

DIPLOMA IN ANALYTICAL CHEMISTRY

Dip (Analytical Chemistry) - NQF Level 6 (360 credits)

Qualification code: DPAC19

SAQA ID: 100979, CHE NUMBER: H16/14303/HEQSF

Campus where offered:

Arcadia Campus

REMARKS

a. *Admission requirement(s) and selection criteria:*

Acceptance is subject to available capacity according to the Student Enrolment Plan (SEP). Once a programme is full, a waiting list will be in place to provide an opportunity for applicants to fill places of those who did not register on time. Applicants will be informed of their status per official letter from the Office of the Registrar, alternatively, they can check their application status on the TUT website, www.tut.ac.za.

• **FOR APPLICANTS WITH A SENIOR CERTIFICATE OBTAINED BEFORE 2008:**

Admission requirement(s):

A Senior Certificate or an equivalent qualification, with a D symbol at Higher Grade or a C symbol at Standard Grade for English, Mathematics and Physical Science.

Selection criteria:

Applicants are selected by means of the following formula for academic merit, based on scholastic performance:

SYMBOL	HG VALUE	SG VALUE
A	8	7
B	7	6
C	6	5
D	4	3
E	2	1

To be considered for this qualification, applicants must have a score of at least **24** according to the table above.

- Applicants with a score of 30 and more according to the formula for academic merit determination will be considered for admission.
- Applicants with a score of 24 to 29 according to the formula for academic merit determination will be kept on a waiting list from which the applicants with the highest scores will be selected. Waiting lists will be cleared at the end of September.

• **FOR APPLICANTS WITH A NATIONAL SENIOR CERTIFICATE OBTAINED IN OR AFTER 2008:**

Admission requirement(s):

A National Senior Certificate with a bachelor's degree or a diploma endorsement, or an equivalent qualification, with an achievement level of at least 4 for English (home language or first additional language), 4 for Mathematics or Technical Mathematics and 4 for Physical Sciences or Technical Sciences.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **21** (excluding Life Orientation).



Assessment procedure(s):

- Applicants with a score of 27 and more will be considered for admission.
- Applicants with a score of 21 to 26 will be kept on a waiting list from which the applicants with the highest scores will be selected. Waiting lists will be cleared at the end of September.

• FOR APPLICANTS WITH A NATIONAL CERTIFICATE (VOCATIONAL) AT NQF LEVEL 4:**Admission requirement(s):**

A National Certificate (Vocational) at NQF Level 4 with a bachelor's degree or a diploma endorsement, with at least 50% for English (home language or first additional language) and 50% for Mathematics, 40% for Life Orientation (excluded for APS calculation), 50% for Sciences, 50% in any two compulsory vocational subjects.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **21** (excluding Life Orientation).

Assessment procedure(s):

- Applicants with a score of 27 and more will be considered for admission.
 - Applicants with a score of 21 to 26 will be kept on a waiting list from which the applicants with the highest scores will be selected. Waiting lists will be cleared at the end of September.
- Recognition of Prior Learning (RPL), equivalence and status:*
See Chapter 30 of Students' Rules and Regulations.
 - Intake for the qualification:*
January only.
 - Presentation:*
Day classes.
 - Minimum duration:*
Three years.
 - Exclusion and readmission:*
See Chapter 2 of Students' Rules and Regulations.
 - Practicals:*
It is compulsory for students to attend 100% of the practical classes. Students must pass the practical component of a module to be admitted to the examination.
 - Textbooks:*
Textbooks and other educational material will be required.
 - Personal protective equipment:*
Specific safety wear is compulsory (where applicable), and students must purchase it themselves.
 - WIL in Analytical Chemistry I:*
See Chapter 5 of Students' Rules and Regulations.



CURRICULUM

FIRST YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
11P105X	Communication for Academic Purposes	(5)	(10)	
AYC105D	Analytical Chemistry I	(5)	(24)	
CHM105X	Chemistry I	(5)	(24)	
CPL105X	Computer Literacy	(5)	(10)	
INI125D	Information Literacy I (block module)	(5)	(2)	
LF1125X	Life Skills I (block module)	(5)	(2)	
MAT105X	Mathematics I	(5)	(24)	
PHI105X	Physics I	(5)	(24)	
TOTAL CREDITS FOR THE FIRST YEAR:			120	

SECOND YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
FIRST SEMESTER				
EVC216D	Environmental Chemistry I	(6)	(12)	Analytical Chemistry I Chemistry I
INA216X	Inorganic Chemistry IIA	(6)	(12)	Chemistry I
OCA216X	Organic Chemistry IIA	(6)	(12)	Chemistry I
PCA216X	Physical Chemistry IIA	(6)	(12)	Chemistry I Mathematics I
TOTAL CREDITS FOR THE SEMESTER:			48	
SECOND SEMESTER				
INB216X	Inorganic Chemistry IIB	(6)	(18)	Inorganic Chemistry IIA
MSP216D	Molecular Spectroscopy I	(6)	(18)	Inorganic Chemistry IIA Organic Chemistry IIA Physical Chemistry IIA
OCB216X	Organic Chemistry IIB	(6)	(18)	Organic Chemistry IIA
PCB216X	Physical Chemistry IIB	(6)	(18)	Physical Chemistry IIA
TOTAL CREDITS FOR THE SEMESTER:			72	
TOTAL CREDITS FOR THE SECOND YEAR:			120	

THIRD YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
FIRST SEMESTER				
ASP316D	Atomic Spectroscopy III	(6)	(18)	Molecular Spectroscopy I
CQA316D	Chemical Quality Assurance III	(6)	(12)	Analytical Chemistry I Environmental Chemistry I
CTG316D	Chromatography III	(6)	(18)	Inorganic Chemistry IIB Organic Chemistry IIB
ETC316D	Electrochemistry III	(6)	(12)	Physical Chemistry IIB
TOTAL CREDITS FOR THE SEMESTER:			60	



SECOND SEMESTER

On completion of all the modules.

WAC316D	WIL in Analytical Chemistry I	(6)	(60)
TOTAL CREDITS FOR THE SEMESTER:			60
TOTAL CREDITS FOR THE THIRD YEAR:			120
TOTAL CREDITS FOR THE QUALIFICATION:			360

MODULE INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular module. At time of publication, the syllabus content was defined as follows:

A

ANALYTICAL CHEMISTRY I (AYC105D) 1 X 3-HOUR PAPER

(Module custodian: Department of Chemistry)

Chemicals, Apparatus and Unit Conversions. Calculations used in Analytical Chemistry. Titrimetric methods. Gravimetric methods. Aqueous solutions and Chemical Equilibria. Statistical methods. (Total notional time: 240 hours)

ATOMIC SPECTROSCOPY III (ASP316D) 1 X 3-HOUR PAPER

(Module custodian: Department of Chemistry)

Introduction to Atomic Spectroscopy. Standardisation and Calibration. Signals and Noise. Atomic Absorption Spectrometry. Atomic Emission Spectrometry. Atomic X-ray Spectrometry. (Total notional time: 180 hours)

C

CHEMICAL QUALITY ASSURANCE III (CQA316D) 1 X 3-HOUR PAPER

(Module custodian: Department of Chemistry)

Introduction to Chemical Quality Assurance. Sampling methods. Validation of Analytical methods. Statistics in Analytical Chemistry. Quality Control Techniques. Documents for Quality Assurance. Organising, auditing and Standard Operating Procedures. Laboratory facilities and Information Management Systems. International standards and Laboratory Accreditation. (Total notional time: 120 hours)

CHEMISTRY I (CHM105X) 1 X 3-HOUR PAPER

(Module custodian: Department of Chemistry)

The role and importance of chemistry in everyday life. Classification and properties of matter. Units of measurement. Atoms, molecules and ions. The modern view of atomic structure and the use of electron configurations in chemical bonding. The periodic table of elements. The use of IUPAC rules for naming inorganic compounds. Application of the mole concept in stoichiometric calculations. Reactions in aqueous solutions. Chemical equilibrium. Fundamental concepts in electrochemistry. Organic nomenclature. (Total notional time: 240 hours)

CHROMATOGRAPHY III (CTG316D) 1 X 3-HOUR PAPER

(Module custodian: Department of Chemistry)

Principles of chromatography. Classification of chromatographic methods. Van Deemter equation and the application thereof. Optimisation of column performance. Applications of chromatography. Gas and liquid chromatography instrumentation. Planar chromatography. (Total notional time: 180 hours)



COMMUNICATION FOR ACADEMIC PURPOSES (11P105X)**1 X 3-HOUR PAPER****(Module custodian: Office of the Executive Dean)**

A workable knowledge of English is an essential skill for any graduate who is required to conduct themselves successfully in a professional working environment. This module will equip students with the competencies required to compose a selection of written texts related to communicating both internally and externally within a professional environment. In addition, the module includes strategies that are essential for the effective communication in various situations, including small groups to avoid unproductive conflict, a multicultural context, etc. (Total notional time: 100 hours)

COMPUTER LITERACY (CPL105X)**CONTINUOUS ASSESSMENT****(Module custodian: End User Computing Unit)**

This module provides students with foundational knowledge in computing fundamentals, essential digital skills in key applications based on MS Office Suite and network basics (i.e. MS Outlook and Internet). Online exams are mapped with End-User Computing: SAQA 49077 (61591) Core Element as well as Internet and Computing Core Certification (IC3). (Total notional time: 100 hours)

E**ELECTROCHEMISTRY III (ETC316D)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Introduction to electroanalytical methods. Potentiometry. Conductimetry. Fundamentals and functioning of electrochemical cells. Galvanic and electrolytic cells. Reference and indicator electrodes. (Total notional time: 120 hours)

ENVIRONMENTAL CHEMISTRY I (EVC216D)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Chemical fate and transport. Aquatic Chemistry. Oxidation-Reduction in Aquatic Chemistry. Phase Interactions in Aquatic Chemistry. Aquatic Microbial Chemistry. Water Pollution. Water Treatment. Chemical Analysis of Water and Wastewater. (Total notional time: 120 hours)

I**INFORMATION LITERACY I (INI125D)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Library and Information Services)**

Introduction of information literacy. Development of a search strategy and application of a search string to search engines and academic databases. Evaluation of information sources. Ethical and legal use of information. (Total notional time: 20 hours)

INORGANIC CHEMISTRY IIA (INA216X)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Covalent and metallic bonding. Ionic Bonding. Solvent systems and acid-base behaviour. Redox Chemistry. Hydrogen and some of its compounds. Alkali metals and their compounds. Alkali earth metals and their compounds. Boron and aluminum and their compounds. Carbon and silicon and their compounds. Nitrogen and phosphorous and their compounds. Oxygen and sulphur and their compounds. The Halogens and their compounds. (Total notional time: 120 hours)

INORGANIC CHEMISTRY IIB (INB216X)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

The Lewis electron-dot structures. Formal charges. The Valence Shell Electron Pair Repulsion Theory. The Valence Bond Theory. The Molecular Orbital Theory. Coordination numbers and geometries. Types of ligands. Nomenclature. Isomers. Crystal field splitting. Distortion of complexes. Properties of the d-block elements. Titanium; Vanadium; Chromium; Manganese; Iron; Cobalt; Nickel; Copper; Silver; Gold; Zinc; Cadmium; Mercury. (Total notional time: 180 hours)



L**LIFE SKILLS I (LF1125X)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Student Development and Support)**

Personal, socio-emotional and academic skills development for students in higher education. This module includes: 1. Intra- and interpersonal skills (e.g. emotional intelligence, relationships, and conflict management); 2. General study skills (e.g. time management, goal setting, learning styles); 3. Health and wellness (e.g. HIV/AIDS, GBV issues, substance abuse); 4. Student life and adjustment (e.g. identity development, adjusting to a higher education environment); and 5. Financial management. (Total notional time: 20 hours)

M**MATHEMATICS I (MAT105X)****1 X 3-HOUR PAPER****(Module custodian: Department of Mathematics and Statistics)**

Consolidation of existing knowledge of and introduction to new types of functions; solution of systems of equations using matrices; introduction to vector algebra and complex numbers; application of differentiation and integration to solve well-defined problems. (Total notional time: 240 hours)

MOLECULAR SPECTROSCOPY I (MSP216D)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Electromagnetic radiation and its interaction with matter. Quantised energy levels and introductory spectroscopy. UV/VIS spectrophotometry. Beer-Lambert law. Infrared spectroscopy. Mass spectroscopy. Nuclear Magnetic Resonance Spectroscopy. (Total notional time: 180 hours)

O**ORGANIC CHEMISTRY IIA (OCA216X)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Naming of organic compounds according to IUPAC rules. Stereochemistry of organic compounds. Structure and reactivity of: Alkanes and cycloalkanes, Alkenes and Alkynes, Aromatic Compounds, Alkyl halides, Alcohols, Ethers and Epoxides, Aldehydes and ketones, Carboxylic acids and their derivatives, Amines. (Total notional time: 120 hours)

ORGANIC CHEMISTRY IIB (OCB216X)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Electrophilic aromatic substitution reactions. Nucleophilic aromatic substitution reactions. Carbonyl nucleophilic addition reactions. Alpha- substitution reactions. Carbonyl condensation reactions. Biomolecules. (Total notional time: 180 hours)

P**PHYSICAL CHEMISTRY IIA (PCA216X)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

States of Matter, gas laws and kinetic model of gases. Molecular speeds, kinetic energy, pressure, temperature, volumes and amount of substance. Unit Conversions. Calculations used in Physical Chemistry. Intermolecular forces, vapour pressure, boiling and melting points of substances. Surface Tension, Viscosity and Capillarity. Concentration of solutions. Vapor pressure difference, boiling point elevation, melting point depression and Osmotic pressure. Phase diagram and Phase changes. Colloids. Chemical Kinetics. Chemical Equilibria. Chemical Thermodynamics. (Total notional time: 120 hours)

PHYSICAL CHEMISTRY IIB (PCB216X)**1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

Chemical Thermodynamics. Phase Changes. Electrochemistry. Chemical Kinetics. Quantum Chemistry Surface Chemistry. (Total notional time: 180 hours)



PHYSICS I (PHI105X)**1 X 3-HOUR PAPER****(Module custodian: Department of Physics)**

Basic Mathematical Concepts for Physics and measurements. Kinematics in one dimension. Kinematics in a plane (projectile motion). Forces and Newton's Laws of Motion. Momentum and Impulse. Work, Energy and Power. Rotational Kinematics. Rotational Dynamics. Elasticity. Static and dynamic fluids. Temperature and 0th Law of Thermodynamics. Thermal Expansion and Thermal Stress. First Law of Thermodynamics. Heat transfer. Gas Laws. General properties of waves. Reflection. Refraction. Interference and Diffraction of waves. Electrostatics. Electric Potential Energy and Potential Difference. Electric Circuits. (Total notional time: 240 hours)

W**WIL IN ANALYTICAL CHEMISTRY I (WAC316D)****WORK-INTEGRATED LEARNING****(Module custodian: Department of Chemistry)**

This module includes: Introduction to Work-Integrated Learning; Laboratory organisation and management, sampling and sample handling, volumetric analysis, gravimetric analysis, instrumental analysis; Quality management; Reporting results; and WIL reflection. (Total notional time: 600 hours)

