Specification of Competency Standards
for the Testing, Inspection and Certification Industry
Unit of Competency

Functional Area - Testing Operations

Title	Develop procedures for estimation of measurement uncertainty in microbiological testing using EURACHEM/MIKE approach
Code	105759L5
Range	This unit of competency (UoC) covers the abilities to develop procedures for estimating the measurement uncertainty in microbiological testing using EURACHEM or "Uncertainty of Quantitative Determinations Derived by Cultivation of Microorganisms (MIKE)" approach by evaluating all critical factors and the associated uncertainties in measurement steps in testing laboratories.
Level	5
Credit	4 （For Reference Only）

Competency	Performance Requirements
	1. Possess knowledge and principles of estimating measurement uncertainty in microbiological testing
	
	• Command the knowledge of statistics, e.g. mean, standard deviation, variance, standard deviation of the mean, degrees of freedom.
	• Explain the applications of various significance tests, e.g. t-test, F-test, analysis of variance (ANOVA), standard deviation of prediction, linear regression.
	• Interpret the approaches of estimation of measurement uncertainty in microbiological testing, e.g.:
	   o EURACHEM,
	   o "Uncertainty of Quantitative Determinations Derived by Cultivation of Microorganisms (MIKE)",
	   o approaches as stipulated in test standards.
	• Differentiate types of distribution of microorganisms, e.g. Poisson and negative binominal distribution and statistical manipulation of such distribution
	• Identify major factors affecting uncertainty of quantitative determination.
	• Examine and verify information on quantitative evaluation of media, intermediate precision and between operators precision.
	2. Develop and document procedures for estimation of measurement uncertainty in microbiological testing
	
	• Select an appropriate approach for estimation of measurement uncertainty in microbiological testing.
	• Identify factors other than precision affecting the uncertainty.
	• Determine the required confidence interval.
	• Outline the steps for estimation of measurement uncertainty including:
	   o convert the data to logarithm form and calculate the intermediate,
	   o precision based on duplicate determinations,
	   o compute the uncertainty due to factors such as media and operators using statistical approach (pair comparison),
	   o combine uncertainty of all factors,
	   o calculate the uncertainty interval and convert back to CFU by anti-logging the uncertainty value.
	• Critically control other experimental factors, e.g. temperature of incubator, incubation time, storage temperature, maximum holding time of samples.
	• Review and re-evaluate the uncertainty regularly taking into account of quality control data and variations in operation.
	• Document the procedures for estimation of measurement uncertainty in microbiological testing.

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	3. Exhibit professionalism • Consider all factors and estimate the measurement uncertainty appropriately. • Ensure the control of experimental parameters critical to the results.
Assessment Criteria	The integrated outcome requirements of this UoC are the abilities to: • select the appropriate approach for estimation of measurement uncertainty in microbiological testing, • evaluate all factors affecting the measurement uncertainty and control factors that contribute significantly to the overall measurement uncertainty, • develop and document the procedures for estimation of measurement uncertainty by applying the knowledge of microbiological testing and statistical methods in compliance with requirements of test standards.
Remark	