



TRAINING PROGRAM



# Assessment of Laboratory competence

## Introduction:

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How reliable is the result?”, how sure are you, To answer this question an uncertainty budget must be prepared, which includes errors, random and systematic, arising from all aspects of experiment adopting on QC & QA principles which can enable a laboratory to show that it has adequate facilities and equipment for carrying out chemical analysis and that the work was carried out by competent staff in a controlled manner, QA should focus on the key issues which determine quality results, costs and timeliness avoid diversion into less important issues.

## Who Should Attend?

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Laboratory supervisors, chemists, and senior technicians working in QA/QC

## Certificate:

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**BTS certificate will be issued to all attendees completing minimum of 75% of the total tuition hours of the WORKSHOP.**

## Course Objectives:

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It is necessary to balance cost of QC & QA against the benefit in reducing quality failures to an acceptable (non-zero) level, you will learn how develop laboratory documents and quality. Attendees will receive practical instructions on the development, implementation and long-term maintenance of an effective laboratory quality system.

## Course Outline:

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- Introduction
- History & Review
- Chemical Measurement
  - ❖ Types of methods
  - ❖ Selection of methods
  - ❖ Chemical measurement evolution
  - ❖ Compare duplicate samples results
  - ❖ Reputability, Reducibility and mean of replicate
  - ❖ Evaluation of analytical data measurement
  - ❖ Prerequisites for analytical method validation
- Method Calibration, and Standardization
- Correction of errors and improving Blank
- Calibration Instruments and Measurement methods
  - ❖ Certificate Reference Material (CRM), choice and preparation
  - ❖ Degrees of Freedom
  - ❖ Linearity and Residual analysis in regression
  - ❖ Blank Correction
  - ❖ Instruments Calibration and Traceability
  - ❖ Calibration Procedures, Certificate, and Documentation
    - Standard calibration curve
    - Standard addition calibration curve
    - Internal standard calibration curve

- Characteristic and steps of Method validation
  - ❖ Selectivity
  - ❖ Specificity
  - ❖ Tolerance
  - ❖ Linearity, Correlation Coefficient
  - ❖ Accuracy & Precision
  - ❖ Reliability (Repeatability, Reproducibility)
  - ❖ Sensitivity, Detection Limit (LOD)
  - ❖ Dynamic Range (LOQ, LOL, and LUR)
  - ❖ Robustness
- The Evaluation of Results and Methods
- Type of errors in chemical measurements
  - ❖ Systematic, Random, and Gross errors
  - ❖ Errors in Qualitative and Quantitative Analysis
  - ❖ Correction of errors and improving accuracy
  - ❖ Correction of errors and improving accuracy
- Measurement Uncertainty in chemical measurements
  - ❖ Difference between Error and Uncertainty
  - ❖ Sources of uncertainty in measurement
  - ❖ Recommendations of ISO 17025 for uncertainty
  - ❖ Procedures for estimating measurement uncertainty
    - “Bottom-up” method GUM
    - “Top-down” methods
    - Monte Carlo method – an alternative to GUM
- Normal Distribution (Gaussian Distribution curve)
- Statistical Process Control (SPC) & Control Chart
- Practical exercises for Inter-Laboratory Performance test
  - ❖ F-test
  - ❖ T-test (Student’s t Distribution test)
  - ❖ Q-test
  - ❖ Z-score
- Practical exercises for Uncertainty& Control Chart
  - ❖ Manual Calculation for Uncertainty
  - ❖ Used Excel Function for Uncertainty
  - ❖ Drawing Control Chart by Excel

❖ Proficiency Test Calculation

- Quality Assurance and Audit Program
- Significant Figure & Rounding
- Reporting Analytical results and Archives
- Laboratory Certification