SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	University of Botswana																	
TITLE	Bachelor of Education (Chemistry)															***NCQF LEVEL***	*7*	
FIELD	Education and Training			***SUB-FIELD***	Chemistry Education											***CREDIT VALUE***	*498*	
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:

The economic strength of any country is linked to its advancements in Science, Mathematics, Technology, and Engineering (STEM) disciplines. This sentiment is embraced globally and is articulated well in the Sustainable Development Goals (SDGs, Goal 4: provision of quality education) and the Africa Agenda 2063 (Aspiration 1: A prosperous Africa based on inclusive growth and sustainable development and, Aspiration 6: An Africa whose development is people-driven …). The Government of Botswana has since realized this, as evidenced in policy documents such as Vision 2036 (Pillar 1: Sustainable Economic Development – to produce productive and competitive human resources that drive growth across economic sectors including emerging industry, and 2) Pillar 2: Human and Social Development– Education and Skills Development – to provide relevant quality education that is outcome-based with an emphasis on technical and vocational skills as well as academic competencies), National Development Plans, the Revised National Policy on Education (RNPE, 1994), and the Education and Training Sector Strategic Plan (ETSSP, 2015-20). These policies call for, by implication, the training of science related subjects teachers to assist the country in its endeavor to improve and diversify its economy into the knowledge based one. The importance of these subjects in the dispensation in which the

knowledge economy runs supreme cannot be emphasized as they are the basis for innovation.

This realization is underscored by the National Policy on Research, Science, Technology, and Innovation of 2011 that recognizes the value of these disciplines on technology and innovation and the need to include them in the school curriculum with view to influencing change.

The constant supply of teachers in the area to respond to the expansion of the education sector as well as the replacing retiring chemistry teachers at the end of their service cannot be ignored. The qualification is designed to also cater for the international market.

PURPOSE:

This program is therefore an answer to the call for the knowledge-based economy, away from reliance on natural resources, through participation in the research, technology, and innovation space. It aims at preparing Chemistry teachers for secondary schools as well as vocational and technical colleges. For Botswana to become a sub-Saharan ICT hub and create an enabling environment for the growth of an ICT industry in the country, schools should produce learners willing and capable of pursuing science-related careers. This is only possible if schools are equipped with teachers who are competent to produce quality globally marketable graduates who are creative, innovative, and have entrepreneurship skills.

The program therefore seeks to graduate a chemistry teacher who can:

- Undertake continuous assessment and evaluation of teaching and learning Chemistry.
- Demonstrate ability to use technology to enhance teaching and learning of Chemistry.
- Demonstrate a culture of creativity, innovation, and knowledge creation related to Chemistry.
- Create learning environments that support all Chemistry learners.

ENTRY REQUIREMENTS (including access and inclusion)

The normal minimum requirements for entry to the Bachelor of Education (Chemistry) Degree programme shall be:

- Certificate IV, NCQF Level 4 (BGCSE or Equivalent).
- Direct entry application through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) is accessible to all applicants through institutional policies in line with the national RPL and CAT policies.

SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
1. Exhibit knowledge of chemistry content, pedagogy and learners and be able to design and execute classroom instruction.	1.1. Select and sequence content to meet the cognitive level of the learners. 1.2. Demonstrate knowledge of the interconnectedness of topics within and between disciplines. 1.3. Design instructional strategies that are appropriate to achieve effective teaching and learning.
2. Engage in continuous assessment and evaluation of chemistry teaching and learning.	2.2. Recognise and utilise multiple assessment strategies and systematically gather data to monitor learners' academic progress in the learning of Chemistry. 2.3. Use assessment data to evaluate teaching and learning to guide decision making on instructional processes and the study of Chemistry as a subject.
3. Create learning environments that support all learners.	3.1. Provide activities that support learners' academic, intellectual, and social development. 3.2. Cater for learners' diverse socio-cultural backgrounds and needs.
4. Use technology to enhance teaching, learning, and the study of Chemistry.	4.1. Utilise appropriate technologies in the teaching and learning of Chemistry. 4.2. Empower learners to use available technologies in learning and in real life situations/applications of the subject Chemistry. 4.3. Use Chemistry knowledge to design and carry out investigations on scientific problems of chemical nature.
5. Engage in continuing professional development.	5.1. Engage in on-going reflective practices and use evidence to continually evaluate practice to adapt instruction to meet the needs of the learner. 5.2. Engage in school-based professional development activities to address contextual

	challenges affecting the teaching and learning of Chemistry. 5.3. Conduct action research on issues affecting teaching and learning.
6. Adhere to ethics of the teaching profession.	6.1. Adhere to the legal aspects of teaching including the rights of learners and parents, as well as the legal rights and responsibilities of the teacher. 6.2. Evaluate effects of learner actions and choices to provide remediation.
7. Demonstrate a culture of creativity, innovation, and knowledge creation.	7.1. Demonstrate inquiry, critical thinking and problem solving, and entrepreneurship skills. 7.2. Engage learners in activities that foster creativity, innovation, and entrepreneurship skills. 7.3. Conduct and produce research reports both in the educational and/or scientific spheres.
8. Demonstrate knowledge and understanding of contemporary theories, principles, and concepts in chemistry that can form the basis for professional judgments and/or formulation of research problems.	8.1. Demonstrate knowledge of basic chemical principles and concepts in different sub-disciplines of the subject. 8.2. Identify problems and develop ways to solve them through proper formulation of research questions and problems.

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total*** ***(Per** Subject/ Course/ Module/ Units)*
		Level [5]	***Level [6]***	***Level [7]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Computer Skills Fundamental	***8***	***8***		***16***
	Communication and Academic Literacy Skills (Science)	***12***			***12***
	Academic and Professional Communication		***12***		***12***
	Introduction to Research Methods in Mathematics and Science			***8***	***8***
	ICT for the Chemistry Teacher			***8***	***8***
	Further Issues in ICT for the Chemistry Teacher			***8***	***8***
	Introductory Mathematics	***16***	***16***		***32***
CORE COMPONENT *Subjects/Courses/ Modules/Units*	General Chemistry	***16***	***16***		***32***
	Introduction to Educational Psychology		***12***		***12***
	Historical, Philosophical and		***12***		***12***

	Sociological Foundations of Education				
	Teaching Practice		***12***	***12***	***24***
	Introduction to Analytical Chemistry		***8***		***8***
	Analytical Chemistry Laboratory		***4***		***4***
	Structure and Survey of Functional Groups		***8***		***8***
	Organic Chemistry Laboratory		***4***		***4***
	Engineering Mathematics		***12***		***12***
	Atomic Structure, Bonding and Main Group Chemistry			***8***	***8***
	Introductory Physical Chemistry			***8***	***8***
	Physical Chemistry Laboratory			***4***	***4***
	Basic Teaching Methods in Secondary School Science		***12***		***12***
	Practicum in Secondary School Science		***12***		***12***
	Coordination Chemistry			***8***	***8***
	Inorganic Chemistry Laboratory			***8***	***4***
	Structure and Survey of			***8***	***12***

	Functional Groups				
	Applications of Thermodynamics and Electrochemistry			***8***	***8***
	Introduction to Exceptional Children	***12***			***12***
	Introductory Pedagogical Content Knowledge in School Chemistry			***12***	***12***
	Analytical Spectroscopy			***8***	***8***
	Group Theory and Organometallic Chemistry			***12***	***12***
	Physical Organic Chemistry			***8***	***8***
	Advanced Practicum in School Chemistry Teaching			***12***	***12***
	Advanced Transition Metal Chemistry			***12***	***12***
	Heterocyclic Chemistry, Synthetic Reactions and Design of Organic Synthesis			***12***	***12***
	Advanced Physical Chemistry			***12***	***12***
	Further Issues in Chemistry Pedagogical Content Knowledge			***12***	***12***
	Sample Handling and Biochemical Analysis			***12***	***12***

	Secondary Metabolites and Biomolecules			***12***	***12***
	Advanced Physical Chemistry II			***12***	***12***
	Introduction to the History and Philosophy of Science			***8***	***8***
ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	***Choose two cognate area (Science Cognate Areas) (32 Credits)***				
	Principles of Biology	***16***			***16***
	Diversity of Animals and Plants		***16***		***16***
	Geometrical Optics and Mechanics	***16***			***16***
	Electricity, Mechanism, and Elements of Modern Physics		***16***		***16***
	Science Education Options				
	Choose ONE of:				
	Human Impact on the Environment			***8***	***8***
	Development and Evaluation of Investigative Work in School Science			***8***	
	And ONE of:				
	Contemporary Issues in Science Education			***8***	***8***

	Research Project in Mathematics/Science Education			***8***	
	Foundations of Education Options				
	Then Choose one of:				
	Curriculum Theory and Instruction			***12***	***12***
	Contemporary Issues in Teacher Education in Botswana			***12***	

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
5	***86***
6	***152***
7	***260***
TOTAL CREDITS	***498***

Rules of Combination:

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

The B Ed (Chemistry) is a four-year qualification composed of fundamental, core, and optional/elective modules. The qualification is a double major in Chemistry and Education. To be awarded the qualification, a student must accumulate at least 498 credits composed of:

- 96 credits Fundamental modules
- 342 credits of Core modules
- 60 credits of Optional/elective modules

ASSESSMENT ARRANGEMENTS

Assessment:

- There shall be both formative and summative assessments in the ratio 50:50.
- All assessments shall be carried out by BQA registered and accredited assessors

MODERATION ARRANGEMENTS

Moderation:

- There shall be both internal and external moderation in line with the institutional policies in place for quality assurance purposes.
- All moderators shall be BQA registered and accredited.

RECOGNITION OF PRIOR LEARNING

- There shall be provision for award of this qualification through RPL in line with the existing institutional RPL and national RPL policies

CREDIT ACCUMULATION AND TRANSFER

- There shall also be provision for Credit Accumulation Transfer (CAT) in line with existing institutional and national policies

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathways

Horizontal Articulation

- Bachelor of Science
- Bachelor of Education (Biology)
- Bachelor of Education (Physics)
- Bachelor of Nursing

Vertical Articulation

- Bachelor's degree (Honors)
- Master of Education (Chemistry

- Master of Science (Chemistry)
- Master of Education (Curriculum and Instruction)
- Master of Education (Measurement and Evaluation)

Employment Pathways

- Chemistry Teacher
- Science Teacher
- College/University tutor
- Curriculum Developer
- Education officer/Inspector/Administrator
- Academic researcher (College/University)
- Assistant researchers in science
- Science Technician

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

To be awarded a Bachelor of Education (Chemistry) degree, a candidate must acquire a minimum of 498 credits.

Certification

Candidates meeting the prescribed requirements will be awarded the Bachelor of Education (Chemistry) and will be issued an official certificate and transcript.

REGIONAL AND INTERNATIONAL COMPARABILITY

This qualification is offered by only one university locally making it a tall order to compare locally. It was therefore compared with qualifications and competencies for external institutions. The University of Fort Hare, South Africa, offers two degrees in science education. The different specializations including Chemistry Education are given under this general qualification. One at NQF level 7 (Bachelor of Education (Senior & Further Education and Training Phase) with a duration of 4 years and 480 credits (https://www.ufh.ac.za/degrees/BachelorEducationMathematicsandPhysicalScience). The other is an honors degree with a two-year duration and 120 credits (B Ed. (Hons) Science Education)

(https://www.ufh.ac.za/degrees/BachelorEducationBEdHons0). Both these degrees are called physical sciences education and science education as opposed to the cognate areas of science. This qualification compares with the Bachelor of Education Senior & Further Education by duration but differs with the B Ed (Hons) as it only takes 2 years against the 4 for this one.

The University of Victoria in Canada (https://www.uvic.ca/education/areas-study/teacher-ed/index.php) offers a Bachelor of Education program for 16 months inclusive of the Summer break that they call Post Degree Professional Program (PDPP) post qualification. One has a choice of training to teach one or two subjects. The program comes with two practicum sessions whose durations have not been stated. The NQF entry level is implied at level 8 and the credit load is not stated also. The B Ed (Chemistry) qualification also offers two practicum sessions each of six weeks duration at levels two and three of study.

The University of Queensland, Australia (https://future-students.uq.edu.au/study/programs/bachelors-science-education-secondary-2479/computer-science-coscic2479) offers a 4 year full time equivalent for a Bachelor of Science/Education (Secondary) at NQF level 7. The entry requirements are a pass in the sciences and English at Australian year 12. Internship placement can be started within the first year of study.

One observed difference is in the credit load. At Fort Hare the credit load is 120, at Victoria University is 534 and at The University of Queensland it is 64. The B Ed (Chemistry) qualification has a minimum credit load of 498.

The three universities offer a blend of content in the teaching subject and education courses simultaneously for the qualifications. They all have a strong grounding in the theory of the subject(s) the teacher is training to teach, as well as gaining experience and skills in content teaching and learning. In some of the universities, the teacher can be qualified to teach more than one science subject at the secondary school as in at the University of Queensland. The three qualifications have a practicum component that afford candidates an opportunity of field experiences. The duration of teaching practice differs with each university, at the University if Queensland, it may be started at the first year of study, different from B Ed (Chemistry) qualification where it is done at levels 200 and 300. The University of Victoria also has two practicum sessions like this qualification. The employment pathways are primarily in secondary school chemistry teaching. Possible employment pathways could be in the following fields:

- School general science teacher
- Education officer
- Laboratory technician

REVIEW PERIOD

The qualification will be reviewed every five (5) years.