UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

External Review of Degree Program(s) **Date June 27 & 28, 2023**

Biochemistry and Molecular Biology (BSc)

Faculties of Science & Engineering/Environment

Reviewers are asked to provide a report that:

- Identifies and commends the degree program's notably strong and creative attributes;
- Describes the degree program's respective strengths, areas for improvement, and opportunities for enhancement;
- Recommends specific steps to be taken to improve the degree program, distinguishing between those the program can itself take and those that require external action;
- Recognizes the institution's autonomy to determine priorities for funding, space, and faculty allocation; and
- Respects the confidentiality required for all aspects of the review process.

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PART 1 - EXECUTIVE SUMMARY

The Executive Summary will be made publicly available on the Provost's website.

ACADEMIC ADMINISTRATIVE UNIT – Department of Chemistry & Biochemistry, and Dept of Ecosystem Science and Management

DEGREE PROGRAM(S) UNDER REVIEW – Biochemistry and Molecular Biology (BSc)

CHAIR/DIRECTOR – Dr. Todd Whitcombe and Dr. Ken Otter

DATE OF DEGREE PROGRAM(S) REVIEW – June 27 & 28, 2023

DATE OF THE PREVIOUS DEGREE PROGRAM(S) REVIEW

INTERNAL RESOURCE PERSON – Afton Zral

REVIEWERS

Reviewer 1 –	Reviewer 2 -	Reviewer 3 -
Kirsten Wolthers	Sunita Chowrira	Erik Jensen
Professor	Professor	Professor
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I. SUMMARY OF THE EXTERNAL REVIEW OF DEGREE PROGRAM(S) PROCESS

THE PROCESS

In May 2023, Dr. Deborah Roberts, Dean for the Faculty of Science and Engineering, and Dr. Wendy Rodgers, Vice-President Academic and Provost, assembled a team of external scientists and educators to review the Biochemistry and Molecular Biology (BCMB), UNBC Undergraduate Program in response to their preparation of a Self-Study document and Strategic Plan. The review team consisted of Drs. Kerstin Wolthers (Department of Chemistry, University of British Columbia – Okanagan), Sunita G. Chowrira (Dept. of Botany/Biology, University of British Columbia – Vancouver), and Erik Jensen (Department of Physics, University of Northern British Columbia). The review team assembled on the UNBC campus on June 27 and 28, 2023, and met with faculty, staff, undergraduate students, and a variety of administrators including the department Chairs, the Deans, and the interim VPRI.

Our finding from this review is incorporated below into the report template provided to us.

II. SUMMARY OF FINDINGS

MAJOR STRENGTHS OF THE DEGREE PROGRAM

- Impressive teaching expertise in the BCMB program from a broad spectrum of science.
- Current students very satisfied with the BCMB Program.
- Small cohort and class size fostering a sense of community among the students.
- Research opportunities and lab courses available throughout the degree program equip graduates with sought after competencies in science.

Below we elaborate on this list, following the Terms of Reference we were given for this external review of the BCMB Program.

Students in the BCMB program interact with and are mentored by a strong cohort of faculty members, with expertise across a broad spectrum of life science and physical science disciplines, and specific strengths in RNA processing, natural products, ecology and conservation. The faculty members teaching in the program are very invested in undergraduate education and are successful in building an inclusive and respectful learning environment for the students.

Informal conversation with students indicated overall satisfaction with the BCMB Program. This is also partly reflected in the 2019 BC Student Outcome Survey. This survey of the 2017 Baccalaureate Graduates revealed that graduates of the BCMB program were satisfied (46%) or very satisfied (54%) with the program, above the cumulative average of programs offered at UNBC. The assessment of useful knowledge was lower for the BCMB program compared to the average at UNBC, but 85% of graduates would select the same program again if provided with the option.

The smaller classes sizes, especially for 2nd to 4th year courses, are viewed as a major strength of the BCMB program. At larger institutions, student enrolments in upper-level biochemistry courses can range between 50 to 300, but at UNBC the numbers are between 5 to 50. Consequently, students obtain more one-on-one instruction, are less intimidated in seeking additional help, and develop closer ties with the institution. Smaller class sizes help students connect with others in the classes and develop a sense of belonging. In summary, students are more likely to feel a part of the UNBC community and contribute to the grassroots culture prevalent at UNBC and the surrounding region.

The BCMB students have the opportunity to engage in research through courses such as BCMB 430 (6C) and BCMB 499 (3C). It is estimated that 20 – 30% of students enroll in these courses, higher in comparison to larger institutions. BCMB students also have opportunities to receive

funding to purchase supplies for their research activities through the Research Program Award (valued at $5000). Full and partial salary support is also available through Learning Tree, Mitacs, Indigenous Mitacs and Undergraduate Research Experience (URE) Awards (without course credits). The outcomes from this include co-authorship on publications, the development of transferrable skills (project management, critical analysis, self-learning), opportunities to highlight their research at regional conferences and network with other researchers. This research experience increases their competitiveness for graduate programs at large universities and students are more likely to engage in outreach activities in the community, promoting the BCMB program and UNBC. BCMB 100 is viewed as a welcome addition to the curricula as the course connects and engages first year students with the research faculty, while informing them of the research activities on campus.

The inclusion of three dedicated BCMB labs, with a two-hour lecture combined with three-hour labs is also viewed as a major strength of the program. The two-hour lecture component enables the instructor to comprehensively cover the methodology prior to the hands-on practical lab experience. Unique to the BCMB labs is the incorporation of sophisticated instrumentation (CD, real time PCR, plate reader) that were donated to the program. Inclusion of these instruments extends the scope of experiments that can be performed by students, provides more in-depth analysis of biomolecules and deepens their understanding of the discipline. The separation of the 6-credit third year BCMB lab into two, three-credit labs is viewed as a favourable move by students as it provides more flexibility with scheduling courses.

There are also supplemental support centers for students who are struggling academically. Math Academic Center for Excellence (MACE) in particular, is much appreciated by students. Professors in the program noted that they **all** have an "open door policy" enabling students to drop by for additional support. At times, this support can come in the form of two BCMB faculty with adjacent offices engaging in conversation with the student.

SIGNIFICANT AREAS OF WEAKNESS OR IN NEED OF FURTHER DEVELOPMENT

Students felt that the first two years of the degree were very intense with a high workload in comparison to the latter two years. First and second-year course requirements are consistent with other biochemistry undergraduate programs offered at other institutions. The nature of the biochemistry discipline is such that it often includes six first year courses with a lab component (Phys, Biol, Chem). At UNBC, students are dropping one course per term in the first year, and it is often physics. The first-year physics instructor noted that they were surprised to see 3rd year students in their course. He stated that students should ideally be taking the course in their first year as the math and problem-solving skills acquired in the course will improve their success in the subsequent 2^{nd,} 3rd and 4th year courses.

On average, students are enrolling in 4.2 courses per term at UNBC. In contrast, at UBC Okanagan, domestic students registered in the first year of the Faculty of Science enroll in 4.8 courses per term. Efforts should be made to identify the reason(s) as to why students are electing to have a reduced course load in their first year (financial reasons, scheduling, not academically prepared).

First-year instructors identified students' poor math and problem-solving skills as one of the key indicators of poor success in other STEM courses (Chemistry and Physics). For example, students can often not solve for x in the following equation: 3/x = 10. To improve student performance, the chemistry instructor provides math quizzes to his class which counts for 5% of the final grade. Unfortunately, this takes instructional time and assessment away from the chemistry learning objectives. The instructors noted that weak math skills are a result of high schools not offering Math 12 (Calculus) or insufficient teaching of the subject matter. Noted concerns also include poor study skills and note taking ability amongst the first-year cohort. Thus, a reduced course load in the first year may reflect the fact that students are not academically prepared for university.

A second-year instructor also noted the challenges of teaching CHEM 204 (Introductory Biochemistry) to BCMB students and Biomedical students. The latter group of students are not required to take first year math or even have Math 12 (pre-calculus), but CHEM 204 is required. A few of the topics in CHEM 204 require good math skills (e.g., Michaelis Menten derivation, Henderson Hasselbach equation), but it is difficult to teach the subject matter to students that do not have the appropriate skill set. Instructors are hesitant to include Math 100 and/or Math 101 as a pre-requisite for CHEM2 204 for fear of the negative impact it will have on the Biomedical program. However, not including a pre-req compromises the pace and depth at which you can teach the CHEM 204 material to the BCMB students.

Students and faculty noted that there were issues with scheduling. For example, students stated that several second-year required courses (some with a lab component) are scheduled into one term. The situation forces students to take six courses per term so they have the necessary pre-requisites for third year courses or can complete the degree within four years. BCMB 100 was also scheduled at the same time as another first year course. Some third- and fourth-year courses are listed as electives for the BCMB program but are not offered on a regular basis or have pre-requisite courses that are not required of the program (e.g., BIOL 332, BIOL 423, CPSC450, HHSC305, HHSC 306, PSYC 318, PSYC 421). Inclusion of a footnote in the calendar noting the pre-requisites for each of these courses would be beneficial for academic planning.

Students also noted poor communication with academic advising and difficulty with course selection. For example, students found it a bit frustrating that they had to click twice to view

the pre-req information for a given course. A few BCMB students received poor advice from academic advising, resulting in them taking an additional year to complete the degree. Consequently, students advise others student not to go academic advising because of poor advice they have received. Instead, students are relying on social networks for advice on course selection and navigating the program. The program planning guide (https://www2.unbc.ca/sites/default/files/sections/advising/bachelorofscience-biochemistryandmolecularbiology.pdf) is currently not "seen" by most students. Students requested that academic advising (especially for those accepted into the program) be performed by faculty members or by people trained in STEM backgrounds.

There were noted issues with the lab instructors not having financial resources to replace aging instrumentation or replacing expired consumables (DNA modifying enzymes). Having the opportunity to periodically apply for teaching lab equipment/reagent funds could alleviate this problem.

The joint administration of the BCMB program is also problematic as it creates additional workload for administration and allows for errors in processing of forms and applications. There can also be inconsistent policies between the two faculties, inadequate financial support towards the program and confusion amongst students. Streamlining administration or designating one Faculty with all administration of the program would be beneficial for both faculty members and students.

COMMENTS OF THE FUTURE DIRECTION OF THE DEGREE PROGRAM(S)

Program Level Learning Outcomes: Efforts should be made to develop program level learning outcomes for the BCMB major, which will help the curriculum committee better decide on which third and fourth year courses are required for the degree. Currently, only one fourth year course is required (BCMB 404) and only 33 credit hours are required at the 300- and 400-level. As a suggestion, the curriculum committee could consider including BCMB 402 and BCMB 403 as required courses for the BCMB program. The curriculum committee could also consider including third- and fourth-year chemistry courses (organic chemistry, natural product biosynthesis, carbohydrate chemistry, analytical chemistry) in the list of electives for the BCMB major. Information taught in these courses is very relevant and integrates with other topics discussed in other third and fourth year BCMB courses (intermediary metabolism, biochemical methods, proteins and enzymology).

Regular anonymous survey of students: This was brought up repeatedly during our conversations with students. The students requested anonymous survey in the program so they could provide feedback on the program. A few areas that could be improved with feedback from students are listed below:

- Make pre-requisites for upper-level courses more visible: many of the courses listed under “choose four of the following”, require pre-requisite courses, that are not required courses to be completed in years 2 or 3, so may easily be missed until too late.
- Redistribute course loads: students find the course load very heavy in years 1 and 2, and light the last two years. To reduce the intensity of the second year, the curriculum committee should also consider shifting a few second-year courses (specifically CHEM 204) to the third year. It appears there is room in the third and fourth year of the program to accommodate additional (at least one more) required course. This curriculum adjustment may help with scheduling, especially for those students that are struggling academically.

Joint administration of the two Faculties participating in the BCMB Program: The two Faculties should carefully consider the benefits of the joint administration of the BCMB program, and if these benefits outweigh the difficulties associated with dual ownership. While the self- study did acknowledge the administrative challenges, from our discussion with faculty, the current framework compromises the program pedologically and affects the morale of faculty members.

Equitability of the teaching load: A question we walked away with: is the teaching load equitable (small vs. large courses taught) across everyone? Has this been assessed recently? It would be a worthwhile exercise to assess teaching load of faculty members.

III. SUMMARY OF THE REVIEWERS' RECOMMENDATIONS

RECOMMENDATIONS	DESCRIPTION OF THE RECOMMENDATION
One: **Two streams or pathways within BCMB**	Consider developing two streams/pathways within the BCMB program, one that focuses on biochemistry and the application of chemistry and physics to biological systems. The second stream focuses on molecular biology as it applies to ecology and conservational biology (a research strength of UNBC). Decide within these two streams what the capstone courses are and then structure the curriculum of the streams such that the students have the necessary pre-reqs for these courses as they progress.
Two: **Associate Head position that bridges the two Faculties**	Consider appointing an associate head/chair that works between the two faculties and departments. This individual will be responsible for working with the two Department Chairs and the two Deans in the administration of the BCMB program (overseeing a budget, approvals)
Three: **Reduce course load in year 2**	To reduce the intensity of the second year, the curriculum committee should also consider shifting second year courses (CHEM 204 and /or CHEM 225) to the third year. There is room in the third and fourth of the program to accommodate another required course. This curriculum adjustment may help with scheduling, especially for those students that are struggling academically. Offer courses in both terms, to provide more flexibility with scheduling courses. Encourage students to definitely complete physics in second year if they are unable to take it in first year.
Four: **Early and periodic Advising**	Require students to meet with an advisor once they are accepted into the BCMB program. The Advisor needs to be knowledgeable of the BCMB-specific curriculum and pre-requisite courses to help students make progress.

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

Responses to the External Review of Degree Program(s) Report, Action Plan and Progress Reports

October 22, 2023

Biochemistry and Molecular Biology

B.Sc. (Major); B.Sc. (Honours)

Department of Chemistry & Biochemistry
Faculty of Science and Engineering

Department of Ecosystem Science & Management
Faculty of Environment

Chair: Dr. Todd Whitcombe/Dr. Ken Otter
Dean: Dr. Nicola Koper/Dr. Deborah Roberts
Vice-President Academic and Provost: Dr. Wendy Rodgers (*response finalized by Interim VPA & Provost, Dr. Bill Owen*)
Date UNBC Received the External Review of Degree Programs Report: August 26th, 2023

Please Note: The Responses to the External Review of Degree Program(s) Report, Action Plan and the 36 Month Action Plan Progress Report are made publicly available on the Provost's website.

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PART 1 – ACADEMIC ADMINISTRATIVE UNIT'S RESPONSE TO THE EXTERNAL REVIEW OF DEGREE PROGRAM(S) REPORT

(October, 2023)

I. Overall Impression of the Summary of Findings and Recommendations from the External Review of Degree Program Report

We would like to begin by acknowledging the hard work of the external reviewers and thanking them for their time, effort, and consideration. We would also like to thank all students, staff, and faculty who took the time to participate in the site visit and discuss the biochemistry and molecular biology (BCMB) program with the external reviewers. And we want to thank Ms. Afton Zral for her assistance throughout the review process.

Overall, the review is quite complimentary and while it does make some recommendations (*vide infra*) the reviewers begin by pointing to the strengths of the degree program:

- *Impressive teaching expertise in the BCMB program from a broad spectrum of science.*
- *Current students very satisfied with the BCMB program.*
- *Small cohort and class size fostering a sense of community among the students.*
- *Research opportunities and lab courses available throughout the degree program equip graduates with sought after competencies in science.*

With regard to the last bullet, they note the financial support available to students through the Research Program Awards and for full and partial salaries through Learning Tree, Mitacs, Indigenous Mitacs, and the Undergraduate Research Experience Awards. In addition, NSERC USRA are available to BCMB students who qualify and have been part of the research funding in the past. They wrote that for the students: "*This research experience increases their competitiveness for graduate programs at large universities and students are more likely to engage in outreach activities in the community, promoting the BCMB program and UNBC*."

Of particular note was the decision made by the BCMB Curriculum Committee to move to two separate 300-level laboratory courses, featuring molecular biology techniques in one and biochemistry techniques in the other. This complements the existing BCMB 255 laboratory course and provides a relatively rich sequence of hands-on learning for our students. As the reviewers noted: "*The inclusion of three dedicated BCMB labs, with a two-hour lecture combined with three-hour labs is also viewed as a major strength of the program. The two-hour lecture component enables the instructor to comprehensively cover the methodology prior to the hands-on practical lab experience*."

The reviewers also pointed out that the students appreciated the supplemental support centres provided for students struggling academically, particularly the Mathematics Academic Centre for Excellence which supports students with weaker backgrounds in mathematics. As the BCMB degree requires a full first year of university level mathematics, this is one of the struggles in the program for many students. The reviewers note, in their discussion of *"areas of weakness or in need of development*", that first-year instructors identified students' poor math and problem-solving skills as one of the key

indicators of poor success in STEM courses. It is unclear to us what actions we can presently take but the BCMB Curriculum Committee and the Chairs will be working with the Mathematics & Statistics Department to consider ways to mitigate the issues.

Additional Comments

While the reviewers only provided four explicit recommendations, they did provide additional commentary on the degree program. One specific comment was: *"The last year of the course is very different in comparison to other biochemistry degrees in that only one fourth year BCMB designated course is required."* The reviewers point out there are usually two or three prescribed courses in a major. This is an issue that has been under discussion at the curriculum committee and between the chairs. The present structure of picking four out of eight BCMB and BIOL courses beyond BCMB 404 means that students can graduate with a BCMB degree with only one fourth year biochemistry BCMB course. The BCMB degree currently lists in the Subject Requirements "Nine additional credit hours…at least 6 credits must be at the 300 or 400 level…." to complete the degree. The BCMB Curriculum Committee will be discussing the shifting of those 6 upper division credit hours directly towards upper division BCMB/BIOL courses by increasing the number of required courses in the pick list from 4 to 6 with the expectation of coming up with a plan to change the degree by December 2023. This may result in an increase in the overall number of credits required at the 300/400-level to 42 (from 33) which would be more in-line with the expectations in both the Biology and Chemistry degree programs. It would also help to ensure the integrity of the degree by increasing the number of selected BCMB or BIOL courses specifically targeted to the BCMB program. For the honours degree, the BCMB Curriculum Committee will be discussing the idea that the degree requirements at the 400-level should be more prescribed. Further, the notion of a capstone course is something the curriculum committee will be discussing, as recommended by the reviewers.

The reviewers also recommended setting up a lab equipment fund to enable timely replacement of old and failing equipment. The BCMB laboratories are proportionally funded by the Department of Chemistry and Biochemistry and by the Department of Ecosystem Science and Management and, for the most part, this works for consumables such as reagents and lab supplies (i.e., gloves, masks, etc.). However, with respect to equipment, each replacement requires an individual process and while we have a list of equipment which includes the age of instruments, we do not have an ongoing process for the replacement of such equipment. This is something which is beyond the specific control of the Departments. It is our understanding funds are available along with all of the information required to engage in updating and/or replacing laboratory equipment required by the degree program's needs. Michael Bell, Senior Laboratory Operations Manager and Infrastructure, will be working on the plan to update laboratory infrastructure and the Departments will be engaged In discussions with him during this process. We will be addressing particular "mission critical" needs first.

Overall, the reviewers provided interesting and useful feedback on the program. The BCMB Curriculum Committee, which consists of representatives from both the ESM and Chemistry and Biochemistry Departments, will continue to work with the reviewer's comments and recommendations to make appropriate changes to the degree.

II. Correction of Factual Errors or Areas of Misunderstanding in the Report

As far as we could determine, there were no factual errors of significance or misunderstandings in the report, with the exception perhaps of the discussion of first/second year course offerings. Specifically, the reviewers note that the students stated "*several second-year required courses (some with a lab component) are scheduled into one term. This situation forces students to take six courses per term…*". The schedule of the first and second year courses schedules are provided in the following table:

September – First year	**January – First year**
BIOL 103-3/BIOL 123-1	BIOL 104-3/BIOL 124-1
CHEM 100-3/CHEM 120-1	CHEM 101-3/CHEM 121-1
MATH 100-3	MATH 101-3
PHYS 101-4 (or PHYS 110-4)	PHYS 101-4 (or PHYS 111-4)

September – Second year	**January – Second year**
BIOL 210-3	BIOL 203-3
CHEM 201-3/CHEM250-1	CHEM 203-3/CHEM 251-1
	CHEM 204-3/BCMB 255-2
STAT 240-3	

It should be noted, however, that several of these courses (e.g. BIOL 103/123, CHEM 100/120) within a semester are linked lecture/lab courses; the Laboratory courses at other institutions would be blended into the lecture courses as a "lab mark", but occur under a single course name, thus, the number of credit hours students must take per term is not higher than other programs We have chosen a distinct route of having the lab components separate which is becoming the norm at many institutions across the country – in part because of the COVID pandemic when laboratory courses could not be offered in person. This might have led to a misunderstanding of the course count in first and second year and has been addressed above.

Regardless, the BCMB Curriculum Committee will be meeting this November to consider the structure of the degree, both with respect to offerings in the first two years and the upper level credits. At the same time, we do recognize that there are still fundamental issues with the scheduling of courses and, in particular, laboratory courses every year. The current process or approach often results in students being blocked from completing the necessary courses in a timely fashion. Issues were also raised by the reviewer concerning advising and while this is not directly within the purview of the program, we do agree that more advisors would be to the benefit of all students and likely alleviate some of the issues students are encountering with respect to fulfilling degree requirements.

There were a few typographical and grammatical errors in the report which should be of little significance.

PART 2 - ACTION PLAN

What steps does the Academic Administrative Unit intend or propose to take in response to the recommendations from the *External Review of Degree Program(s) Report*?

UNBC Responses to the External Review of Degree Program(s) Report			
1	**Recommendation**	*Two streams or pathways within BCMB*	
	Action	It is our view that the BCMB degree does not need nor should develop two streams, with one focused on "biochemistry and the application of chemistry and physics to biological systems" and the other focused on "molecular biology as it applies to ecology and conservational biology". In part, we feel this recommendation may have arisen from the reviewers because they were not charged with reviewing the Biology or Chemistry programs at the same time as examining the BCMB degree. The Biology degree program requires a very similar first and second year to the BCMB degree and then offers areas of specialization in Applied Ecology, Botany and Mycology, Cell Biology and Genetics, Ecology and Evolution, Field Biology and Natural History, and Zoology. The Cell Biology and Genetics already fills the role of offering a molecular biology stream within the ESM suite of degrees (and requires some of the courses from the same pick list as the BCMB degree). The Ecology and Evolution and Applied Ecology streams already provide a framework for developing an understanding of ecology and conversation. We feel that developing a second stream within the BCMB degree would be redundant.	
	Person(s) Responsible	**Dr. Todd Whitcombe and Dr. Ken Otter**	
	Target Implementation Date	**No action required**	
	Implementation Details	**12 month Action Plan Progress Report**	
		24 month Action Plan Progress Report	
		36 month Action Plan Progress Report	

2	**Recommendation**	*Associate Head position that bridges the two Faculties*	
	Action	We agree that the current model of administrative oversight of the degree is cumbersome, particularly following the separation of the two administrating units (ESM and Chem & Biochemistry) into distinct Faculties (Fac Env and Fac Sci & Eng). As the reviewers note, the present structure of two Chairs and two Deans within two Faculties does result in difficulties and extra administrative workload. Students are often unclear who they should report to, where they should get forms signed, who they should contact, and which administrative assistant is responsible for the degree program. When the BCMB degree was housed in the same College as were the two departments with a single dean, these difficulties existed but could be managed. With the change in the university's academic structure, some of the issues have become more prominent. The reviewers proposed the appointment of an Associate Head to coordinate between the two Chairs and two Faculties, but it is our view, however, that such a position would simply add another layer of administration to the oversight. Rather, we propose that the administrative structure and support for the degree should be localized into the Department of Chemistry and Biochemistry. With the high workload for the Chair of ESM, and reduced workload of the Chair of Chem & Biochemistry following the University restructuring (removing Engineering and Environmental Science from the portfolio), it would be reasonable to change to having all of the administrative structure rest within the Department of Chemistry and Biochemistry. Academic oversight of the degree would continue through the BCMB Curriculum Committee, which maintains equal representation from both departments. To ensure continued cross-collaboration, the Curriculum Committee would meet at least once in each of the fall and winter semesters. Consumables used in the laboratories would continue to be paid for by cost-sharing, but all administrative responsibilities for the degree would reside with a single chair.	
	Person(s) Responsible	**Dr. Todd Whitcombe and Dr. Ken Otter**	
	Target Implementation Date	**Dec. 1st, 2023**	
	Implementation Details	**12 month Action Plan Progress Report**	**N/A**
		24 month Action Plan Progress Report	
		36 month Action Plan Progress Report	

3	**Recommendation**	*Reduce course load in second year*	
	Action	As it is unclear to us that the second year of the degree is particularly "intense", we are not in favour of moving forward with this recommendation directly. As demonstrated in the above table, neither of the terms in second year are particularly course intensive with only 10 and 12 credits in the September and January terms, respectively. Rather, we feel the reviewers did not recognize that the separation of the lecture and lab components of particular courses (e.g., BIOL 103/123, CHEM 100/120, CHEM 201/250) are actually linked courses, rather than independent courses. With proper advising and course planning, students should be able to have a reasonable course load. Further the reviewers' recommendation is to move CHEM 204 to a 3rd year course to reduce load in the second year. However, not all of the students taking CHEM 204 are "BCMB" students. CHEM 204 is a required course for Chemistry, Biology, and the B.H.Sc. Biomedical stream. Shifting this course to third-year level would have an impact on each of these degree programs. Finally, shifting the CHEM 204 and its laboratory course to the third year would unnecessarily pack all the laboratory courses into the third year of the program which would result in scheduling conflicts and would mean that students have to wait until third year to actually begin their major or honours program.	
	Person(s) Responsible	**Dr. Todd Whitcombe and Dr.Ken Otter**	
	Target Implementation Date	**No action required**	
	Implementation Details	**12 month Action Plan Progress Report**	
		24 month Action Plan Progress Report	
		36 month Action Plan Progress Report	

4	**Recommendation**	*Early and periodic Advising*	
	Action	We agree with this recommendation. Advising at UNBC has been a long-standing issue as the number of students per advisor and the diversity of programs each advisor is responsible for results in students having less than ideal contact. Often students select courses based on advice from their friends and classmates and not on the advice provided by the advising office or the department. This can lead to a longer time to degree completion as students may select courses they can't use towards their degree or fail to take courses that are necessary pre-requisites for future desired courses. One step that we will be including is a road map for the courses required to complete the BCMB degree within the calendar entry and on the BCMB website.	
	Person(s) Responsible	**BCMB Curriculum Committee/Advising**	
	Target Implementation Date	**December 2023 for development of a road map**	
	Implementation Details	**12 month Action Plan Progress Report**	**Monitor the effectiveness of road map in guiding students. Modify as necessary.**
		24 month Action Plan Progress Report	**Monitor the effectiveness of road map in guiding students.**
		36 month Action Plan Progress Report	

FOLLOW UP DATES

As per the *External Review of Degree Program(s) Procedures*, the Academic Administrative Units are responsible for submitting Action Plan Progress Reports to the Dean on the following dates:

- 12 month Action Plan Progress Report: ___October 31, 2024_____
- 24 month Action Plan Progress Report: ___October 31, 2025_____
- 36 month Action Plan Progress Report: ___October 31, 2026_____

PART 3 – DEAN'S AND VICE-PRESIDENT ACADEMIC AND PROVOST'S RESPONSES

I. Summary of the Degree Program Review Process

Overall, the review process succeeded in achieving our goals. The reviewers were fully engaged in the process and the team was able to schedule meetings with faculty and students. The report produced by the reviewers pointed out some positive aspects of the program, which was well appreciated by both Deans and the Chairs and faculty involved in the program. There were also some concrete suggestions for improvement.

II. Dean's Response to the Recommendations and Action Plan

(October 24, 2023)

There were four recommendations made by the visiting team. The Chairs disagreed with the recommendation that the program develop two streams or pathways. The basis for the disagreement was that there were already streams in the biology degree that overlapped with a molecular biology stream. It would have been preferred that the reasoning would include the strength of the BCMB degree and what this offers to students. It is possible that the advising documents, once developed, will help to visualize if there are indeed two streams once the prerequisites are taken in to account or if students actually can mix and match from the more biochemistry related courses and the biology related courses.

The second recommendation was to appoint an associate head and the Chairs agreed that a change in administrative structure would be a benefit to the program, but not that an associate head would solve that issue. The Chairs recommend that the administration be done by the Chair of Chemistry and Biochemistry, and thus administratively reside in the Faculty of Science and Engineering. The Deans agree with this. Noting that the curriculum committee and curriculum decisions will still be made jointly.

The Chairs disagreed that they should shift CHEM 204 or CHEM 205 to the third year and pointed out that the 2nd year curriculum was not as busy as it looked because our labs are listed separately. The Deans agree with this cautiously and recommend that the curriculum committee examine this in more detail when they next meet. The concern from students was that the workload was heavy, they were not remarking on how it was listed. Is the workload in the lecture and labs as separate classes heavier because they are not one class?

The Chairs agree that more frequent and knowledgeable advising is important. They have agreed to working with the BCMB advisor to create a program course map that the advisor and students can use. The Deans encourage them to consider the most commonly taken electives and ensure the map includes taking prerequisites for those courses. We also note that the advisors have informed us that structural changes

across the university, such as moving from the 2-college model to 5 faculties, have significantly improved advisors' abilities to respond to student questions in a timely manner. The advisors suggest that concerns raised by students about advising may be a legacy of the former system that have since been resolved.

We noticed that the response from the Chairs did not include a response to the comments of the future direction of the degree program. The development of program level learning outcomes and the use of these by the curriculum committee in their further examination of the curriculum would be a great benefit. They also mentioned that regular anonymous surveys of students regarding the program components would also be beneficial.

Overall, the Deans feel that this has been a valuable exercise and look forward to seeing the program grow.

III. Vice-President Academic and Provost's Response to the Recommendations and Action Plan

(Interim Vice-President Academic and Provost, Dr. Bill Owen, May 13, 2024)

Thank you to the reviewers, the departments, Chairs and Deans for their participation in the Biochemistry and Molecular Biology program review process. This important and regular required program review ensures the existing and future high quality academic integrity in the BCMB program.

I have carefully read the reviewers' report, the departmental response, and the decanal response. I want to underscore the authority and responsibility of the Deans and Chairs for a large majority of the recommendations. I broadly agree with the recommendations and note the departments have already moved actions related to some of the noted recommendations.

As an academic program dispersed across two Faculties, I have also noted the complexity and collaborative nature of this program. I want to emphasize the important role the BCMB program plays in providing students with high quality education to students within the institution. The need for the BCMB program to consider pan-institutional needs as well as collaborative departmental needs is important in considering the continued success of students.

As is usually the case, the external committee has made recommendations that have some degree of resource implications. Whereas I again broadly support suggestions to refine a budget model that appropriately supports the requirements of the laboratories, recommendations that require acquiring new resources or reallocation of resources will take some time to achieve.

Upon review of the documents and the responses by the Chairs and the Deans, I support the additional suggestion by the Deans in light of the Chair's responses. The development and sharing of program level learning outcomes is an important outcome noted by the Deans that would facilitate curriculum maps for students, faculty and advisors. Furthermore, program learning outcomes would align with the upcoming refresh of the academic plan (in alignment with the strategic plan READY – cultivating curiosity) and DQAB requirements for curricular review and development of learning outcomes.

I support the directions outlined by the Chairs and Deans, and look forward to hearing about the impact of the actionable recommendations.