

**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)**

**JOB ANALYSIS CHART FOR ANALYTICAL CHEMISTRY TECHNICIAN LEVEL 6**

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| **DUTIES** | TASKS | | | |
| **BASIC COMPETENCIES** | | | | |
| **A**  **Demonstrate communication skills** | A1  Meet communication needs of clients and colleagues | A2  Develop communication strategies | A3  Establish and maintain communication pathways | A4  Promote use of communication strategies |
| A5  Conduct interview | A6  Facilitate group discussion | A7  Represent the organization |  |
| **B**  **Demonstrate Numeracy Skills** | B1  Apply a wide range of mathematical calculations for work | B2  Use and apply ratios, rates and proportions for work | B3  Estimate, measure and calculate measurement for work | B4  Use detailed maps to plan travel routes for work |
| B5  Use geometry to draw 2D shapes and construct 3D shapes for work | B6  Use differentiation and integration concepts in solving mathematical problems | B7  Collect, organize, and interpret statistical data for work | B8  Use routine formula and algebraic expressions for work |
| B9  Use common functions of a scientific calculator for work |  |  |  |
| **C**  **Demonstrate Digital Literacy** | C1  Identify appropriate computer software and hardware | C2  Apply security measures to data, hardware, software in automated environment | C3  Apply computer software in solving tasks | C4  Apply internet and email in communication at workplace |
| C5  Apply Desktop publishing in official assignments | C6  Prepare presentation packages |  |  |
| **D**  **Demonstrate employability skills** | D1  Develop self-awareness and understanding of every day demands and challenges in the workplace | D2  Demonstrate critical safe work habits for employees in the workplace | D3  Lead a workplace team | D4  Plan and organize work |
| D5  Maintain professional growth and development in the workplace | D6  Demonstrate learning, creativity and innovativeness in the workplace |  |  |
| **E**  **Demonstrate environmental literacy** | E1  Control environmental hazard | E2  Control environmental Pollution control | E3  Demonstrate sustainable resource use | E4  Evaluate current practices in relation to resource usage |
| E5  Identify Environmental legislations/conventions for environmental concerns | E6  Implement specific environmental programs | E7  Monitor activities on Environmental protection/Programs | E8  Analyse resource use |
| E9  Develop resource Conservation plans |  |  |  |
| **F**  **Demonstrate occupational safety and health practices** | F1  Identify workplace hazards and risk | F2  Identify and implement appropriate control measures | F3  Implement OSH programs, procedures and policies/ guidelines |  |
| **G**  **Demonstrate entrepreneurial skills** | G1  Develop business Innovative strategies | G2  Develop new products/ markets | G3  Expand customers and product lines | G4  Motivate staff/workers |
| G5  Expand employed capital base | G6  Undertake county/ regional business expansion |  |  |

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| **COMMON COMPETENCES** | | | | |
| **Duties** | Tasks | | | |
| **A**  **APPLY PHYSICS PRINCIPLES** | A1  Apply units of measurement and measuring instruments. | A2  Apply the principles of forces | A3  Solve problems related to motion, work energy and power | A4  Apply the concepts of density and pressure |
| A5  Apply the principles of fluid flow and heat transfer | A6  Apply properties of light and sound waves |  | |
| **B**  **APPLY STANDARD LABORATORY PRACTICES** | B1  Identify and Manage Laboratory hazards and risks | B2  Apply laboratory safety procedures | B3  Store laboratory samples, chemicals and reagents | B4  Prepare laboratory reagents |
| B5  Maintain laboratory ware and equipment | B6  Maintain laboratory hygiene | B7  Dispose laboratory wastes | B8  Specify analytical reagents, chemicals, laboratory ware and equipment for procurement |
| B9  Receive, qualify and validate the analytical, reagents, laboratory ware and equipment |  | | |
| **C**  **APPLY INORGANIC CHEMISTRY** | C1 Demonstrate knowledge of atomic structure | C2  Demonstrate knowledge of periodic table | C3  Demonstrate the knowledge of chemical bonding and structure. | C4  Demonstrate knowledge of chemical equations and reactions. |
| C5  Demonstrate knowledge on qualitative & quantitative analysis of inorganic compound | C6  Demonstrate knowledge of nuclear chemistry |  | |
| **D**  **APPLY PHYSICAL CHEMISTRY** | D1  Demonstrate the knowledge of the states of matter | D2  Demonstrate the knowledge of gas behaviour | D3  Demonstrate the knowledge of chemical reactions. | D4  Demonstrate the knowledge of phase diagrams |
| D5  Demonstrate the knowledge of reaction kinetics | D6  Demonstrate the knowledge of Electrochemistry | D7  Demonstrate the knowledge of thermodynamics | D8  Demonstrate the knowledge of thermometric analysis |
| **E**  **APPLY ORGANIC CHEMISTRY** | E1  Demonstrate the knowledge of hydrocarbons | E2  Demonstrate the knowledge of haloalkanes | E3  Demonstrate the knowledge of hydroxyl compounds | E4  Demonstrate the knowledge of carbonyl compounds |
| E5  Demonstrate knowledge of carboxylic acids | E6  Demonstrate knowledge of carboxylic acid derivatives | E7  Demonstrate knowledge of amines and nitrogen compounds | E8  Demonstrate the knowledge of aromatic compounds |
| E9  Demonstrate the knowledge of heterocyclic compounds | E10  Demonstrate the knowledge of polynuclear aromatic compounds | E11  Demonstrate knowledge of polymer chemistry | E12  Demonstrate knowledge of stereochemstry |
| E13  Demonstrate knowledge on organic spectroscopic techniques | E14  Demonstrate knowledge of formulation chemistry |  | |
| **F**  **APPLY BIOCHEMISTRY TECHNIQUES** | F1  Demonstrate knowledge of water, acids, bases and buffers | F2  Demonstrate knowledge of cell biology | F3  Demonstrate knowledge of carbohydrates | F4  Demonstrate knowledge of proteins . |
| F5  Demonstrate knowledge of lipids | F6  Demonstrate knowledge of vitamins and minerals | F7  Demonstrate knowledge of enzymes and coenzymes | F8  Demonstrate knowledge of nucleic acids |
| F9  Demonstrate knowledge of metabolism | F10  Demonstrate knowledge of biochemical techniques |  | |
| **G**  **APPLY ANALYTICAL CHEMISTRY RESEARCH** | G1  Formulate analytical chemistry problem | G2  Develop research proposal | G3  Prepare research instruments | G4  Collect analytical chemistry data |
| G5  Analyse and interpret analytical chemistry data | G6  Prepare analytical chemistry research report | G7  Present analytical chemistry research report |  |
| **H**  **APPLY STATISTICAL METHODS** | H1  Introduction to statistics | H2  Apply Sampling methods and data collection | H3  Apply Presentation of data | H4  Apply Measures of central tendency |
| H5  Apply Measures and relative measures of dispersion | H6  Apply Elements of probability | H7  Apply Probability distribution | H8  Apply Moments, skewness and kurtosis |
| H9  Apply Correlation and regression |  | | |

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| **CORE COMPETENCIES** | | | | |
| **Duties** | Tasks | | | |
| **A**  **DEVELOP STANDARD OPERATING TEST PROCEDURES** | A1  Develop analytical test purpose and objective | A2  Develop analytical test scope | A3  Develop analytical quality specifications | A4  Develop the test methodology |
| A5  Review/improve test procedures |  | | |
| **B**  **COLLECT AND PREPARE ANALYTICAL CHEMISTRY SAMPLES** | B1  Design a sampling plan | B2  Implement sampling plan | B3  Label/code analytical samples | B4  Preserve and transport analytical sample |
| **C**  **PERFORM ANALYTICAL CHEMISTRY TECHNIQUES** | C1  Demonstrate knowledge on Separation techniques | C2  Demonstrate knowledge of titrimetric techniques | C3  Demonstrate knowledge of gravimetric techniques | C4  Demonstrate knowledge e on qualitative methods of chemical analysis |
| C5  Demonstrate knowledge on spectroscopic methods | C6  Demonstrate knowledge of instrumental methods of analysis | C7  Calibrates/Optimise analytical equipment | C8  Perform cleaning and basic service for analytical equipment |
| **D**  **ANALYSE AND INTERPRET ANALYTICAL DATA** | D1  Receive and input analytical data | D2  Analyse analytical data | D3  Interpret output result | D4  Prepare report and present findings |
| **E**  **MANAGE ANALYTICAL CHEMISTRY LABORATORY, REAGENTS AND INSTRUMENTS** | E1  Specify analytical reagents and lab-ware for procurement | E2  Receive and inventory analytical reagents and lab-ware | E3  Prepare and standardise working solutions | E4  Track and maintain reagents and lab-ware re-order levels |
| E5  Manage analytical chemistry housekeeping, safety and security |  | | |
| **F**  **MANAGE ANALYTICAL CHEMISTRY SAMPLES** | F1  Receive , record ,re-label, retrieval and movement of analytical samples | F2  Secure and store analytical samples | F4  Collect, segregate, and dispose laboratory sample-waste |  |

**General Knowledge and Skills**

**Skills**

* Communication
* Planning
* Organizing
* Leadership
* Interpersonal
* Problem solving
* Critical thinking
* Negotiation

**Knowledge**

* Laboratory security and safety
* Chemical safety and security
* Basic tools of analytical chemistry
* Measurements in analytical chemistry
* Concentrations
* Stoichiometric equations
* Preparation of equations
* Analytical techniques
* Procedure development
* Protocols
* Analytical methodologies
* Evaluation of analytical data
* Experimental errors
* Uncertainty
* Distribution of analytical measurements
* Statistical data analysis
* Detection limits
* Analytical standards
* Calibrations
* Sensitivity
* Regression lines and calibration curves
* Reversible Reactions and Chemical Equilibria
* Thermodynamics and Equilibrium Chemistry
* Manipulating Equilibrium Constants
* Equilibrium Constants for Chemical Reactions
* Le Châtelier’s Principle
* Ladder Diagrams
* Solving Equilibrium Problems
* Buffer Solutions
* Collection and preparation of samples
* The Sampling techniques
* Designing a sampling plan
* Separating the Analyte from Interferents
* Separation Efficiency
* Separation Techniques
* Liquid–Liquid Extractions
* Gravimetric Methods
* Titrimetric Methods
* Spectroscopic Methods
* Electrochemical Methods
* Chromatographic and Electrophoretic Methods
* Kinetic Methods
* Developing a Standard Method
* Quality Assurance
* Quality problem solving
* Improvement tools
* Chemometrics

**Behaviours**

* Trustworthy
* Reliable
* Patient
* Decisive
* Confident
* Responsible
* Creative
* Optimistic
* Honest
* Team player
* Positive attitude
* Keen to details
* Professional
* Intelligent
* Courteous
* Process oriented
* Accurate
* Knowledgeable
* Consistent
* Self-motivated
* Faithful
* Integrity
* Flexible
* Calm
* Composed

**Tools, Equipment, Supplies and Materials**

* ISO standards
* Regulatory framework
* AOAC methods
* Pharmacopoeia
* Lab-wares
* Relevant measurement and testing infrastructure/Equipment
* Reagents
* Stationary
* Personal protective equipment
* Laboratory workspace, tools and fixture

**Future Trends and Concerns**

* Occupational safety and health
* Automation of analytical testing
* Business process outsourcing
* Competition from other courses e.g. Chemical engineering, industrial chemistry