as diabetes, avoid sugar.

All food products require basic nutritional labelling in order to help consumers make informed choices about the food they eat and are especially important where specific claims are made about a food's nutritional content. The use of additives such as preservatives, colours and sweeteners is closely controlled by legislation, in order to ensure only permitted types and levels are used within the production of food. Whilst beneficial in the correct quantities, too much may be potentially harmful to health in the long term and producers have no control over the quantities of product an individual may consume. The relevant EU Directives governing the use of additives in foods, and controlling levels are Directive 94/35/EC for sweeteners; Directive 94/36/EC for colours; Directive 95/2/EC for all other additives including preservatives (often referred to as 'Miscellaneous Additives'); and Directive 90/496/EC for nutritional labelling.

Most countries set strict limits for the amount of pesticide residue in foods in order to protect consumers. The fruit/vegetable test material will allow participants to monitor their quality and reliability of results to help ensure compliance with regulatory requirements.

The full range and availability of test materials in QFCS is determined on an annual basis and further details can be found in the QFCS application form and scheme description.

Test material	Analytes
Standard Solutions	<p><b>Preservatives:</b> Benzoic Acid (E210 - E213) Sorbic Acid (E200 - E203) Sulfur Dioxide (E220 - E228)</p> <p><b>Sweeteners:</b> Acesulfame K (E950) Aspartame (E951) Saccharin (E954)</p> <p><b>Colours:</b> Allura Red (E129) Brilliant Blue (E133) Indigo Carmine (E132) Ponceau 4R (E124) Sunset Yellow (E110) Tartrazine (E102)</p>
Cereals and **Ready to eat' products	<p><b>Nutritional Analysis:</b> Ash, Carbohydrate, Dietary Fibre, Energy, Fat, Moisture, Protein, Salt, Total Sugars.</p>
*Fruit/Vegetable	<p><b>Pesticides:</b> Herbicides, Organochlorine, Organophosphorus, Synthetic pyrethroids, Triazines.</p>

Note: Test materials and analytes may be added or removed, please see current application form. \*\*Ready to eat' products and fruit/vegetable test materials are currently not included in our scope of accreditation.



### QGS - Gelatine scheme

The Quality in Gelatine Scheme (QGS) has been developed in collaboration with the trade body, Gelatine Manufacturers of Europe (GME). GME members account for nearly half of the worldwide gelatine production and the key role of the GME is to ensure that gelatine is manufactured to a consistently high quality for the benefit of gelatine customers and consumers.



Gelatine is a pure protein obtained from animal raw materials containing collagen and is typically produced in two grades as far as microbiological specification is concerned – food grade and pharmaceutical grade.

Gelatine is an excellent nutrient for most bacteria and for this reason the manufacturing processes have to avoid contamination otherwise the safety and/or quality of the gelatine could be affected. QGS test materials are available on a gelatine hydrolysate matrix in order to represent a realistic challenge, and include the relevant microorganisms for laboratories involved in the quality control analysis of gelatine. Test material quantities are supplied as either 10 g for enumeration of indicator organisms or 25 g for detection of pathogens.

The full range and availability of test materials in QGS is determined on an annual basis and further details can be found in the QGS application form and scheme description.

Test material	Analytes
Gelatine Hydrolysate	<p><b>Enumeration:</b> Sulphite-reducing bacteria, Total aerobic mesophilic count.</p> <p><b>Presence/absence:</b> <i>Clostridium perfringens</i>, Coliforms, <i>Escherichia coli</i>, <i>Staphylococcus aureus</i>, <i>Salmonella</i> species.</p>

Note: Test materials and analytes may be added or removed, please see current application form.

## QMAS - Meat scheme

The Quality in Meat Analysis Scheme (QMAS) is intended for use by chemists and microbiologists working in the meat and meat products industries. The scheme is also suitable for use in the fish processing industry, by the inclusion of a fish test material. Legislation in the form of EU Regulation 882/2004 'Official Controls Performed to Ensure the Verification of Compliance with Feed and Food Law, Animal Health and Animal Welfare Rules' requires official control laboratories to be accredited to ISO/IEC 17025 and therefore to use external means of monitoring performance such as proficiency testing. In practice, many industry laboratories and third party (contract) laboratories are also accredited and will use QMAS as a means of monitoring the quality of analysis.

A variety of real meat test materials in a vacuum packed format is provided for participants, enabling them to analyse a comprehensive range of relevant chemical tests which are all widely used in the meat and food sectors. The real fish test material allows laboratories to perform a range of basic proximate analyses (fat, ash, salt, protein and moisture), and the lyophilised meat test material provides a highly stable matrix for the analysis of nitrite and nitrate.

For microbiological determinations, test materials are provided in a lyophilised meat matrix. Test materials are available for the analysis of indicator organisms, as performed routinely in factory based laboratories and off-site contract testing facilities. There are also test materials for pathogen analysis suitable for laboratories permitted to undertake this analysis, often carried out by external providers.

The full range and availability of test materials in QMAS is determined on an annual basis and further details can be found in the QMAS application form and scheme description.



Test material	Analytes
Meat and Fish	<p><b>Chemical:</b> Ash, Carbohydrate, Energy, Fat, Hydroxyproline, Moisture, Nitrate, Nitrite, Phosphate, Protein, Sodium, Salt, Saturates, Mono-unsaturated fats, Poly unsaturated fats, Total Fat, Total Trans Fatty Acids.</p> <p><b>Microbiological:</b> <b>Enumeration:</b> Coliforms, Enterobacteriaceae, <i>Escherichia coli</i>, Total aerobic mesophilic count.</p> <p><b>Presence/absence:</b> <i>Listeria</i> species, <i>Listeria monocytogenes</i>, <i>Salmonella</i> species.</p>

Note: Test materials and analytes may be added or removed, please see current application form.

### QMS - Food microbiology scheme

The Quality in Microbiology Scheme (QMS) is a PT scheme intended for use by microbiologists working in the food and dairy industries.

Food testing is an essential element of the 'Hazard Analysis Critical Control Point' (HACCP) process in food production as it verifies the controls are working at the critical points in manufacturing. Failures leading to food poisoning outbreaks can have a devastating effect on reputation, brand value and ultimately profits. Failures which do not lead to an outbreak also can have an effect, leading to reduced shelf life and wastage. Over time can result in product defects – affecting customer confidence in the product.

Laboratories carrying out such microbiological testing need to be able to demonstrate that they are producing accurate and meaningful results. This can be done by conducting a comprehensive quality assurance programme, which includes regular participation in a suitable proficiency testing (PT) scheme.

The QMS scheme provides simulated food test materials in a choice of matrices that includes oatmeal and skimmed milk powder. The range of organisms offered for testing covers all those that are likely to be found in food and dairy, from spoilage organisms, pathogens, indicator organisms and normal background flora.



Microorganisms may be reference strains sourced from national culture collections, or may be fully characterised wild strains.

Atypical strains may occasionally be included in test materials. Atypical strains can occur in 'real' foods and could be undetected or mis-identified. It is therefore a realistic challenge to occasionally include atypical strains within a PT scheme.

The full range and availability of test materials in QMS is determined on an annual basis and further details can be found in the QMS application form and scheme description.

Test material	Analytes
Oatmeal and Skimmed Milk Powder	<p><b>Enumeration:</b> Aerobic psychrotrophs, <i>Bacillus cereus</i>, Coagulase positive staphylococci, Coliforms, <i>Clostridium perfringens</i>, <i>Escherichia coli</i>, Enterobacteriaceae, Enterococci, <i>Listeria monocytogenes</i>, Lactic acid bacteria, <i>Listeria</i> species, Mesophilic aerobic spores, Thermophilic aerobic spores, Mesophilic anaerobic spores, Sulphite-reducing bacteria.</p> <p>Yeast/Mould, Osmophilic Yeast/Mould.</p> <p><i>Pseudomonas</i> species, <i>Salmonella</i> species, Thermotolerant coliforms.</p> <p>Total aerobic mesophilic count, Total anaerobic mesophilic count.</p> <p><b>Presence/absence:</b> <i>Campylobacter</i> species*, <i>Clostridium</i> species, <i>Cronobacter</i> species, <i>Escherichia coli</i>, <i>Escherichia coli</i> O157, <i>Listeria</i> species, <i>Listeria monocytogenes</i>, <i>Salmonella</i> species, <i>Vibrio parahaemolyticus</i>, <i>Vibrio</i> species, <i>Yersinia enterocolitica</i>.</p> <p>* Lyophilised vial format</p>

Note: Test materials and analytes may be added or removed, please see current application form.

- **Aquacheck**  
Water chemistry scheme
- **CONTEST**  
Contaminated land scheme
- **STACKS**  
Stack emissions scheme
- **QWAS**  
Water microbiology scheme



## Water and environment PT scheme selector

Scheme	Scheme year	Tests	Test material matrix
Aquacheck Water chemistry scheme	April - March	Chemical, ecotoxicology, physical and radiochemical	Clean waters and waste waters, agricultural soils and sewage sludge.
CONTEST Contaminated land scheme	April - March	Chemical and physical	Soil extracts, soil materials and standard solutions.
STACKS Stack emissions scheme	September - August	Chemical and physical	Stack / impinger solutions and filters*.
QWAS Water microbiology scheme	January - December	Microbiological	Waters (Various e.g. bathing, environmental, mineral, potable, process, recreational, sea, surface, waste) and simulated effluent sludge.

\*Please note that the filter test materials are currently not included in our scope of accreditation.

## “ How often do I need to participate? ”

The frequency that a laboratory needs to participate in proficiency testing depends on a wide range of factors specific to each individual laboratory. Therefore every individual laboratory may have a different need, which is why our schemes provide flexible participation, although some do have a minimum participation level. Third parties, such as regulatory bodies, may recommend minimum levels of participation. To gain the benefit from trend analysis, participation in a minimum of four rounds over a scheme year is recommended.

Analyte group	Number of distributions per scheme year	See page
Inorganic, organic and metal analytes in a range of water types. Determination of radiochemical and ecotoxicological parameters.	Twenty	22
Inorganics, organic and metal analytes measured in soil, leachates and solutions from contaminated land.	Five	26
Inorganic and metal analytes routinely measured in impinger solutions and filters containing heavy metals.	Four	28
Routine microbiological testing, complex pathogen detection and indicator organisms.	Ten	29



### Aquacheck - Water chemistry scheme

Everybody depends on water; it is vital in sustaining all natural systems on and under the earth's surface. Water sources require regular analyses to determine their safety and suitability for a variety of uses. The water we drink must be good in quality and quantity so that it is free from harmful chemicals and microorganisms in order to guarantee wellbeing. The water discharged by local waste water treatment plants and industry must be monitored to ensure strict compliance with environmental guidelines. Process waters must be kept clean from contaminants to ensure product quality. As water sources can change, regular testing is advised. The types of analysis could vary from simple field testing for a single analyte to complex laboratory based analysis.

The Aquacheck scheme provides test materials for the analysis of organic and inorganic chemicals in clean waters; waste waters and effluents; agricultural soils; sewage sludge; ecotoxicology, radiochemistry and special distributions. Different test materials are provided for different analytical groups: major inorganic compounds; metals; phenols; organochlorine pesticides and many others. Participants may select any number or combination of groups to suit their analytical requirements. Test parameters within the groups are continually reviewed to ensure they meet current laboratory testing and regulatory requirements.

Test materials are distributed frequently throughout the scheme year. The use of natural matrices ensures that matrix effects are fully represented. Where it is not possible to use natural matrices, the Aquacheck scheme uses either a synthetic matrix or a simulated material which represents some of the matrix effects likely to occur in real samples. In this way participation in Aquacheck enables laboratories to monitor and improve the quality of their routine analytical measurements and provides independent evidence of laboratory performance for both laboratory management and customers. It also allows laboratories to demonstrate to regulators and accreditation bodies the validity of their analytical measurements.

The full range and availability of test materials in Aquacheck is determined on an annual basis and further details can be found in the Aquacheck application form and scheme description.



Test material	Analytes
Sample 1H Major Inorganic Components (in Hard Water)	Alkalinity, Barium, Calcium, Chloride, Conductivity (20°C), Fluoride, Kjeldahl Nitrogen, Magnesium, Nitrogen, Potassium, Sodium, Sulfate, Total Hardness, Total Phosphorus.
Sample 1S Major Inorganic Components (in Soft Water)	Alkalinity, Barium, Calcium, Chloride, Conductivity (20°C), Fluoride, Kjeldahl Nitrogen, Magnesium, Nitrogen, Potassium, Sodium, Sulfate, Total Hardness, Total Phosphorus.
Sample 1A Major Ions in Higher Salinity Potable Water	Chloride, Conductivity (20°C), Magnesium, pH at 20-25°C, Sodium, Sulfate, Total Dissolved Solids (180°C), Total Organic Carbon (TOC).
Sample 2H Nutrients and Others (in Hard Water)	Ammonia, Colour, Free Cyanide, Nitrate, Nitrite, Permanganate Index (PI), pH at 20-25°C, Silicate, Soluble Reactive Phosphorus, Total Cyanide, Total Dissolved Solids (180°C), Total Oxidised Nitrogen (TON).
Sample 2S Nutrients and Others (in Soft Water)	Ammonia, Colour, Free Cyanide, Nitrate, Nitrite, Permanganate Index (PI), pH at 20-25°C, Silicate, Soluble Reactive Phosphorus, Total Cyanide, Total Dissolved Solids (180°C), Total Oxidised Nitrogen (TON).
Sample 2A pH in Poorly Buffered Waters	pH at 20-25°C – Low pH at 20-25°C – High
Sample 3 Non-Specific Analytes	BOD (5 day), COD, Suspended Solids, Methylene Blue Active Substances (MBAS), Dissolved Organic Carbon, Turbidity.
Sample 3A Inorganic Disinfection By-products	Bromate, Bromide, Chlorate, Chlorite.
Sample 3B Free Chlorine	Free Chlorine.
Sample 4 Metals (Preserved in 0.5% Nitric Acid)	Aluminium, Barium, Boron, Copper, Iron, Lithium, Manganese, Silver, Strontium, Zinc.
Sample 4G Metals in Groundwater (Preserved in 0.5% Nitric Acid)	Aluminium, Barium, Boron, Copper, Iron, Lithium, Manganese, Silver, Strontium, Zinc.
Sample 5 Toxic Metals (Preserved in 0.5% Nitric Acid)	Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Mercury, Molybdenum, Nickel, Selenium, Tin, Vanadium.
Sample 5A Metals for Hydride Generation (Preserved in 0.5% Hydrochloric Acid)	Antimony, Arsenic, Selenium, Tin.
Sample 5B EQS Metals (Preserved in 0.5% Nitric Acid)	Cadmium, Copper, Lead, Mercury, Nickel, Total Chromium, Vanadium, Zinc.

Test material	Analytes
Sample 5C Chromium (VI) in Clean Water	Chromium (VI).
Sample 5G Toxic Metals in Groundwater (Preserved in 0.5% Nitric Acid)	Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Mercury, Molybdenum, Nickel, Selenium, Tin, Vanadium.
Sample 6A Haloforms and Chlorinated Solvents	Bromodichloromethane, Bromoform, Carbon Tetrachloride, Chloroform, Dibromochloromethane, Tetrachloroethene, Trichloroethene, 1,2-Dichloroethane.
Sample 6B Phenols	Pentachlorophenol, Phenol, 2-Chlorophenol, 4-Chlorophenol, 2,4-Dichlorophenol, 2,4,6-Trichlorophenol.
Sample 6C Benzene, Toluene and Xylenes	Benzene, Ethylbenzene, m-+ p-Xylene, m-Xylene, o-Xylene, p-Xylene, Styrene, Toluene, Total Xylene.
Sample 7A Organochlorine Pesticides	Aldrin, Alpha Endosulphan, Alpha Hexachlorocyclohexane, Beta Endosulphan, Beta Hexachlorocyclohexane, Delta Hexachlorocyclohexane, Dieldrin, Endrin, Hepatachlorepoxyde, Hexachlorobenzene, Lindane (Gamma HCH), o,p-DDT, p,p'-DDD, p,p'-DDE, p,p'-DDT, Pentachlorobenzene, Trifluralin.
Sample 7B Chlorinated Solvents	Carbon Tetrachloride, Chloroform, Hexachlorobutadiene, Tetrachloroethene, Trichloroethene, 1,2-Dichloroethane, 1,1,1-Trichloroethane, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,3,5-Trichlorobenzene.
Sample 7C Polycyclic Aromatic Hydrocarbons (2 Spikes)	<i>Spiking solution 7C1</i> Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Fluoranthene, Indeno(1,2,3-cd)pyrene.  <i>Spiking solution 7C2</i> Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Chrysene, Dibenz(ah)anthracene, Fluorene, Naphthalene, Perylene, Phenanthrene, Pyrene.
Sample 7D Polychlorinated Biphenyls	PCB (28), PCB (52), PCB (101), PCB (118), PCB (138), PCB (153), PCB (180).
Sample 8 Triazines, Urons and Acid Herbicides (2 Spikes)	<i>Spiking solution 8(1)</i> Atrazine, Bentazone, Chlortoluron, Diuron, Isoproturon, Linuron, MCPA, MCPB, Mecoprop, Propazine, Simazine, 2,4 D.  <i>Spiking solution 8(2)</i> Glyphosate.

Test material	Analytes
Sample 8B Herbicides (2 Spikes)	<i>Spiking solution 8B(1)</i> Bromoxynil, Ioxynil, Monuron, Propyzamide.  <i>Spiking solution 8B(2)</i> Dicamba, Dichlorprop, Trichlopyr, 2,4-DB.
Sample 9 Organophosphorus Pesticides	Azinphos-ethyl, Azinphos-methyl, Chlorfenvinphos, Chloropyrifos, Diazinon, Dichlorvos, Fenitrothion, Fenthion, Malathion, Mevinphos, Parathion-ethyl, Parathion-methyl.
Sample 10 Nutrients and Other Analytes	Ammonia, Chloride, Free Cyanide, Kjeldahl Nitrogen, Nitrate, Nitrite, Silicate, Soluble Reactive Phosphorus, Total Cyanide, Total Nitrogen, Total Oxidised Nitrogen (TON), Total Phosphorus.
Sample 11 Non-Specific Analytes	BOD (5 day), COD, Dissolved/Total Organic Carbon, Methylene Blue Active Substances (MBAS), Suspended Solids.
Sample 12 Metals (Preserved in 0.5% Nitric Acid)	Aluminium, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Zinc.
Sample 12C Chromium (VI) in Waste Water	Chromium (VI).
Sample 13 Sewage Sludge Inorganics and Specific Elements	Arsenic, Cadmium, Chromium, Cobalt, Copper, Fluoride, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Total Boron, Total Nitrogen, Total Phosphorus, Total Potassium, Vanadium, Zinc.
Sample 14 Agricultural Soil Inorganics and Specific Elements	Arsenic, Cadmium, Carbonate Content, Chromium, Cobalt, Conductivity (20°C), Copper, Dry matter (105±5°C), Extractable Phosphorus (Olsen), Extraction of Magnesium, Extraction of Potassium, Extraction of Sodium, Fluoride, Iron, Lead, Loss on ignition (550±25°C), Manganese, Mercury, Molybdenum, Nickel, Organic Carbon Content (Modified Walkley Black), pH at 20-25°C (2.5:1 water:soil), Selenium, Total Boron, Total Nitrogen, Total Phosphorus, Total Potassium, Vanadium, Water Extractable Boron, Zinc.
Sample 16 Compositional Analysis of Sewage Sludge	Calcium, Loss on ignition (500±5°C) Magnesium, pH at 20-25°C, Total Solids (105±5°C).
Sample 17A Major Waste Water Analytes	Conductivity (20°C), Non Filterable COD, pH at 20-25°C, Settled Chemical Oxygen Demand (COD), Suspended Solids, Total COD, Total Dissolved Solids (180°C).

Test material	Analytes
Sample 17B Total Phenol, Cyanide and Sulphate	Cyanide, Sulphate, Total Phenol.
Sample 17C Metals (Preserved in 0.5% Nitric Acid)	Aluminium, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Tin, Vanadium, Zinc.
Sample 17D Ammonia, Phosphate and Nitrogen	Ammonia, Soluble Reactive Phosphorus, Total Phosphorus, Total Nitrogen.
Sample 18A Haloforms and Chlorinated Solvents	Bromodichloromethane, Bromoform, Carbon Tetrachloride, Chloroform, Dibromochloromethane, Tetrachloroethene, Trichloroethene, 1,2-Dichloroethane.
Sample 18B Phenols	Pentachlorophenol, Phenol, 2-Chlorophenol, 4-Chlorophenol, 2,4-Dichlorophenol, 2,4,6-Trichlorophenol.
Sample 18C Benzene, Toluene and Xylenes	Benzene, Ethylbenzene, m-+ p-Xylene, m-Xylene, o-Xylene, p-Xylene, Styrene, Toluene, Total Xylene.
Sample 19A Organochlorine Pesticides	Aldrin, Alpha endosulphan, Alpha Hexachlorocyclohexane (HCH), Beta endosulphan, Beta Hexachlorocyclohexane (HCH), Delta Hexachlorocyclohexane (HCH), Dieldrin, Endrin, Heptachlor, Heptachlor epoxide, Hexachlorobenzene, Lindane (Gamma HCH), o,p-DDT, p,p'-DDT, p,p'-DDE, p,p'-DDD, Pentachlorobenzene, Trifluralin.
Sample 19B Chlorinated Solvents	Carbon Tetrachloride, Chloroform, Hexachlorobutadiene, Tetrachloroethene, Trichloroethene, 1,2-Dichloroethane, 1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,3,5-Trichlorobenzene, 1,1,1-Trichloroethane.
Sample 19C Polyaromatic Hydrocarbons (2 Spikes)	<i>Spiking solution 19C1</i> Benz(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Fluoranthene, Indeno(1,2,3-cd)pyrene.  <i>Spiking solution 19C2</i> Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Chrysene, Dibenz(ah)anthracene, Fluorene, Naphthalene, Perylene, Phenanthrene, Pyrene.
Sample 19D Polychlorinated Biphenyls (PCBs)	PCB (28), PCB (52), PCB (101), PCB (118), PCB (138), PCB (153), PCB (180).

Test material	Analytes
Sample 20 Triazines, Urons and Acid Herbicides (2 Spikes)	<i>Spiking solution 20(1)</i> Atrazine, Bentazone, Chlortoluron, Diuron, Isoproturon, Linuron, MCPA, MCPB, Mecoprop, Propazine, Simazine, 2,4-D.  <i>Spiking solution 20(2)</i> Glyphosate.
Sample 21 Organophosphorus Pesticides	Azinphos-ethyl, Azinphos-methyl, Chlorfenvinphos, Chlorpyrifos, Diazinon, Dichlorvos, Fenitrothion, Fenthion, Malathion, Mevinphos, Parathion-ethyl, Parathion-methyl.
Sample 22 Qualitative Organics by GCMS	Ten organic analytes are provided for qualitative identification. This sample is designed to test the ability of laboratories to identify organic compounds via GCMS analysis.  Participants are provided with a solution containing ten organic compounds. The test requires that participants identify the ten compounds present. Results returned will be identified as satisfactory or unsatisfactory. Participants are also provided with a solvent blank.  The choice of the ten organic compounds is designed to avoid the formation of reaction by-products.
Sample 22A Qualitative Organics by Purge and Trap GCMS	Six organic analytes are provided for qualitative identification. This sample is designed to test the ability of laboratories to identify organic compounds via purge and trap GCMS analysis.  Participants are provided with a solution containing six organic compounds. The test requires that participants identify the six compounds present. Results returned will be identified as satisfactory or unsatisfactory. Participants are also provided with a solvent blank.  The choice of the six organic compounds is designed to avoid the formation of reaction by-products.
Sample 23 Mineral Oil in Water	Total Hydrocarbons by GC Analysis, Total Hydrocarbons by Gravimetric Analysis, Total Hydrocarbons by IR Analysis, Volume of sample provided.
Sample 24 Oil and Grease in Water	Total Oil and Grease, Volume of sample provided.

Test material	Analytes
Sample 25 Qualitative Determination in Clean Water	The intent of this sample is to test the ability of laboratories to detect and identify an unknown contaminant in surface/potable waters. This sample is designed for laboratories which may be involved in investigating potentially contaminated potable or surface waters and tests both the extraction and identification stages of investigations.  Participants are provided with a two litre water sample and one or more 'indicators' of a potential problem, e.g. water is discoloured or has an oily sheen.  Participants are asked to identify the contaminating substance(s). Results returned will be identified as satisfactory or unsatisfactory.
Sample 26 PFOS and PFOA	Perfluorooctanoic acid, Perfluorooctanesulfonic acid.
Sample 27 AOX in Wastewater	Adsorbable organically bound halogens.
Sample 30 Gross Alpha and Gross Beta in Clean Water	Gross Alpha as <sup>241</sup> Americium, Gross Alpha as <sup>239</sup> Plutonium, Gross Beta as <sup>137</sup> Caesium, Gross Beta as <sup>40</sup> Potassium, Gross Beta as <sup>90</sup> Strontium.
Sample 31 Aqueous Tritium in Clean Water	Aqueous Tritium.
Sample 50 Ecotoxicology	<i>Daphnia magna</i> 24hr EC50, <i>Daphnia magna</i> 48hr EC50, Freshwater algae growth inhibition test – biomass reduction ( <i>Pseudokirschneriella subcapitata</i> ), Marine algae growth inhibition test ( <i>Skeletonema costatum</i> ), 15 minute luminescent bacteria IC50 tests, Other 30 minute luminescent bacteria IC50 tests, Oyster 24 hour embryo-larval development test ( <i>Crassostrea gigas</i> ), <i>Tisbe battagliai</i> 48 hour mortality test, <i>Vibrio fischeri</i> 30 minute IC50 (ISO 11348-3), <i>Vibrio fischeri</i> 30 minute IC50 (ISO 11348-2).

Note: Test materials and analytes may be added or removed, please see current application form.

## CONTEST - Contaminated land scheme

Land contamination can pose both environmental and human health risks. The main causes of contamination are direct discharge of industrial wastes, domestic pollution, over-usage of pesticides, oil and fuel dumping, leaching of wastes from landfills and leaking underground storage tanks which corrode over time releasing toxic substances into previously clean soils.

The CONTEST scheme has been exclusively developed for contaminated soils and the primary aim is to enable laboratories performing the analysis of soils to monitor their performance and compare it with that of their peers. CONTEST will also enable participants to demonstrate to customers, regulators and accreditation bodies the validity of their analytical measurements.

Participation in a proficiency testing scheme for soil, such as CONTEST, is a requirement of the UK Environment Agency's Monitoring Certification Scheme (MCERTS) "Performance Standard for Laboratories Undertaking Chemical Testing of Soil".

The CONTEST scheme includes a comprehensive range of analytes of relevance to the testing of soils. The test materials are available as standard solutions, soil extracts and soil materials for the analysis of metals, inorganic contaminants (chlorides, cyanides, fluorides, sulphites), organics (BTEX, chlorinated hydrocarbons, PAH's, PCB's, phenols, TPH) and soil leachates.

The full range and availability of test materials in CONTEST is determined on an annual basis and further details can be found in the CONTEST application form and scheme description.

Test material	Analytes
Polyaromatic Hydrocarbons (PAHs): Soil and Standard Solution	Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Benz(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz(ah)anthracene, Fluoranthene, Fluorene, Indeno(123-cd)pyrene, Naphthalene, Phenanthrene, Pyrene, Total PAH.
Polychlorobiphenyls (PCBs): Soil and Standard Solution	PCB (28), PCB (52), PCB (101), PCB (118), PCB (138), PCB (153), PCB (180).
Total Petroleum Hydrocarbons (TPH): Soil and Standard Solution	Total TPH (C <sub>10</sub> -C <sub>40</sub> inclusive), TPH Aliphatic C <sub>10</sub> -C <sub>12</sub> (inclusive), TPH Aliphatic C <sub>13</sub> -C <sub>16</sub> (inclusive), TPH Aliphatic C <sub>17</sub> -C <sub>21</sub> (inclusive), TPH Aliphatic C <sub>23</sub> -C <sub>35</sub> (inclusive), TPH Aliphatic C <sub>36</sub> -C <sub>40</sub> (inclusive), TPH Aromatic EC <sub>10</sub> -EC <sub>12</sub> (inclusive), TPH Aromatic EC <sub>13</sub> -EC <sub>16</sub> (inclusive), TPH Aromatic EC <sub>17</sub> -EC <sub>21</sub> (inclusive), TPH Aromatic EC <sub>22</sub> -EC <sub>35</sub> (inclusive), TPH Aromatic EC <sub>36</sub> -EC <sub>40</sub> (inclusive).
Total Petroleum Hydrocarbons (TPH): Volatile range: Standard Solution	TPH Aliphatic ≤C <sub>6</sub> , TPH Aliphatic C <sub>7</sub> -C <sub>8</sub> (inclusive), TPH Aliphatic C <sub>9</sub> -C <sub>10</sub> (inclusive), TPH Aromatic C <sub>6</sub> (inclusive), TPH Aromatic C <sub>7</sub> -C <sub>8</sub> (inclusive), TPH Aromatic C <sub>9</sub> -C <sub>10</sub> (inclusive).
Chlorinated Hydrocarbons: Standard Solution	Chlorobenzenes, Dichloromethane, Hexachloro-1,3-butadiene, Tetrachloromethane, Trichloroethene, Trichloromethane, Vinyl Chloride, 1,1,1,2-Tetrachloroethane, 1,1,1-Trichloroethane, 1,2-Dichloroethane, 1,2-Dichloroethene, 2-Chlorotoluene.
BTEX: Standard Solution	Benzene, Ethylbenzene, m- + p-Xylenes, o-Xylene, Toluene.
Phenols: Soil and Standard Solutions	Cresols, Phenol, Xylenols Total Phenols (sum of phenol, cresols and xylenols, individually quantified). Distillable Phenolic Substances, Total Monohydric Phenols.
Semi-Volatile Organic Compounds: (SVOC) Standard Solution	SVOCs (Qualitative identification).
Miscellaneous: Soil	Elemental Sulfur. Total Organic Carbon.

Test material	Analytes
Metals: Soil, Acid Extract of Soil and Standard Solution	Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Chromium (VI), Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Thallium, Tin, Vanadium, Zinc.
Test material	Analytes
Leachable contaminants: Soil	Antimony, Ammonia, Arsenic, Barium, Boron, Cadmium, Calcium, Chloride, Chromium, Chromium (VI), COD, Conductivity (20°C), Copper, Fluoride, Free Cyanide, Iron, Lead, Magnesium, Mercury, Molybdenum, Nickel, Nitrate, pH, Phenol Index, Phosphate, Potassium, Selenium, Sodium, Sulfate, Thiocyanate, Tin, TOC/DOC, Total Cyanide, Zinc.
Test material	Analytes
Inorganic contaminants: Soil	Ammonia, Complex Cyanide, Dry Matter, Easily liberated Sulfide, Free Cyanide, Loss on Ignition, pH, Thiocyanate, Total Cyanide, Total Sulfate, Water Soluble (boron, chloride, fluoride, sulfate).
Standard Solution	Easily liberated Sulfide, Thiocyanate, Total Cyanide, Total Fluoride, Total Sulfate, Water Soluble Boron.

Note: Test materials and analytes may be added or removed, please see current application form.



## STACKS - Stack emissions scheme

The STACKS scheme has been designed for periodic manual measurement of industrial stacks by the analysis of simulated impinger solutions for a range of common pollutants.

Modern (and not so modern) combustion and industrial processes produce a range of air pollutants that have been shown to have, or are suspected of possessing, harmful effects on human health and the environment. Pollutants not only have local impact, but can also travel long distances, chemically reacting in the atmosphere to produce secondary pollutants such as acid rain or the much publicised damage to the ozone layer.

Industrial companies are required by regulatory authorities and environmental agencies to measure emissions from their chimney stacks. Monitoring of these emissions helps plants to manage their impact on the environment. By meeting the set limits, companies can avoid heavy fines and adverse publicity.

EU legislation (Directive 96/61/EC and its codified version 2008/1/EC) dictates that the emissions from stationary stacks such as chimney stacks are monitored in order to prevent or reduce emissions and that measures are taken to monitor such emissions.

Test material	Analytes
Impinger Solutions	Ammonia, Antimony, Arsenic, Cadmium, Chromium, Cobalt, Copper, Hydrogen Chloride (Hydrogen Chloride and HCl), Hydrogen Fluoride, Lead, Manganese, Mercury, Nickel, Sulfur Dioxide, Thallium, Vanadium.
*Metals on filters (Quartz or PTFE)	Antimony, Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Thallium, Vanadium.

Note: Test materials and analytes may be added or removed, please see current application form. \*Please note that the filter test material is currently not included in our scope of accreditation.



Participation in a proficiency testing scheme for stack emission monitoring is a requirement for laboratories accredited to carry out this analysis under the UK Environment Agency's Monitoring Certification Scheme (MCERTS) or if the testing forms part of a laboratory's scope of accreditation to ISO/IEC 17025.

The test materials used in the scheme will reflect the types of materials generally encountered by participants. The preparation and analysis of the test parameters are all based on the relevant EN Standards or equivalent, and are continually reviewed to ensure they meet current laboratory testing and regulatory requirements.

The full range and availability of test materials in STACKS is determined on an annual basis and further details can be found in the STACKS application form and scheme description.

## QWAS - Water microbiology scheme

The QWAS scheme is solely intended for microbiological analysis of waters, effluents and sludges and helps microbiologists demonstrate reliable results when conducting analysis on a wide range of water test materials. QWAS can help laboratories to meet the requirements of the laboratory standard ISO/IEC 17025, which states that analytical results must be monitored using external quality assessment, and the EU Directive 98/83/EC dealing with the quality of water for human consumption.

The test materials are provided in a stable, lyophilised format and QWAS participants can choose any combination of simulated potable, process and surface/wastewater materials, or an environmental water test material for *Legionella* testing. There is also an effluent sludge test material to allow participants to monitor treated sewage sludge which is used as an agricultural fertilizer. A sea water test material for bathing purpose as monitored by the EU for awarding 'blue flag' status for beaches is also available.

Microorganisms may be reference strains sourced from national culture collections, or may be fully characterised wild strains. When reconstituted, test material quantities vary, depending upon the microbiological specifications for the organism under test. Atypical strains may occasionally be included in test materials. Atypical strains can occur in 'real' samples and could be undetected or mis-identified. It therefore represents a realistic challenge to occasionally include atypical strains within a PT scheme.

For laboratories that perform the analysis of water, participation in a relevant proficiency testing scheme can provide confidence that results of these analyses are meaningful and accurate which, in turn, helps to ensure the safety of water.

The full range and availability of test materials in QWAS is determined on an annual basis and further details can be found in the QWAS application form and scheme description.

Test material	Analytes
Waters (Various e.g. bathing, environmental, mineral, potable, process, recreational, sea, surface, waste) and Simulated Effluent Sludge.	<p><b>Enumeration:</b>  <i>Clostridium perfringens</i>, Coliforms, Enterococci (faecal streptococci), <i>Escherichia coli</i>, Faecal coliforms, <i>Legionella</i> species, <i>Pseudomonas aeruginosa</i>, <i>Pseudomonas</i> species, <i>Staphylococcus aureus</i>, Total coliforms, Yeast and Mould.</p> <p>Total aerobic mesophilic count, Total aerobic mesophilic count at 22°C, Total aerobic mesophilic count at 37°C.</p> <p><b>Presence/absence:</b>            Sulphite – reducing clostridia, <i>Salmonella</i> species.</p>

Note: Test materials and analytes may be added or removed, please see current application form.



# Quality control materials



## Post-report PT test materials available

At the end of PT rounds, material is available for up to 3 months to the participants in order to investigate any issues with the analytical process. This is often required by accreditation bodies where there is no obvious non-analytical error (such as a transcription error) that could explain the occurrence of a poor score in a PT round.

## Value quality control materials

For many of our schemes there is ample stock available after the report has been issued, and these are ideal for use as quality control materials within the day-to-day laboratory programme. For many schemes, the samples are commercially produced materials with long shelf-lives, making them the perfect solution for many of your QC requirements.

## Proven quality

The assigned value for the PT test materials is supported by the analysis of many laboratories (in some cases hundreds) and statistical data processing, to ensure the reported values are reliable\*.

## Benefits of PT test materials for quality control

- Proven values, fully documented in the PT report
- Excellent value for money
- Ideal for method validation
- May be used to help establish measurement uncertainty
- Perfect for process control between PT rounds
- Excellent training tool for new staff
- Saves time preparing in-house controls
- Helps validate internally prepared materials
- Underpins your internal quality procedures

## For further information contact: LGC Standards Proficiency Testing

Europa Business Park, Barcroft Street, Bury, Lancashire BL9 5BT, UK

**Tel:** +44 (0)161 762 2500 **Fax:** +44 (0)161 762 2501

**Email:** [customerservices@lgcpt.com](mailto:customerservices@lgcpt.com) **Web:** [www.lgcpt.com](http://www.lgcpt.com)

\*Some materials use reference values and these are determined by different processes, depending upon the scheme. Please check the specific scheme report for the material required.

- **QBS**  
Beverage scheme
- **BAPS**  
Brewing analytes scheme
- **DAPS**  
Distillers' analytes scheme
- **MAPS**  
Malt analytes scheme
- **SUPS**  
Sugar scheme



## Beverage PT scheme selector

Scheme	Scheme year	Tests	Test material matrix
QBS Beverage scheme	January - December	Chemical and microbiological	Carbonated drink, carbonated drink (degassed), dilutable / ready to drink fruit juice, mineral water and soft drink
BAPS Brewing analytes scheme	January - December	Chemical, microbiological and sensory	Ales, lagers and stouts
DAPS Distillers' analytes scheme	April - March	Chemical	Distilled spirits, fermented worts, cider, wines and fortified wines, liqueurs and cream liqueurs, and ready to drink alcoholic beverages
MAPS Malt analytes scheme	January - December	Chemical and physical	Brewing/distilling malted barley, barley and malting cereals
SUPS Sugar scheme	January - December	Chemical and microbiological	Cane or beet sugar and molasses

““ **My results have not been included in the report  
can I calculate my own performance score?**

To calculate your performance score please visit [www.lgcpt.com/portal](http://www.lgcpt.com/portal)  
Select 'help' from the menu and download the z score calculator.””

Analyte group	Number of distributions per scheme year	See page
Chemical tests of relevance to the beverage industries for quality checks and complex parameters. Microorganisms of relevance to beverage products, including pathogens and indicator organisms.	Four	34
Chemical parameters of relevance to the brewing industry for quality checks and complex analysis. Brewery spoilage organisms. Sensory parameters of relevance to the brewing industry offering assessments in aroma and taste evaluation.	Twelve - Chemistry Six - Microbiology Twelve - Sensory	35
Chemical tests of relevance for alcoholic beverages and intermediate process samples.	Four	36
Chemical and physical tests of relevance to the malting industries for quality checks and complex analysis including mycotoxin analysis.	Twelve	37
Chemical tests of relevance to the sugar processing and food industries. Microorganisms of relevance to sugar products, including pathogens and indicator organisms.	Twelve	38



## QBS - Beverage scheme

The QBS scheme is specifically tailored for chemists and microbiologists working in the fruit juice, mineral water and soft drinks industries (including carbonated drinks). The scheme can also be of value to other laboratories that need to test for general food additives, such as sweeteners and preservatives.

Fruit juice and beverage products are regularly tested in order to ensure that they are of acceptable chemical and microbiological quality for consumption.

Chemical test materials are ready-to-use liquid matrices, covering product quality and compositional values. This enables laboratories to assess performance and demonstrate compliance with the relevant compositional standards and the statutory limits governing the use of additives. It also shows that the tests used to monitor other ingredients are reliable, essential to maintain the organoleptic properties of the beverage so vital to product quality.

Chemical analytes available for testing within the QBS scheme include a comprehensive range of quality checks (including brix, titratable acidity, pH) in addition to other more complex parameters which range from common additives (e.g. preservatives and sweeteners) to heavy metals and minerals and miscellaneous additives such as caffeine and vitamin C.

Test materials for microbiological testing cover the main spoilage and indicator organisms and are provided as lyophilised material with a choice of diluent (fruit juice, soft drink or mineral water) and a test material for analysis using filtration method to meet the laboratory's particular requirements.

The full range and availability of test materials in QBS is determined on an annual basis and further details can be found in the QBS application form and scheme description.



Test material	Analytes
Carbonated drink, Carbonated drink (degassed), Dilutable/Ready to drink, Fruit juice and Soft drink.	<p><b>Chemical:</b> Acesulfame K, Acidity (as Citric Acid Monohydrate), Ascorbic Acid (Vitamin C), Aspartame, Benzoic Acid, Brix, Caffeine, Carbon Dioxide, Free and Total Sulfur Dioxide, Fructose, Glucose, Headspace Air, Saccharin (as Amide), Sorbic Acid (as Free Acid), Sucrose, pH.</p> <p><b>Heavy Metals and Minerals:</b> Antimony, Cadmium, Calcium, Iron, Lead, Phosphorus, Potassium, Magnesium, Sodium.</p>
Fruit juice, Mineral water and Soft drink	<p><b>Microbiological:</b> <b>Enumeration:</b> Enterococci, <i>Escherichia coli</i>, Lactic acid bacteria, <i>Pseudomonas aeruginosa</i>, Total aerobic mesophilic count, Total aerobic mesophilic count at 22°C, Total aerobic mesophilic count at 37°C, Yeast and Mould.</p> <p><b>Presence/absence:</b> <i>Escherichia coli</i>.</p> <p><b>Microbiological Filtration:</b> <b>Enumeration:</b> Lactic acid bacteria, Total aerobic mesophilic count, Yeast and Mould.</p> <p><b>Presence/absence:</b> <i>Escherichia coli</i>.</p>

Note: Test materials and analytes may be added or removed, please see current application form.

## BAPS - Brewing analytes scheme

The BAPS scheme is designed to promote quality in the measurement of a range of chemical, microbiological and sensory analytes in real beer matrices. It is jointly run by LGC Standards and Campden BRI.

Analytes available are divided into five samples: Chemical (Samples 1, 2 and 3), Microbiological (Sample 4), Sensory (Sample 5).

Test material	Analytes
Sample 1 Chemical analysis	Alcohol by Volume, Bitterness, Carbon Dioxide, Carbon Dioxide (Pressure) corrected for foreign gas, Carbon Dioxide (Pressure) uncorrected for foreign gas, Colour @ 430 nm, Haze at 0°C, Haze at 20°C, Original Extract, Original Gravity, pH, Present Gravity, Refractive Index, Sulfur Dioxide.
Sample 2 Chemical analysis	Acetaldehyde, Calcium, Chloride, Copper, Dimethyl Disulfide, Dimethyl Sulfide, Energy value (kcal), Energy value (kJ), Ethyl Acetate, Ethyl Hexanoate, FAN, Free Diacetyl, Free 2,3-Pentanedione, Free VDK as Diacetyl, Glucose, HRV – NIBEM, HRV – Rudin, Hydrogen Sulfide, Iron, Iso- $\alpha$ -acids, Iso-Amyl Acetate, Iso-Butanol, Magnesium, Maltose, Maltotetraose, Maltotriose, Methanethiol, Methylthioacetate, Nitrate, n-Propanol, Phosphate, Potassium, Sodium, Sulfate, Tetra-iso- $\alpha$ -acids, Total Carbohydrate, Total Polyphenols, TSN, 2+3 Methyl Butanol, 2-Methyl Butanol, 3-Methyl Butanol.
Sample 3 Chemical analysis	Bitterness, Colour at 430nm, Colour at 530nm, Free 2,3-Pentanedione, Free Diacetyl, Free VDK as Diacetyl, Iso- $\alpha$ -acids, Tetra-iso- $\alpha$ -acids.
Sample 4 Microbiological analysis	Wild Yeasts (anaerobic and aerobic), Brewing Yeasts (ale and lager), Lactic Acid bacteria, Acetic Acid bacteria and other organisms.
Sample 5 Sensory analysis	<b>Aroma:</b> Alcoholic/Solvent, Burnt, Cereal, Fruity/Estery, Hop, Malty, Sulfur, Sweet, Toffee and others.  <b>Taste:</b> Alcoholic/Solvent, Astringent, Bitter, Burnt, Cereal, Fruity/Estery, Hop, Linger, Malty, Sour, Sulfur, Sweet, Toffee and others.

Note: Test materials and analytes may be added or removed, please see current application form.

For Samples 1, 2, 3, 4 and 5, participants may select the samples and rounds they wish to receive. As part of a comprehensive quality assurance programme, and to gain the benefit of trend analysis, participation in all the rounds over a year is recommended.

**Sample 1** is designed to provide participants with test materials that encompass a range of key brewing analytes that are routinely analysed in the brewing industry.

**Sample 2** is designed to provide participants with test materials that encompass a range of analytes that complement the routine analysis provided by Sample 1.

**Sample 3** is a test material of beer with high bitterness content and/or a high colour value.

**Sample 4** is designed to provide participants with microbiological test materials containing organisms typically encountered in the brewing industry.

**Sample 5** test materials are provided to allow participants to evaluate various aroma and taste characteristics found in the brewing industry. Campden BRI will undertake suitability testing using their sensory panel and provide an expert profile.

The full range and availability of test materials in BAPS is determined on an annual basis and further details can be found in the BAPS application form and scheme description.



## DAPS - Distillers' analytes scheme

As well as distilled beverages, DAPS covers analysis of a wide range of alcoholic beverages and intermediate process samples. The range of beverages includes fermented worts, scotch whisky, clear and dark spirits, liqueurs, ciders, wines and ready to drink alcoholic beverages (also known as 'lifestyle' drinks). DAPS does not include any test materials of beer – there is a separate scheme for beer, BAPS (see page 35).



There are five different groups available, with a comprehensive range of test parameters, as summarised in the table.

One of the key tests performed within DAPS is the measurement of alcoholic strength. Duty is normally paid on the basis of the alcohol in the beverage, and so it is a key performance indicator for the product and tax authorities. By monitoring laboratory performance in this key area, laboratories can help ensure that overpayment is not made thus saving money. Underpayment, which could lead to financial penalties, can also be avoided.

Furthermore, many of the key parameters in DAPS are related to flavour compounds within the beverage and so, by ensuring consistent analysis of these parameters, beverage producers may improve consistency of product across batches. Such parameters include acetaldehyde, furfural, 2+3 methyl butanols, ethyl acetate and acetic acid.

The full range and availability of test materials in DAPS is determined on an annual basis and further details can be found in the DAPS application form and scheme description.

Test material	Analytes
Group A Distillers' Fermented Wort	Alcohol by volume, Final Gravity, pH, Original and Residual Gravity, Residual Fermentable Sugars (total amount of glucose, maltose and maltotriose).
Group B Distilled Spirits	Acetic Acid, Apparent Alcoholic Strength, Actual Alcoholic Strength, Acetal, Acetaldehyde, Calcium, Citric Acid, Colour, Copper, Ethyl Acetate, Ethyl Carbamate, Furfural, Fructose, Glucose, Glycerol, Haze, Iron, Iso-Amyl Acetate, Iso-Butanol, Linalool (gin only) Magnesium, Maltose, Methanol, n-Butanol, NDMA, n-Propanol, pH, Potassium, Propylene Glycol, Sodium, Sucrose, Terpinene-4-ol (gin only), Total Acidity, Volatile Acidity, 2 + 3-Methyl butanols, 2-Methyl butanol, 3-Methyl butanol.
Group C Cider	Actual Alcoholic Strength, Carbon Dioxide, Colour, Haze, pH, Specific Gravity, Total Acidity, Total Sulfur Dioxide, Volatile Acidity.
Group D Wines and Fortified Wines	Actual Alcoholic Strength, Ascorbic Acid, Citric Acid, Colour @ 420nm, Colour @ 520nm, Colour @ 620nm, Copper, Free Sulfur Dioxide, Fructose, Glucose, Iron, Lactic Acid, Malic Acid, pH, Sorbic Acid, Specific Gravity, Total Acidity, Total Sulfur Dioxide, Volatile Acidity.
Group E Liqueur, Cream Liqueur and Ready to drink alcoholic beverages	Actual Alcoholic Strength, Acetal, Acetaldehyde, Ascorbic Acid, Benzoic Acid, Carbon Dioxide, Citric Acid, Ethyl Acetate, Furfural, Glycerol, Iso Amyl Acetate, Iso-Butanol, Methanol, n-Butanol, n-Propanol, pH, Propylene Glycol, Residue, Sorbic Acid, Specific Gravity, Total Acidity, Total Sugars, Volatile Acidity, 2+3 Methylbutanols, 2-Methylbutanol, 3-Methylbutanol.

Note: Test materials and analytes may be added or removed, please see current application form.

## MAPS - Malt analytes scheme

The MAPS scheme covers test materials from the full range of malted barley, barley and other malting cereals used for brewing and distilling. These test materials are analysed for a wide range of analytes, using EBC (European Brewing Convention) and IBD (Institute of Brewing and Distilling) methods, as well as a number of other physical and chemical methods. All test materials are sourced from commercially-traded malting barleys.

Malt is a complex product and forms a key ingredient in brewing and distilling. It is important in terms of soluble starch content, as this is converted to sugar in the mashing process, partly determining the alcohol yield during fermentation. Malt also makes a contribution to the flavour of the final product, whether it is used to produce a distilled spirit or a beer. In whisky for example the malting process can determine the level of peaty flavour, whilst in beers it can impart a range of flavours and add to the physical attributes such as colour and foam.

Meeting the demanding specifications laid down by brewers and distillers is critical to the business of any maltster and is greatly dependent on the quality of the malting barley. For this reason the accuracy of laboratory results is essential as they will ultimately decide if the product is suitable for use in the production plant.

The full range and availability of test materials in MAPS is determined on an annual basis and further details can be found in the MAPS application form and scheme description.



Test material	Analytes
Malt	<p><b>Chemical:</b> Alpha Amylase, Cold Water Extract, Diastatic Power, DMSP, DPWK, EBC Fraction IV (&lt;2.2mm + damaged corns from all other sieves), EBC Reject Fraction (EBC Fraction IV plus foreign matter), Free &amp; Total DMS, Friability, Glassy (Whole) Corns, Glycosidic Nitrile, Hartong VZ45, Homogeneity, Malt Mod Homogeneity, Malt Modification, Moisture, NDMA, Partly Unmodified Grains, Residual Sulfur Dioxide, Sieving Test (&lt;2.20mm, 2.20 to 2.50mm, 2.50 to 2.80mm, &gt;2.80mm), Total Nitrogen, Total Phenols.</p> <p><b>EBC wort dependent:</b> Beta Glucan, Boiled Wort Colour, Colour, DMSP, Extract Difference (0.2-1.0), Fermentability (Boiled), Extract: (0.2mm, 1.0mm), FAN, Kolbach Index, pH, TSN, Viscosity.</p> <p><b>IoB wort dependent:</b> Beta Glucan, Colour, Extract (0.2mm, 0.7mm), Extract Difference (0.2mm-0.7mm), FAN, Fermentability (Boiled, Unboiled 2.0mm, 0.7mm), pH, Predicted Spirit Yield (as is), SNR, Soluble Extract Difference (0.2-0.7), (0.2-1.0), Soluble Extract 0.2m, 0.7mm, 1.0mm, TSN, Viscosity.</p>
Barley	<p><b>Chemical:</b> Aubry Test, BRF (4ml Test and 8ml Test), EBC Fraction IV (&lt;2.2mm + Damaged Corns from all other sieves), EBC Reject Fraction (EBC Fraction IV plus Foreign Matter), Germinative capacity, Hectolitre Weight, Moisture, Schonfeld Test, Sieving Test &lt;2.20mm, &lt;2.25mm, &gt;2.50mm, &gt;2.80mm, 2.20 to 2.50mm, 2.25 to 2.50mm, 2.50 to 2.80mm, Thousand Corn Weight, Total Nitrogen.</p>
Malt Flour	<p><b>Mycotoxin:</b> Deoxynivalenol (DON), Ochratoxin A.</p>

Note: Test materials and analytes may be added or removed, please see current application form.

### SUPS - Sugar scheme

The Sugar Proficiency Testing Scheme (SUPS) is suitable for all laboratories concerned with the quality of sugar, particularly manufacturers of sugar and sugar products and the soft drinks industry.

All matrices are sourced from commercial manufacturers as cane or beet sugar and molasses. Participants receive test materials quarterly for monthly analysis and reporting of results.

SUPS is the only scheme designed to provide sugar analysts with information relevant to the methods of analysis used to define the quality of sugar. It is based on the use of specified methods available in the ICUMSA (International Commission for Uniform Methods of Sugar Analysis) Methods Book that have undergone international validation.



Sugar is traded all around the world and it is therefore essential that those laboratories analysing sugar for trade purposes know exactly how they perform when carrying out these analyses. SUPS provides data which helps with identification of any performance issues with respect to the methods used and provides evidence of competence for individual laboratories.

The full range and availability of test materials in SUPS is determined on an annual basis and further details can be found in the SUPS application form and scheme description.

Test material	Analytes
Cane or Beet Sugar	<p><b>Chemical:</b> Arsenic, Ash, Colour, Copper, Iron, Lead, Reducing Sugars, Reflectance Grade, Sulfur Dioxide, Turbidity.</p> <p><b>Sediment:</b> Sediment (insoluble),</p>
Molasses	<p><b>Chemical:</b> Dry Substance, pH, Sucrose, Reducing Sugars.</p>
Lyophilised Material	<p><b>Microbiological:</b> Total aerobic mesophilic count, Osmophilic Yeast and Mould, Yeast and Mould.</p>

Note: Test materials and analytes may be added or removed, please see current application form.

- **PACQS**  
Particle analysis and  
characterisation quality scheme
- **PHARMASSURE**  
Pharmaceutical scheme
- **PHYTAS**  
Phytochemical scheme
- **QMIS**  
Microbiology investigation  
scheme
- **QUARTZ**  
Forensic blood toxicology  
scheme
- **TOYTEST**  
Toy safety scheme



Other  
PT schemes

## Other PT scheme selector

Scheme	Scheme year	Tests	Test material matrix
PACQS* Particle analysis and characterisation scheme	September - August	Physical	Particulate materials
PHARMASSURE Pharmaceutical scheme	April - March	Chemical and microbiological, instrumental techniques	Pharmaceutical products and standard solutions
PHYTAS* Phytochemical scheme	September - August	Chemical	Botanical
QMIS Microbiology investigation scheme	January - December	Microbiological	Lyophilised microorganisms
QUARTZ Forensic blood toxicology scheme	September - August	Chemical	Blood and standard solutions
TOYTEST Toy safety scheme	January - December	Chemical assessment against standards	Toys and standard solutions

\*Please note that the PACQS and PHYTAS schemes and alcohol test material are currently not included in our scope of accreditation.

## “ “ How can I receive advice and feedback? ” ”

Communication with participants will be carried out through scheme-related documentation, e-mails, letters, newsletters, memos, fax, or through LGC Standards local offices. Open meetings may also be organised and all interested parties invited to attend. ” ”

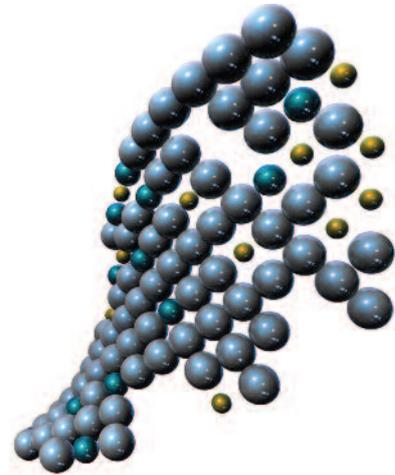
Analyte group	Number of distributions per scheme year	See page
Particle size analysis by wet and dry laser diffraction.	Four	44
Basic/advanced chemical analysis, microbiological analysis and sterility testing.	Four	45
Comprehensive range of botanical products for identification and quantification of active ingredients.	Four	46
Food and water pathogens, indicator and spoilage organisms.	Two	47
Drug identification, quantification and alcohol quantification.	Four	48
Metals analysis, toy safety assessment exercises and physical measurement assessments.	Four	49

Other  
PT schemes



### PACQS - Particle analysis and characterisation quality scheme

The PACQS scheme, for users of laser diffraction particle size analysers, is designed to give invaluable feedback on the accuracy of particle sizing measurements. These are critical to product quality in a wide range of industries, from pharmaceuticals to paints, cosmetics to ceramics and more. PACQS can be a powerful training tool for laboratory and production personnel carrying out the tests as they will get direct feedback on their analytical performance. The scheme is managed in accordance with international standard for laser diffraction particle analysis (ISO 13320-1). Participants have the added value of being able to contact the appropriate instrument manufacturers, who contribute to the independent advisory group, to seek advice with respect to their performance in the scheme.



The full range and availability of test materials in PACQS is determined on an annual basis and further details can be found in the PACQS application form and scheme description.

Test material	Analytes
Various materials, providing a range of sizes and physical/optical properties	Particle diameter statistics determined by Laser diffraction techniques:  D <sub>10</sub> value, D <sub>50</sub> value, D <sub>90</sub> value, D <sub>4:3</sub> (volume weighed mean).

Note: Test materials and analytes may be added or removed, please see current application form. PACQS is currently not included in our scope of accreditation.

## PHARMASSURE - Pharmaceutical scheme

PHARMASSURE has been specifically designed to meet the needs of the pharmaceutical industry. The reduction of risks associated with the manufacture of pharmaceutical products is the primary objective of the pharmaceutical quality assurance laboratory. There is an abundance of regulations, biological standards, validation procedures and other tools available to the quality control professional to achieve this aim. In most cases however, the use of these tools is aimed at assessing the product or the environment in which it was produced. The introduction of proficiency testing offers a valuable independent tool for the ongoing assessment of the testing procedures, methods employed, laboratory staff responsible for the analysis and subsequent interpretation of results.

Test material	Analytes
Sample 1 Basic chemical analysis	Acid/Base Titration, Density, Melting Point, Other Basic Titration (actual analytes dependant on test), pH, Refractive Index.
Sample 2 Advanced chemical analysis	Advanced Titration (e.g. Potentiometric, Non-Aqueous), Flame Spectroscopy, FTIR, HPLC, GC, IR, Polarimetry, UV, Viscosity.
Sample 3 Microbiological identification	A low inoculum level test material for enumeration by membrane filtration and identification.
Sample 4 Microbiological enumeration	A high inoculum level test material for enumeration of Total aerobic mesophilic bacteria, <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , Yeasts and Moulds.
Sample 5 Sterility testing	A set of 5 test materials each to be tested for sterility.

Note: Test materials and analytes may be added or removed, please see current application form.

The regulations surrounding the manufacture of pharmaceutical products and the laboratories which test them are wide ranging, and compliance with the requirements of GMP/GLP are aimed at ensuring the safety and efficacy of all pharmaceutical preparations. Similarly, the annual revalidation of methods is an important tool in understanding and ensuring that a testing method is working properly. However, these tools are largely internal operations. Regular participation in a PT scheme, provides an external independent tool for monitoring the effectiveness of methods employed in any laboratory, without the work involved in a full method revalidation. The test materials cover chemical and microbiological analysis. The sterility test is ideally suited to ongoing assessment and provides staff involved in the analysis and in interpretation of results with a tool to ensure that low level contamination events which occur particularly infrequently – and often not at all over the course of a testing year – are identified and the results correctly interpreted.

The full range and availability of test materials in PHARMASSURE is determined on an annual basis and further details can be found in the PHARMASSURE application form and scheme description.



### PHYTAS - Phytochemical Testing Assurance Scheme

PHYTAS has been developed in response to demands from the phytochemical industry. In recent times there has been a huge amount of media attention and popular interest in medicinal plants and the chemicals they contain. These plant materials are highly valued for the role they can potentially play in promoting and sustaining human health. Plants have evolved to produce an array of secondary compounds, many of which have been used in traditional medicines and remedies for hundreds of years.

The most common classes of 'active' compound found in medicinal plants are alkaloids, terpenoids, phenols and glycosides, though the range of compounds is by no means limited to these four classes. As extracts of living matter, the quality and potency of botanical products is subject to variation, giving rise to uncertainty amongst consumers, analysts and regulators alike.

Test material	Analytes
Botanical	Identification and quantification of a range of active ingredients.

Note: Test materials and analytes may be added or removed, please see current application form. PHYTAS is currently not included in our scope of accreditation.



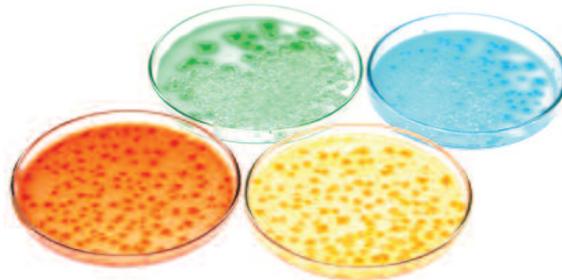
The analysis of such a wide range of compounds, in what is by definition an incredibly diverse range of matrices, is not always straightforward and there is little standardisation of methodologies from laboratory to laboratory. One of the major concerns in a relatively new and broad field of analysis is this lack of standardised methods and even definition of the 'required' components for analysis. Proficiency testing is an important tool in the improvement of analytical performance in scientific disciplines such as this and by standardising the quality of analysis, one of the variables is removed – helping to achieve consistency in the quality of the finished product for the consumer.

The full range and availability of test materials in PHYTAS is determined on an annual basis and further details can be found in PHYTAS application form and scheme description.

## QMIS - Microbiology investigation scheme

The Quality in Microbiology Investigation Scheme (QMIS) is designed to work alongside the QMS scheme (see page 18).

QMIS differs from the normal schemes in that the microbiologist must carry out specified laboratory techniques and apply further investigative measures in order to identify an unknown organism provided for analysis. It therefore assesses the ability to carry out fundamental microbiological techniques, and from the results of these, determine the final identity of the isolate.



Each test material is provided with brief information about its origin, along with narrative details, from which the microbiologist must deduce the necessary tests (in addition to those prescribed in the accompanying information, such as Gram stain, catalase, oxidase, etc.) required to achieve the correct identification of the organism.

QMIS organisms are selected from our comprehensive range of microorganisms of relevance to food and water analysis and are presented in a lyophilised format to include pathogens, indicator organisms and spoilage organisms.

The full range and availability of test materials in QMIS is determined on an annual basis and further details can be found in the QMIS application form and scheme description.

Test material	Analytes
Food and Water	<b>Food:</b> Unknown pathogen for identification with scenario.
	<b>Food:</b> Unknown routine organism for identification with scenario.
	<b>Water:</b> Unknown isolate for identification with scenario.

Note: Test materials and analytes may be added or removed, please see current application form.

## QUARTZ - Forensic blood toxicology scheme

QUARTZ is a blood toxicology scheme and is designed for laboratories undertaking analysis of drugs in post-mortem and other blood samples for toxicological purposes, particularly in a forensic context. Test materials are prepared by spiking pre-screened human blood, which are assessed for homogeneity prior to despatch.

The analytes to be determined in each round are from a list, compiled by the Advisory Group, of non-prescription, prescription and controlled drugs, as well as other toxins, which reflect what participants are likely to encounter in forensic casework.

The drugs used are subdivided into two groups:

**Group A** those drugs that are more frequently determined by participants.

**Group B** those drugs that may be less frequently determined by participants.

Test material will contain between 0 and 4 drugs and up to three samples are provided in each round.

Alcohol is a major cause of road casualties and deaths and as penalties for drink-driving are severe it is essential the accuracy of analysis can be proven in the legal case. The test material comprises 10ml vial of whole blood containing alcohol for analysis. The full range and availability of test materials in QUARTZ is determined on an annual basis and further details can be found in the QUARTZ application form and scheme description.



Test material	Analytes
<b>Group A</b> More frequently determined drugs	6MAM (MACM), Amfetamine, Amisulpride, Amitriptyline, Benzoylcegonine, Buprenorphine, Carbamazepine, Chlordiazepoxide, Chlorpromazine, Citalopram, Clomipramine, Clozapine, Cocaine, Codeine, Cyclizine, Desmethyldiazepam, Diazepam, Diclofenac, Dihydrocodeine, Diphenhydramine, Dosulepin, Fentanyl, Fluoxetine, Ibuprofen, Imipramine, Ketamine, Lamotrigine, MDA, MDMA, Methadone, Methamphetamine, Midazolam, Mirtazepine, Morphine, Olanzapine, Oxazepam, Oxycodone, Paracetamol, Paroxetine, Pethidine, Phenytoin, Procyclidine, Promethazine, Propoxyphene, Quetiapine, Risperidone, Salicylate, Sertraline, Temazepam, THC, THC-COOH, Tramadol, Venlafaxine, Zolpidem, Zopiclone.
<b>Group B</b> Less frequently determined drugs	Amlodipine, Amobarbital, Atenolol, Benzyl piperazine (BZP), Butobarbital, Clobazam, Clomethiazole, Clonazepam, Dextromoramide, Dipipanone, Gabapentin, Loprazolam, Lormetazepam, Mefenamic Acid, Methylphenidate, Naltrexone, Pentobarbital, Phenelzine, Propranolol, Secobarbital, Sildenafil, Thioridazine, Trazadone, Zaleplon.

Note: Metabolites of the above substances may also be added.

Test material	Analytes
Drug Identification	Participants will be asked to identify the drug(s) only. The test material will always (if positive) contain one drug from Group A. Up to three other drugs may be in the test material from either Group A and/or Group B.
Drug Quantification	Participants will be told the identity, or generic classification, of the drug(s), and asked to quantify the concentration. They will also be asked to give an interpretation of the results in respect to a case study provided. The test material will always contain a drug from Group A. Any other drugs present will be from Group A and/or Group B.
Drug Quantification	Standard solutions containing drugs for the evaluation of instrumentation.
*Alcohol Quantification	Participants will be required to quantify the alcohol concentration by their usual methods

Note: Test materials and analytes may be added or removed, please see current application form. \*Please note the Alcohol test material is currently not included in our scope of accreditation

## TOYTEST - Toy safety scheme

Play is a vital part of child-development and toys help at every stage from babies to school-age children. Toys are safer than ever before, but we should remain cautious about often hidden hazards of toys. We rely on manufacturers, suppliers and toy legislation to help keep our children safe and at the same time prevent product recalls and protect brand value.

With an international reputation as a leading independent PT supplier, LGC Standards TOYTEST scheme allows laboratories involved in the safety testing of toys to monitor their analysis against the current European and American standards. Participation in TOYTEST will enable laboratories performing tests on toy products to monitor their performance and compare with that of their peers.

Test materials are assessed against the requirements of EN71 (European Standard) and ASTM (American Society for Testing and Materials F963) toy safety standards.

A comprehensive range of test materials will be included over the scheme year to be assessed against the regulations; however, not all parts of the standards will be assessed over a scheme year. Participants will be given clear instructions as to which parts of the standards are to be assessed.

Test materials will also be provided for analytical testing, such as paint flakes for lead analysis, and standard solutions for heavy metal analysis.

Further tests may be added at the discretion of the Advisory Group.

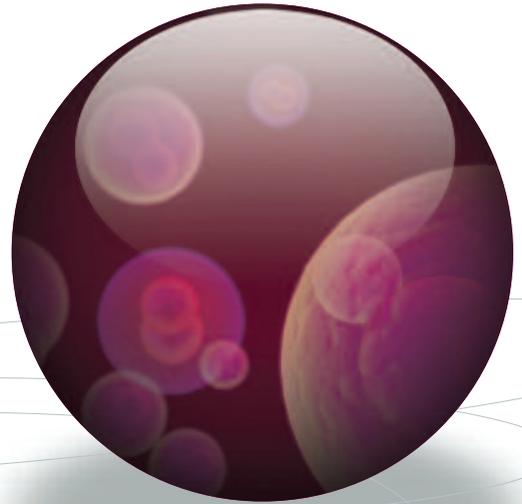
The full range and availability of test materials in TOYTEST is determined on an annual basis and further details can be found in the TOYTEST application form and scheme description.

Test material	Analytes
Test usually a toy material or toy part	EN71-1: Test material for analysis and assessment against standard.
A paper exercise relating to the interpretation and inspection of toys	EN71-2: Test material for flammability testing.
A standard solution containing metals at levels similar to a typical extract	EN71-3: Test material and Standard solution provided for metal analysis.
	EN71-7: Information provided for assessment against standard.
	EN71-8: Information provided for assessment against standard.
	EN71-9: Test material for analysis and/or information provided for assessment against standard.
	ASTM F963: Test material assessment against standard.
Section of material and/or standard solution	Azo dyes.
Dried paint flakes	ASTM: Total Lead.
Section of plastic material	Phthalates.

Note: Test materials and analytes may be added or removed, please see current application form.



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**Cryopreservation products**

[www.lgcstandards.com/atcc](http://www.lgcstandards.com/atcc)



*Excellence through measurement*

- **Special bespoke microbiology test materials**
- **Closed customised PT schemes**
- **Other PT services**
- **Product development**
- **Reference materials**
- **Training and education**
- **Summary**

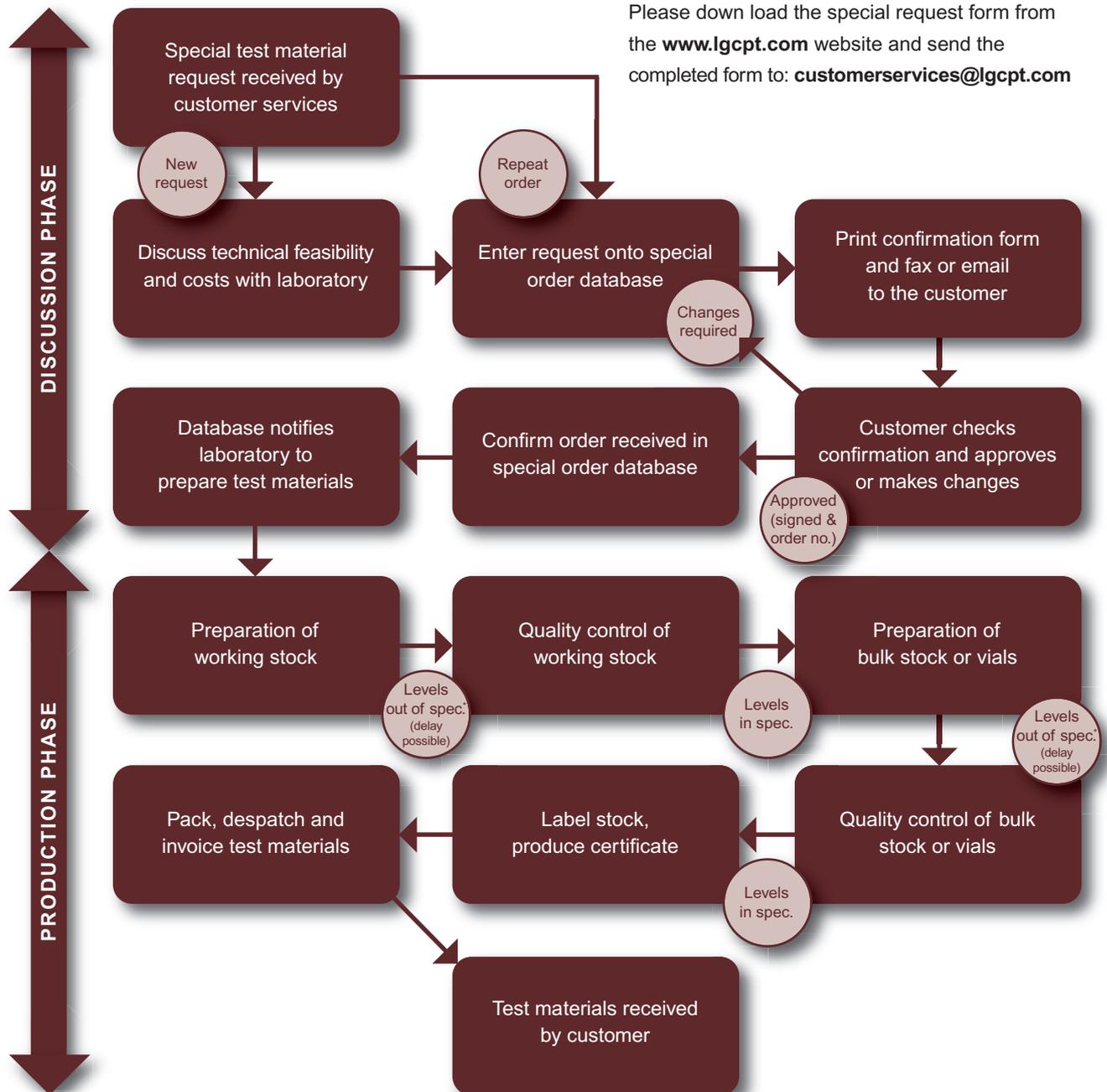


**Other services**

### Special bespoke microbiology test materials

In the unlikely event that our standard schemes do not fulfil your company's requirements, we would be happy to discuss any special requests you may have, subject to a minimum order value.

Please download the special request form from the [www.lgcpt.com](http://www.lgcpt.com) website and send the completed form to: [customerservices@lgcpt.com](mailto:customerservices@lgcpt.com)



Special Notes: The production phase does not start until an approved (signed, dated and with purchase order number where applicable) confirmation form has been received by LGC Standards. \*Products out of specification are more likely with special test materials as defined levels are often requested. As we are dealing with live organisms, the final levels cannot always be accurately predicted, resulting in further work needing to be carried out and resulting delay in completion of the manufacturing process.

## Closed customised PT schemes

In addition to the regular schemes, LGC Standards is able to offer customised or closed proficiency testing schemes tailored to a specific organisation's requirements. We operate such schemes on behalf of some of the largest companies in the world and we are happy to discuss your requirements in this area. Please note that a minimum level of business is required before a scheme can be setup.

For further details contact:  
**customerservices@lgcpt.com**

## Other PT services

- Advice and consultancy for potential PT providers;
- Consultancy for PT providers in the implementation of appropriate quality systems;
- Training courses for PT participants and their customers;
- Prominent role in the development of policy and guidance for proficiency testing by representing the UK on a number of key international committees.

## Product development

LGC Standards Proficiency Testing is continually striving to improve current products and to introduce new products and PT schemes where appropriate. New products may be introduced initially by offering them on a trial basis to participants. It will be made clear to participants when they are participating in a trial.

If you have a requirement for a new analyte, test material matrix, or a whole new scheme please contact:  
**www.customerservices@lgcpt.com**

## Reference materials

LGC Standards combines expertise in analytical sciences, and experience in international standards, to offer laboratories throughout Europe the ideal solution to sourcing high quality certified reference materials.

Our expert technical support staff unrivalled knowledge in the use of certified reference materials across a broad range of analytical sectors.

As the leading global supplier of reference materials, LGC Standards offers:

- Partnership with the world's key producers of reference materials;
- Expert local customer service and technical support;
- Supply of all major pharmacopeia and reference materials;
- Assistance in finding the right materials to suit your need;
- Over 25,000 reference materials in our range.

For further information or to receive any one of our catalogues, please contact your local office or visit our website: **www.lgcstandards.com**

### Training and education

A range of training courses is available from LGC Standards to help laboratory managers and analysts demonstrate competence in, and keep abreast of, quality assurance issues and practices. LGC Standards analytical quality training programme includes:

- Achieving traceability in chemical testing;
- Using proficiency testing in the analytical laboratory;
- Method validation;
- Quality systems in testing laboratories;
- Statistics for analytical chemists;
- Further statistical tools for analytical chemists;
- Principle and practice of measurement uncertainty in chemical testing laboratories;
- Evaluating measurement uncertainty for chemical testing laboratories.

The majority of the courses are run in Teddington, South West London. In addition LGC Standards can provide training for groups of staff at your own site, where the courses can be customised to meet your exact needs.

To find out more about the training courses and seminars available and to make an on-line booking visit our website: [www.lgc.co.uk](http://www.lgc.co.uk)

### Summary

Proficiency testing is widely used across many industries as an integral part of the quality control and risk reduction process. Similarly participation in these types of programmes provides the analytical laboratory with the ability to assess performance on an ongoing basis and benchmark that performance against other laboratories while maintaining anonymity. Confidentiality of participant results is an absolute requirement of proficiency testing and is assured for all participants. The ongoing assessment of performance using proficiency testing allows the identification of areas for training and improvement and may also assist with audit processes.

Proficiency testing is only one of the many tools that can bring about improvements in your laboratory's quality system. Other ways may include the use of quality control materials and reference materials. LGC Standards can offer our market leading products from our catalogues covering a wide range of sectors including food, environmental, pharmaceutical, clinical and industrial.



Frequently asked  
questions

## Frequently asked questions

### Q: Which international standards are relevant to PT?

**A:** All the PT schemes within LGC Standards Proficiency Testing are operated in accordance with the international standard ISO/IEC 17043. The statistical analysis undertaken is in accordance with the international standard ISO 13528. LGC Standards Proficiency Testing is accredited by the United Kingdom Accreditation Service for the provision of proficiency testing schemes, currently against ISO/IEC Guide 43.1 and ILAC G13. A copy of our current scope of accreditation is available on the UKAS website ([www.ukas.com](http://www.ukas.com)).

### Q: How are your schemes organised?

**A:** The day-to-day operation of each scheme is the responsibility of LGC Standards Proficiency Testing. Individual schemes are managed by a team of Scheme Coordinators, to cover reporting, customer service and technical functions. For some schemes, external advisors may also be used to provide the full range of relevant knowledge and expertise needed to operate the scheme effectively.

### Q: Do you use Advisors and Advisory Groups?

**A:** Yes depending upon the scheme in question. Advisors are selected on the basis of their technical knowledge and experience of the industry to which the scheme is related. Advisors may be used on an ad-hoc basis and contacted when specific issues need to be addressed.

Alternatively, formal advisory groups may be used. Advisory Groups consist of members who may or may not be participants on the scheme but who are experienced in the field of testing covered by the PT scheme.

The composition and terms of reference of each Advisory Group will be agreed on a scheme-by-scheme basis. Membership of the Advisory Groups is subject to change but members' names are available on request.

### Q: Do you run schemes that are jointly managed?

**A:** Yes one or two schemes are operated jointly with a partner organisation. Where schemes are operated jointly, a Management Committee may be set up to address operational issues for the scheme.

### Q: How do I join a scheme?

**A:** Participants are advised to participate in the scheme(s) that are most appropriate to their own area of testing. Where necessary, staff at LGC Standards Proficiency Testing can advise on which scheme is most suitable for participants.

For each scheme, a scheme description and application form will be available, containing information about the test materials included in the scheme, and the intended distribution dates. Participants are invited to complete the application form, indicating which test materials they wish to receive during the scheme year. If the availability of test materials changes during the scheme year, participants are kept fully informed.

Once a participant joins a scheme and has selected the test materials required, a participant schedule is provided as confirmation.

### Q: Can you guarantee my laboratory's confidentiality?

**A:** In order to ensure confidentiality, participants in all schemes are allocated a unique laboratory reference number. This number enables results to be reported without divulging the identities of participant laboratories. Only LGC Standards Proficiency Testing and the laboratory itself know this number.

### Q: How often do I need to participate?

**A:** The frequency that a laboratory needs to participate in proficiency testing depends on a wide range of factors specific to each individual laboratory, such as, other quality tools used, the volume of work undertaken and the

risk associated to the measurements. Therefore every individual laboratory may have a different need, which is why schemes provided by LGC Standards offer flexible participation, although some do have a minimum participation level. Third parties such as regulatory bodies, may recommend minimum levels of participation. To gain the benefit from trend analysis, participation in a minimum of four rounds over a scheme year is recommended.

**Q: What are the fees for participation?**

**A:** Fees for participation are reviewed annually and the current fees for each scheme are available on application. Payment terms are detailed on the application form and invoice. Participants are advised that delays with payments may result in test materials and reports being withheld until payment is made.

**Q: Where do you source your test materials?**

**A:** The vast majority of test materials are manufactured by LGC Standards Proficiency Testing. Where this is not possible, test materials are carefully sourced to meet the needs of participants. Wherever practical, test materials will be as similar as possible to those routinely tested by participating laboratories. However, in some cases, in order to achieve the required degree of homogeneity and stability, test materials may be in the form of simulated matrices or concentrated spiking solutions.

The range of test materials will usually be varied from round to round in order to be realistic and challenging. Details of individual test material types are available in the relevant scheme description.

**Q: How are test materials packaged and transported?**

**A:** Test materials are sent in appropriate packaging and under conditions intended to protect the contents during transit. All test materials are sent using priority courier. Overseas customers must provide relevant documents

to prevent delay in customs such as import permits and may be required to pay import duties locally.

Once packages have been delivered, LGC Standards Proficiency Testing cannot be held responsible if they subsequently fail to reach the correct personnel or are not stored under the recommended conditions. Participants are asked to check the contents of packages immediately on receipt and to contact LGC Standards Proficiency Testing if there are any problems with the condition of the test materials or accompanying documentation.

**Q: How is test material stability affected by time, distance and temperature?**

**A:** The test materials are all stable at the stated storage temperatures for at least the period of the Proficiency Test round. Studies have shown there is no significant difference between results of test materials tested the day after despatch and those tested on the deadline date. There is also no evidence that results are influenced by different climatic conditions of participating countries.

Distance travelled does not affect test material results. We have undertaken studies on a number of our PT test materials comparing the average result according to distance travelled, and no correlations have been found. Stability consideration is an important part of the design and feasibility process for a PT scheme, where transport conditions such as temperature, humidity, pressure, exposure to x-rays etc. are taken into account.

**Q: How do I treat my PT test material?**

**A:** It is important for laboratories to understand how to get the optimum benefit from PT participation. To do this, a laboratory must participate in an open and honest fashion, being prepared to, on occasion, be evaluated as unsatisfactory. If PT is to achieve its aims, laboratories need to treat the PT test materials the same as routine

test materials, and staff must be encouraged to treat them appropriately and learn from their results in a constructive manner.

Laboratories will learn very little about the quality of their routine work if the PT test materials are given special treatment, such as carrying out a much higher number of analyses, in order to be evaluated as satisfactory. This may in fact compromise the quality of routine measurements as a disproportionate level of effort is being expended for the PT.

**Q: Do I have to use specific methods to analyse the test materials?**

**A:** Unless otherwise instructed, participants should analyse the test materials using any method that they feel is appropriate. Participants are asked to treat the PT material in the same way as a routine test material.

Participants may be asked to state their method when reporting results. It is important that this information is accurate as results are analysed and reported according to the method stated.

**Q: Do I have to report my results within a specific timescale?**

**A:** Deadlines are specified for the return of results, to ensure the timely issue of assigned values and reports to participants. For each scheme a closure date will therefore be specified. For certain tests there may also be a date specified by which examination of the test material is recommended to have been commenced. This is to ensure that sufficient time is available to complete the test and report results in time for the deadline date.

**Q: How should I report my results using PORTAL?**

**A:** For the majority of schemes, results are returned through our bespoke electronic reporting software, *PORTAL*. Once you are ready to report your results, please go to [www.lgcpt.com/portal](http://www.lgcpt.com/portal) you will need to log

in using your Lab ID, Username and Password. We advise that prior to using *PORTAL* you read the user guide which is available at [www.lgcpt.com/portal](http://www.lgcpt.com/portal) select 'help' from the menu. If you require further assistance please contact our support team. Email: [support@lgcpt.com](mailto:support@lgcpt.com) Tel: +44(0)161 762 2500. For your local LGC Standards office see pages 64 - 65.

For some schemes (or parts of a scheme) alternative reporting mechanisms are provided, details of which will be emailed to participants prior to test materials receipt.

It is recommended that results and calculations are checked thoroughly before reporting. Results should be reported clearly, in the format and units detailed in the scheme description. If calculations are used, unless instructed otherwise, the laboratory is to report only the final calculated result.

In general, results of zero should not be reported; results should be reported depending upon the detection limit of the method used, for example, <10. The exception is a small number of parameters, where it may be appropriate to report a result of zero, depending on the measurement scale being used. Results of zero and truncated results, such as < or > cannot be included in the data analysis and therefore can not be allocated a performance score.

Results may be rounded up or down in the report and may not therefore be identical to your original reported result. However, performance scores are calculated using the unrounded results submitted and so are unaffected by rounding. The effects of rounding may also mean that occasionally percentage totals do not add up exactly to 100%.

Part of the challenge of proficiency testing is the ability to perform calculations and

transcribe results correctly. LGC Standards Proficiency Testing staff cannot interpret or calculate results on participants' behalf. Once submitted and received, results can not be amended and no changes can be made after the report has been issued.

**Q: Can my results be included in the report if I've missed the deadline for reporting?**

**A:** Participants are asked to return results by the given deadline in order to ensure that their results are included in the statistical analysis and the scheme report. Results received after the closure date will not be included in the report.

For schemes where a generic report is issued, this is available to all participants subscribing to the round regardless of whether their results were submitted or not.

**Q: How do you prevent collusion and falsification of results?**

**A:** It defeats the objective of taking part in proficiency testing if participants are not returning genuine results. Certain measures are built into the schemes to try and prevent collusion but, ultimately the responsibility rests with each participating laboratory to behave in a professional manner.

**Q: How is the assigned value established?**

**A:** ISO 13528: "Statistical methods for use in proficiency testing by interlaboratory comparisons" sets out how the assigned value and performance assessment criteria can be established and describes the options for the various scoring systems.

The assigned value is the value selected as being the best estimate of the 'true value' for the parameter under test. The method used to determine the assigned value may vary depending upon the particular scheme and test material and is detailed in the relevant scheme description.

For quantitative tests, where it is appropriate,

practicable and technically feasible the assigned value will be derived through formulation (or occasionally through the use of a certified reference material) to provide metrological traceability; the associated uncertainty of the value can therefore be estimated. However, in many cases the use of a consensus value is the only practicable and technically feasible approach to use. When the assigned value is determined from the consensus value of participant results, or from expert laboratories, robust statistical methods are used for calculation of the consensus value, the estimated standard uncertainty and the robust standard deviation.

For qualitative tests, participant results are compared against the intended result based on formulation.

For schemes where the result is subjective rather than quantifiable, a model answer produced by appropriate experts will be published in the report.

For microbiology test materials, all participant results are transformed by converting them to  $\log_{10}$  before the statistical analysis is undertaken.

**Q: How do I evaluate measurement uncertainty?**

**A:** The aim when evaluating measurement uncertainty is to combine the effects of all the errors, that will influence the measurement result, into a single value. There are many different guides available which provide advice on evaluating measurement uncertainty. Two specific guides that are internationally recognised, are:

- ISO (BIPM, IEC, IFCC, IUPAC, IUPAP & OIML) "Guide to the Expression of Uncertainty in Measurement"
- EURACHEM/CITAC Guide "Quantifying Uncertainty in Analytical Measurement"

Further information on approaches to evaluating measurement uncertainty may also be available from your national accreditation body. For example, UKAS M3003 "The expression of uncertainty and confidence in measurement".

The EURACHEM/CITAC Guide can be downloaded, along with further information on evaluating measurement uncertainty, from the website [www.nmschembio.org.uk](http://www.nmschembio.org.uk)

**Q: Can I use PT data to estimate my measurement uncertainty?**

**A:** It is possible, but must be regarded as a very rough estimate, and is not an approach addressed in many guides to evaluating measurement uncertainty. However, two documents that do address the use of PT data are:

- NORDTEST Report TR 537 "Handbook for Calculation of Measurement Uncertainty in Environmental Laboratories"
- ISO/TS 19036 "Microbiology of food and animal feeding stuffs - Guidelines for the estimation of measurement uncertainty for quantitative determinations"

**Q: What is the standard deviation for proficiency assessment (SDPA)?**

**A:** The SDPA expresses the acceptable difference between the laboratory result and the assigned value. An acceptable z-score represents a result that does not deviate from the assigned value by more than twice the SDPA. The method used to determine the SDPA may vary depending upon the particular scheme and test material and is detailed in the relevant scheme description.

**Q: What standard deviation for proficiency assessment (SDPA) is used in microbiology PT schemes?**

**A:** There are many sources of variation in microbiological testing and the SDPA used to assess performance therefore needs to be fit-for-purpose and take all possible sources

of variation into account. From experience and historical data, LGC Standards PT uses a fixed SDPA value of  $0.35 \log_{10}$  for the majority of microbiological tests.

**Q: What is the purpose of scoring my result?**

**A:** Once the assigned value for the parameters under test has been established, participant laboratories are assessed on the difference between their result and the assigned value, with this difference being represented by a performance score called a z-score. This provides a simple and consistent measure of performance which is the key to monitoring competence and implementing an improvement programme as required.

**Q: How are z-scores calculated?**

**A:** The participant's result,  $x$ , is converted into a z-score using the following formula;

$$z = \frac{(x - X)}{SDPA}$$

Where:  $X$  = the assigned value SDPA = standard deviation for proficiency assessment.

For small data sets, there will be increased uncertainty around the assigned value if using consensus values from participants' results. In such cases, z-scores may not be provided, or may be given for information only.

The z-score expresses performance in relation to the assigned value and standard deviation. A z-score of 2 represents a result that is a distance of  $2 \times$  SDPA from the assigned value.

A fixed value for SDPA is preferable as this enables z-scores to be compared from round to round to demonstrate general trends.

For each scheme, the value of SDPA and the method used to derive it is reported in the scheme description and/or report.

**Q: How do I interpret my results?**

**A:** For quantitative examinations, participant performance is assessed using the z-score, and the following interpretation is given to results.

$ z  \leq 2.00$	Satisfactory result
$2.00 <  z  < 3.00$	Questionable result
$ z  \geq 3.00$	Unsatisfactory result

For qualitative examinations, laboratories reporting the assigned result will be considered correct.

**Q: What are the advantages of a z-score?**

- A:**
- Results can be expressed in a form that is relatively easy to interpret and understand;
  - Results can be summarised in graphical or tabular form to depict overall performance;
  - A performance score allows participants to directly compare their own result with others;
  - If consistent statistical values are applied, a performance score enables participants to monitor and trend their own performance over time.

It is important to interpret any performance score in the full context of the overall results and in the context of a laboratory’s own quality control measures.

**Q: What is the estimated uncertainty of the assigned value?**

**A:** The assigned value has a standard uncertainty ( $u_x$ ) that depends upon the method used to derive the assigned value. When the assigned value is determined by the consensus of participants’ results, the estimated standard uncertainty of the assigned value can be calculated by;

$$u_x = 1.25 \times \text{Robust standard deviation} / \sqrt{n}$$

Where n = number of results

When the assigned value is determined by formulation, the standard uncertainty is estimated by the combination of uncertainties

of all sources of error, such as gravimetric and volumetric measurements.

If  $u_x$  is  $\leq 0.3 \times \text{SDPA}$ , then the uncertainty of the assigned value can be considered negligible and need not be considered in the interpretation of results.

If  $u_x$  is  $> 0.3 \times \text{SDPA}$ , then the uncertainty of the assigned value is not negligible in relation to the SDPA and so z'- scores (z-prime), which takes into account the standard uncertainty of the assigned value in their calculation, will be reported in place of z-scores.

**Q: How is z'- score (z-prime) calculated?**

**A:** A z'- score (z-prime) incorporates the standard uncertainty of the assigned value and is calculated as follows:

$$z' = \frac{(x - X)}{\sqrt{\text{SDPA}^2 + u_x^2}}$$

Where

- x = participant result
- X = the assigned value
- SDPA = standard deviation for proficiency assessment
- $u_x$  = standard uncertainty of the assigned value X

A z'-score is interpreted in exactly the same way as a z-score,  $\leq 2$  is satisfactory,  $> 2$  but  $< 3$  is questionable and  $\geq 3$  is unsatisfactory.

**Q: Do you include outlying results due to ‘errors and blunders’ in the statistical analysis of the data?**

**A:** Although robust estimators are used in order to minimise the influence of outlying results, extreme results or results that are identifiably invalid should not be included in the statistical analysis of the data. For example, these may be results caused by calculation errors or the use of incorrect units. However, such results can be difficult to identify by the PT organiser. For this reason, the robust mean and standard deviation will be calculated in the usual way,

but those results that are out of the range of the assigned value  $\pm 5 \times \text{SDPA}$  will be excluded and the robust mean and standard deviation will then be recalculated. These recalculated values will be used for the statistical analysis. By removing these 'blunders' from the dataset any influence on the summary statistics is completely removed. All results, including excluded results, will be given z-scores.

**Q: What could be the cause of my poor performance?**

**A:** A single poor result is not indicative of overall laboratory performance but neither is a single good result. Ideally, PT results should be monitored over time to detect unusual bias or repeated unsatisfactory results indicate poor performance.

There are many possible reasons for a single unsatisfactory result including statistical chance. It is therefore important to interpret the results from PT schemes within the context of an all-round quality assurance programme, including internal quality control, use of validated methods and reference materials.

There are numerous potential causes of unsatisfactory performance in a PT scheme which may include analytical and non-analytical errors:

**Analytical errors**

- Calibration / instrument problems;
- Extraction / clean-up;
- Interferences / matrix effects;
- Diagnostic kits / reagents;
- Analyst / method performance.

**Non-analytical errors**

- Calculation / transcription;
- Reporting format / units;
- Storage;
- Test material defects.

Test materials are subjected to rigorous quality control testing before being distributed to participants, and are unlikely to be the cause of a poor z-score.

All possible reasons for a poor performance should be investigated fully in order to identify the most likely cause and to enable action to be taken to prevent recurrence. Repeat test materials are available after every distribution, but it is most important to investigate and understand the reason(s) for the failure, document this fully, and carry out corrective actions before repeating a test.

**Q: How can I measure my laboratory's performance over time?**

**A:** You can do this by Trend Analysis. A single result simply reflects the performance of the laboratory on the particular day that the test was carried out and therefore gives limited information. Frequent participation in PT schemes over time can give greater insight into long-term performance and can help identify where internal bias may be occurring. One of the best methods of summarising z-scores over time is graphically as this gives a clear overview and is less prone to misinterpretation than numerical methods.

Participants are therefore advised to monitor their PT results over time. Further information regarding interpretation and trend analysis of proficiency results is given in the IUPAC "International Harmonised Protocol for the Proficiency Testing of Analytical Chemistry Laboratories", 2006 and ISO 13528.

Trend Analysis is an integral part of our *PORTAL* software.

**Q: How can I graphically plot and analyse trends for qualitative results?**

**A:** Qualitative results are difficult to depict graphically as they are not normally allocated a performance score. However for qualitative results, a correct result could be allocated a

performance score of 0 to represent a satisfactory result. A false positive result can be represented by a performance score of + 3, whilst a false negative result can be represented by a performance score of - 3. If plotted graphically over time, this should give a clear visual indicator of performance in qualitative tests.

**Q: How will I receive my report?**

**A:** Following statistical evaluation of the results, the reports will be available on the website within 4 to 15 working days of round closure (see specific scheme description). Participants will be emailed a link to the report when it is available. The contents of reports vary from scheme to scheme but include details of the composition of test materials, the assigned values, and tabular and/or graphical representations of participants' results. Paper copies are also available for an additional charge.

**Q: How do I assess the reproducibility standard deviation from the PT report?**

**A:** The robust standard deviation provided in the PT report for a specific method can be taken as an estimate of the reproducibility standard deviation for the PT round for that specific method.

**Q: Can I have a report that only includes my group laboratories?**

**A:** Yes we can produce reports tailored to a customer's specific requirement. There will be an additional charge for administration and computer programming costs.

Copyright to all reports remains with LGC Standards Proficiency Testing but permission is granted to participants to make copies for their own internal use, for example for quality control and regulatory purposes. No other copies may be made without obtaining permission.

**Q: My results have not been included in the report can I calculate my performance z score?**

**A:** To calculate your performance score please visit [www.lgcpt.com/portal](http://www.lgcpt.com/portal) Select 'help' from the menu and download the z score calculator

**Q: How can I receive advice and feedback?**

**A:** Communication with participants will be carried out through scheme-related documentation, e-mails, letters, newsletters, memos, fax, or through LGC Standards local offices. Open meetings may also be organised and all interested parties invited to attend.

**Q: How can I send feedback?**

**A:** Comments on any aspect of our products and services are welcome either by phone, fax, letter, email or by contacting your local LGC Standards office.

# ChromaDex phytochemicals and services

## Phytochemical pure substances

- Reference standards
- Primary standards
- Rare chemicals
- Product libraries

## Contract services

- Contract analysis
- Contract research
- Process development
- Isolation
- Method development



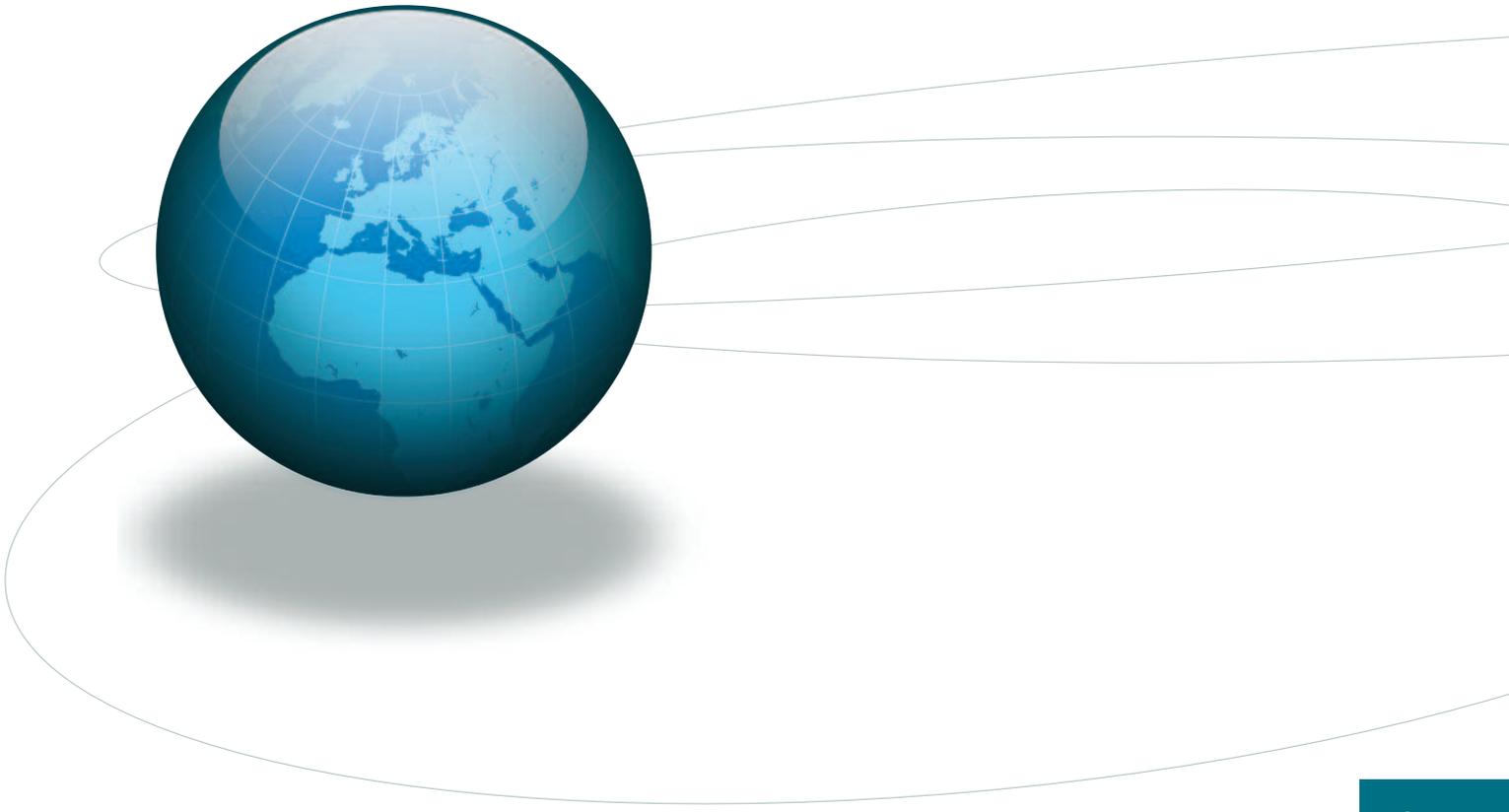
## Reference materials

- Botanical reference materials (BRM)
- Extract reference materials (XRM)
- Voucher specimens

## Analysis kits

- Standard kits
- HPLC kits
- TLC kits
- Bioluminex





LGC Standards Proficiency Testing has dedicated local offices worldwide to help with your needs from placing an order through to specific enquiries. Please see the list below to contact your nearest office.

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