10

SECTION A:	QUALIFICATION DETAILS																	
QUALIFICATION DEVELOPER (S)	University of Botswana																	
TITLE	Doctor of Philosophy in Chemistry														**NCQF LEVEL**	10		
FIELD	Natural, Mathematical and Life Sciences		**SUB-FIELD**	Chemistry											**CREDIT VALUE**	380		
New Qualification		✓	Review of Existing Qualification															
SUB-FRAMEWORK	General Education		TVET		Higher Education	✓												
QUALIFICATION TYPE	Certificate	I		II		III		IV		V		Diploma		Bachelor				
	Bachelor Honours		Post Graduate Certificate		Post Graduate Diploma													
	Masters		Doctorate/ PhD	✓														

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

Postgraduate training in chemistry (PhD) will serve as a springboard for young chemists aspiring for careers in industry, academia, and research institutions. Research in the various disciplines of Chemistry (Analytical, inorganic, organic and physical)) play an important role in generating new knowledge and solving national, regional as well as global problems. Botswana is endowed with minerals and natural resources that benefit the nation in economy diversification and technological development.

The PhD in Chemistry Qualification will help Botswana to develop skilled chemists to promote innovation, critical thinking and problem solving. This is in line with pillar 1 of the Botswana vision 2036 which deals specifically with the development of knowledge-based economy.

The National Development Plan eleven (NDP 11) identifies among others, low quality in tertiary education as a challenge in Botswana's developmental advancements or progress. The Education and Training Sector Strategic Plan (ETSSP 2015-2020) vision decried the miss-match between qualifications and industry demands as one of

10

the hindrances to innovation, technological and entrepreneurial advancement of any country, Botswana included. Training at higher degree level to address these and many other needs is of paramount importance. The Science Education doctoral qualification is a research-intensive qualification that prepares students for research and teaching as applied to various educational contexts. Completion of a PhD degree is all about creating fresh knowledge, making new discoveries, and developing new skills.

The qualification is aimed at generating scientists who will be able to address national research priorities, contribute to the social and economic development of the country and to enhance the profile of the country in the global arena of knowledge generation and innovation. To achieve this noble goal, there is a need to increase the number of graduate qualifications on offer and expand areas of research. This PhD qualification directly addresses this goal. The Qualification contributes towards building, sustaining, and strengthening the nation's human resource capacity for impact-oriented research for development.

PURPOSE:

The purpose of the qualification is to produce graduate who have most advanced knowledge, skills, and competences to:

- Conduct independent research and analysis in their disciple and contribute original and substantive work in chemistry using complex research techniques.
- Develop and implement a strategy for dissemination of research findings and defend the research work and outputs before a diverse audience.
- Demonstrate skills for critical analysis and synthesis of complex scientific information.
- Develop in application of chemistry to vitro diagnostic solutions and interventions that impacts on the practice of laboratory testing.
- Effectively communicate scientific findings to various audiences
- Demonstrate strategic leadership.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum entry requirements:

- Master's Degree (NCQF level 9) in chemistry or cognate field of study.

- There will be access through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) in National Policies

10

SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
LO 1. Demonstrate most advanced frontiers of existing knowledge or professional practice in a chemistry and /or interdisciplinary discourse through research.	1.1 Develop a research question in the field of chemistry. 1.2 Conduct comprehensive literature review and synthesise knowledge. 1.3 Design an appropriate research methodology for the problem at hand. 1.4 Develop a research proposal that can be used to seek funding.
LO 2. Conduct independent research and analysis in chemistry and contribute original and substantive work in the field.	2.1 Select and apply appropriate research methods and specialised analytical techniques. 2.2 Manage a chemistry research project. 2.3 Analyse and synthesise scientific findings. 2.4 Determine sound judgement based on evidence generated through research.
LO 3. Apply high level of specialised skills to undertake original and scholarly research of international standard to solve problems in the field of chemistry.	3.1 Identify a problem and formulate researchable idea to address the problem. 3.2 Develop, write, and defend a research proposal.
LO 4. Evaluate and synthesise new and complex ideas to develop new knowledge and approaches or extend and redefine existing knowledge and professional practices.	4.1 Formulate hypothesis (questions) to solve identified problem in chemistry. 4.2 Generate the right kind of data, 4.3 Analyse data, and interpret findings to find solutions in the world of science/chemistry.
LO 5. Implement a strategy for dissemination of research findings and defend the research work and outputs before a diverse audience.	5.1 Write reports using scientific academic writing. 5.2 Present and defend research findings at national, regional, or international scientific meetings.

10

	5.3 Write an original research doctoral thesis that places research within the broader context of research. 5.4 Publish at least two manuscripts in international peer reviewed journals with a known impact factor.
LO 6. Demonstrate high level of advanced strategic leadership, proficiency in professional practice and associated systems design	6.1 Implement and manage with full responsibility and accountability for resource management, own work output and of others. 6.2 Work independently to plan and execute a research project. 6.3 Determine a high degree of competence in analysing a problem and designing steps towards solving a problem.
LO 7. Exercise high level of initiative and scholarly integrity in a wide range of context	7.1 Write reports using scientific academic writing. 7.2 Show leadership skills in research. 7.3 Practice ethical research and academic integrity. 7.4 Utilize advanced research methodologies to contribute significant knowledge in Chemistry.

10

SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	**TITLE**	**Credits Per Relevant NCQF Level**			**Total** (**Per** Subject/ Course/ Module/ Units)
		Level [ ]	**Level [ ]**	**Level [10]**	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Seminar topic Guided Readings and Seminars in Chemistry			**20**	20
CORE COMPONENT Subjects/Courses/ Modules/Units	Supervised Research and Thesis in Science Education (PhD)			360	360
Elective/optional COMPONENT **Subjects/Courses / Modules/Units**					

10

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	**Credit Value**
10	**20**
	360
TOTAL CREDITS	**380**

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

A Candidate must complete a total of 380 credits to graduate with a Doctor of Philosophy degree (Chemistry).

The candidate must register for two seminar topics (20 credits) chosen from fundamental component and 360 credits from supervised research in the specialisation area of choice.

ASSESSMENT ARRANGEMENTS

The formative assessment will be based on seminar presentations. The summative assessment shall be a written thesis and an oral examination (defence).

The qualification is solely researched based. All assessments shall be carried out by BQA registered and accredited assessors (or equivalents) as prescribed in the institutional regulations.

MODERATION ARRANGEMENTS

There shall be internal and external moderation arrangements done by BQA registered and accredited moderators.

RECOGNITION OF PRIOR LEARNING

This will be done in line with the National Recognition of Prior Learning (RPL) policy.

CREDIT ACCUMULATION AND TRANSFER

Transfer of credits from another recognized University or equivalent Institution of higher education may be considered on production of satisfactory documentation and references. No more than one-third of the total number of credits required for the programme can be credited from study at another university.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Horizontal Progression:

- Doctor of Philosophy (Science Education)

Vertical Articulation

PhD in Chemistry is at the highest qualification and there is no possible vertical articulation. Graduates of the programme can access post -doctoral studies to expand their knowledge in the area of research.

Employment

- Business development manager.
- Consultant.
- Environmental chemist.
- Forensic chemist.
- Patent Lawyer.
- Product developer.

10

- Technical writer.
- Toxicologist
- Lecturer in academic institutions

QUALIFICATION AWARD AND CERTIFICATION

Qualification award:

On successful completion, a candidate will be awarded a Doctor of Philosophy (Chemistry).

The candidate should have achieved a total of **380 credits** according to the rules of combination to be awarded this qualification.

Certification:

Successful graduate will be awarded a **Doctor of Philosophy (Chemistry)** and an official transcript.

REGIONAL AND INTERNATIONAL COMPARABILITY

Similarities and Differences:

Similarities: All programs are research based without any requirement to take any classes. Duration is approximately 3 to 5 years. Examination is by thesis and oral defence.

Differences: The University of South Africa requires candidates to publish at least two articles in peer reviewed journals.

REVIEW PERIOD

Every 5 years

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