

NELSON MANDELA
UNIVERSITY



Faculty of Science

School of Biomolecular and Chemical Sciences

Departments: Biochemistry and Microbiology, Chemistry, Physiology, Textile Science

Director: Prof. Zenixole Tshentu

Qualification Purpose and Characteristics (HEQSF, 2013)

Bachelor's Degree:

The primary purpose of a **general** Bachelor's Degree is to provide a **well-rounded, broad education** that equips graduates with the **knowledge base, theory and methodology of disciplines** and fields of study, and to enable them to demonstrate initiative and responsibility in an academic or professional context. Bachelor's degrees may require students to undertake research in a manner that is appropriate to the discipline or field of study in order to **prepare them for postgraduate study**. The general Bachelor's Degree **emphasises general principles and theory** as preparation for entry into **general employment** or for a **postgraduate programme**.

Qualification Purpose and Characteristics (HEQSF, 2013)

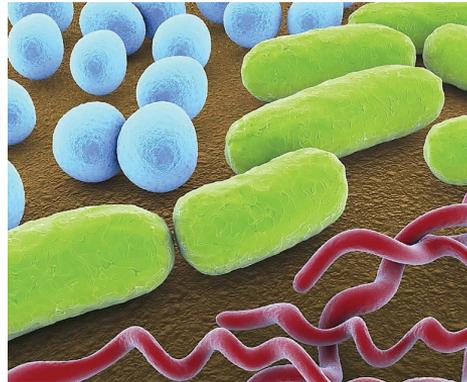
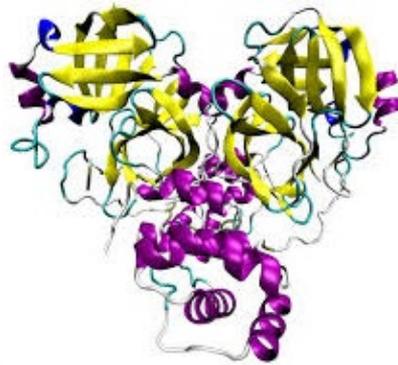
Diploma:

This qualification primarily has a vocational orientation, which includes professional, vocational, or **industry specific knowledge** that provides a sound understanding of general theoretical principles as well as a combination of general and specific procedures and their application. The purpose of the Diploma is to develop graduates who can **demonstrate focused knowledge and skills in a particular field**. Typically they will have **gained experience in applying such knowledge and skills in a workplace context**. A depth and **specialisation of knowledge**, together with **practical skills and experience in the workplace**, enables successful learners to enter a number of career paths and to **apply their learning to particular employment contexts** from the outset. Diploma programmes typically include an appropriate **work-integrated learning (WIL) component**.

Department of Biochemistry and Microbiology (<https://biomicro.mandela.ac.za/>)

Biochemistry is the study of the living cell in terms of the laws of Chemistry and Physics. Biochemists decipher the equations of life by experimenting on the influence of chemical reactions within the cell and sometimes the whole organism.

Microbiology is the study of the world of organisms too small to be seen by the naked eye; the effect they have in nature; their effect on humans, animals and plants and their ability to make physical and chemical changes in our environment.



BSc degree with a major in Biochemistry

Biochemistry is offered from year 2:

Introductory Biochemistry and Genetics 2
Metabolism 2

Advanced Protein Technology 3
Integrated Biochemistry 3

Followed by BSc Honours (Biochemistry), MSc (Biochemistry) and PhD (Biochemistry)

Research: Diabetes, cancer, HIV, disease markers

BSc degree with a major in Microbiology

Microbiology is offered from year 2:

Introductory Microbiology and Control Micro-organism 2
Medical Microbiology 2

Bacteriology, Microbial Ecology, Virology and Mycology 3
Gene Manipulation, Industrial Microbiology and Biotechnology 3

Followed by BSc Honours (Microbiology), MSc (Microbiology) and PhD (Microbiology)

Research: medical microbiology and industrial microbiology

Careers in Biochemistry and Microbiology

Medical research

Agriculture

Food industries

Pharmaceutical industries

Biotechnology industries

Law enforcement (forensics)

Sport science

Nutritional research

Academic research



Department of Human Physiology (<https://physiology.mandela.ac.za/>)

Human Physiology is the science of how the human body functions. It involves the study of all mechanical and chemical bodily processes to understand its responses in health and disease.

Programmes offered in the Department of Physiology:

BSc Physiology (Major)
BSc Honours (Physiology)
MSc (Physiology)
MSc (Nanoscience) – Biomed
PhD (Physiology)



Principles of Human Physiology and Control Systems 2
Human Systemic Physiology 2
Integrated Human Physiology 3

Research focus in Human Physiology:

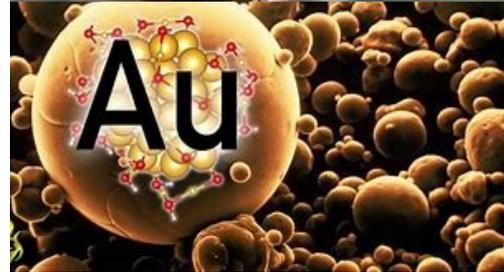
Cardiovascular system and HIV;

Characterising addiction and epigenetic changes to behaviour in rodents;

Using medicinal plants to treat diabetes mellitus, endocrine disorders and cancer;

Analysis of disease-related genes;

Nanoparticle drug delivery systems and diagnosis.



Human Physiology is the foundation for careers in:

Medical Sciences

Forensic Science

Medical Engineering

Education and Training

Pharmaceutical & Medical devices industry

Research (academic and industrial)



Department of Chemistry (<https://chem.mandela.ac.za/>)

Chemistry is the study of the composition, properties and reactions of matter.

Programmes offered in the Department of Chemistry:

Diploma in Analytical Chemistry
Diploma in Polymer Technology
Diploma in Chemical Process Technology
Advanced Diploma in Analytical Chemistry
Honours in Formulation Science
BSc Chemistry (Major)
BSc Honours (Chemistry)
MSc (Chemistry)
MSc (Nanoscience) – Nanochemistry
PhD (Chemistry)



Diploma in Analytical Chemistry

FOCUS IS ON:

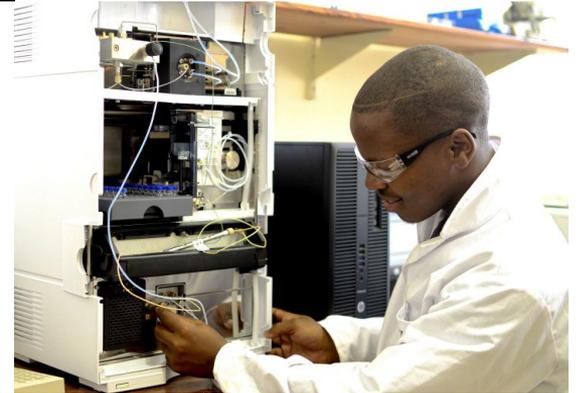
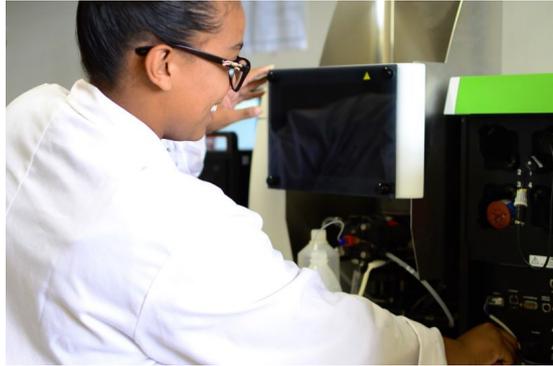
Analytical techniques
Analytical skills

LESS ON:

Fundamentals of chemistry

Analytical Chemist Careers:

Analysis, method development and validation;
Perform process and product development;
Design instruments used in analytical analysis;
Sales and marketing of chemical products and instruments;
Customs and excise; and
Forensic and regulatory activities.



Diploma in Polymer Technology

Areas of specialization:

Paint
Rubber
Plastics



Polymer Technologist
Careers:

Production management,
Design and formulation
of polymeric products
such as car tyres,
moulded plastic products
and paints.

Major companies in South Africa that employ **Polymer Technologists** are Plascon, Aberdare, Woodoc, Chemserve, VWSA, GM, DuPont, BASF, Plastamid, Sasol, Bayer, Nampak, Goodyear, Bridgestone, Continental Dunlop and CSIR.

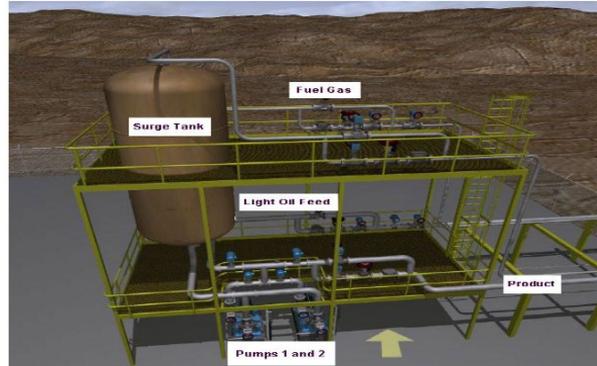
Diploma in Chemical Process Technology

FOCUS IS ON:

Process Technology
Process Chemistry
Process Equipment
Process Operation
Process Control

Industries:

Gas and oil refining
Refinery of minerals
Fine chemicals
Household products



BSc Chemistry Major – courses, careers and entry requirements

FOCUS IS ON:

Inorganic Chemistry

Organic Chemistry

Physical Chemistry

LESS ON:

Analytical Chemistry

Admission requirements to study towards the BSc degree:

- Minimum National Senior Certificate (NSC) statutory requirements for a degree entry must be met.
- An applicant with NSC grade 12 Mathematics requires a minimum applicant score (AS) of 410.
- NSC achievement rating of at least 60% for Mathematics (but 65% for entry into Physical, Mathematical and Computing Sciences).

BSC Chemistry Careers:

Industrial Chemist

Production Chemist

Teacher or Lecturer

Research Chemist

Environmental Scientist

Forensic Scientist

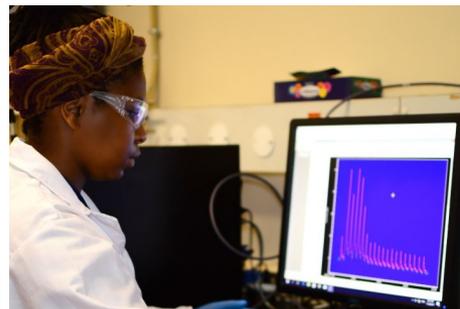
Sales Representative.

Admission requirements to study towards the Diplomas:

- Minimum National Senior Certificate (NSC) statutory requirements for a diploma must be met.
- An applicant with NSC Grade 12 Mathematics requires a minimum applicant score (AS) of 350.
- NSC achievement rating of at least 55% for Mathematics.
- NSC achievement rating of at least 50% for Physical Sciences.

Research activities in Chemistry

Battery chemistry
Polymer science and technology
Nanomaterials and nanochemistry
Solid state transitions
Metal ion separation
Analytical chemistry
Microalgae technologies
Catalysis and biocatalysis
Natural products chemistry
Fuel chemistry
Supramolecular chemistry
Bioinorganic chemistry
Coordination chemistry
Main group chemistry
Green chemistry
Formulation science
Micro-reactor and continuous flow synthesis
Pharmaceutical manufacture



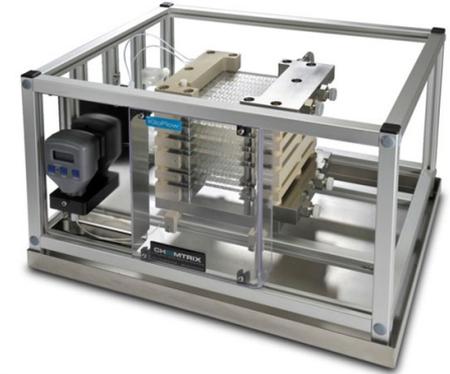
SARChI Chair in Microfluidic Bio/Chemical Processing - Prof Paul Watts

Challenges in South Africa - Availability of Drugs and Chemicals:

- HIV and TB drugs are often imported from Europe, India and China (imported drugs to South Africa from just India is R120 billion over last 10 years).
- Unavailability of chemicals delays research within academia and industry.

Can new technology enable cost-effective on-demand production?

- Manufacture efficiently where needed
- Job creation and training
- New business opportunities
- Strengthen economy
- Improve health.....



<https://applyonline.mandela.ac.za/>

<https://www.mandela.ac.za/Apply/Frequently-asked-questions/Admissions>

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THANK YOU!

Change the World

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