

Biology

Department of Biology
Faculty of Science

This section presents the requirements for programs in:

- **Biology – B.Sc. Honours**
- **Computational Biology with Specialization in Molecular Bioinformatics – B.Sc. Honours**
- **Computational Biology with Specialization in Biodiversity – B.Sc. Honours**
- **Biology – B.Sc. General**
- **Biology and Physical Geography – B.Sc. Combined Honours**
- **Biology and Geology – B.Sc. Combined Honours**
- **Biology and Physics – B.Sc. Combined Honours**
- **Neuroscience – B.Sc. Combined Honours**
- **Biology – B.A. Honours**
- **Biology – B.A. General**
- **Biology – B.A. Combined Honours**
- **Minor in Biology**

Requirements for the program Biology and Biotechnology are presented in the Biotechnology program section of this Calendar.

Co-operative Education Option is available (see the Co-operative Education section of this Calendar).

Graduation Requirements

In addition to the requirements listed below, students must satisfy:

- i) the University regulations (see *The Academic Regulations of the University* in this Calendar),
- ii) for B.Sc. programs, the common regulations applying to all B.Sc. programs including those relating to Science Continuation and Breadth requirements (see the *Academic Regulations and Requirements for the Bachelor of Science Degree*),
- (iii) for B.A. programs, the common regulations applying to all B.A. programs including those relating to First-Year Seminars and Breadth requirements (see *The Academic Regulations and Requirements for the Bachelor of Arts Degree*).

Students should consult with the Department when planning their program and selecting courses.

Course Categories for Biology Programs

The program descriptions below make use of the following course categories that are defined in the Bachelor of Science Regulations in this Calendar.

- **Science Faculty Electives**
- **Advanced Science Faculty Electives**
- **Science Continuation**
- **Science Geography**
- **Science Psychology**
- **Approved Arts or Social Science**
- **Free Elective**

Restricted Courses: Biology General and Honours students (except students in the B.A. General, B.A. Honours and Combined Honours programs) may use Technology, Society, Environment courses TSES 3001, TSES 3002, TSES 3500, TSES 4001, TSES 4002, TSES 4003, TSES 4005, TSES 4006, TSES 4007 in fulfilling degree requirements, but only as free electives.

Program Requirements

General Note on Programs

If the Department of Biology cannot find a supervisor for a student who has applied to register for BIOL 4908, then BIOL 4907 will be accepted as a replacement. Under such an exceptional circumstance the Department Chair will direct the student to replace BIOL 4908 with BIOL 4907.

Biology

B.Sc. Honours (20.0 credits)

A. Credits Included in the Major CGPA (7.0 credits):

1. 5.0 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200, BIOL 2600, BIOL 4901, BIOL 4908 [1.0];
2. 0.5 credit in either BIOL 3205 or BIOL 3305;
3. 1.5 credits selected from BIOL 2303 and Biology at the 3000-level or above;
4. 2.0 credits in Advanced Science Faculty Electives;

B. Credits Not Included in the Major CGPA (13.0 credits):

5. 1.0 credit in Science Faculty Electives;
6. 2.0 credits in Advanced Science Faculty Electives;
7. 1.5 credit in CHEM 1000 [1.0], MATH 1007;
8. 0.5 credit in either MATH 1107 or STAT 2507;
9. 1.0 credit in either (PHYS 1003 and PHYS 1004) or (PHYS 1007 and PHYS 1008);
10. 2.0 credits in Science Continuation credits (not in Biology);
11. 0.5 credit in NSCI 1000 or Approved Arts or Social Sciences;
12. 1.5 credits in Approved Arts or Social Sciences;
13. 1.0 credit in free electives.

Note: students should choose the courses for items 3, 4 and 5 above so that they can develop an area of specialization according to their preferred area of biology. Possible areas of specialization include molecular and cellular biology, genetics, microbiology, plant and animal physiology, animal behaviour, ecology, and systematics. These courses should be chosen in consultation with the Undergraduate Adviser or a faculty member working in an area close to the interest of the student.

Biology

B.Sc. General (15.0 credits)

A. Credits Included in the Major CGPA (6.0 credits):

1. 3.5 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200, BIOL 2600;
2. 0.5 credit in either BIOL 3205 or BIOL 3305;
3. 2.0 credits selected from BIOL 2303 and Biology at the 3000-level or above;

B. Credits Not Included in the Major CGPA (9.0 credits):

4. 1.5 credit in CHEM 1000 [1.0], MATH 1007;
5. 0.5 credit in either MATH 1107 or STAT 2507;
6. 1.0 credit in either (PHYS 1003 and PHYS 1004) or (PHYS 1007 and PHYS 1008);

7. 2.0 credits in Science Continuation not in Biology;
8. 1.0 credit in Science;
9. 0.5 credits in NSCI 1000 or Approved Arts or Social Sciences;
10. 1.5 credits in Approved Arts or Social Sciences;
11. 1.0 credit in free electives.

**Computational Biology with Specialization in Molecular Bioinformatics
B.Sc. Honours (20.0 credits)**

A. Credits Included in the Major CGPA (12.0 credits):

1. 4.0 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200 BIOL 2600, BIOL 4901;
2. 0.5 credit in either BIOL 3205 or BIOL 3305;
3. 2.5 credits in CMPS 2800, CMPS 3604, CMPS 3800, CMPS 4909 [1.0];
4. 4.0 credits in CHEM 2203, CHEM 2204, BIOL 3104, BIOC 3100 [1.0], BIOC 4002, BIOC 4006, BIOL 4106;
5. 1.0 credit in Biology or Biochemistry at the 3000-level or above;

B. Credits Not Included in the Major CGPA (8.0 credits):

6. 1.0 credit in CHEM 1000 [1.0];
7. 1.0 credit in PHYS 1007 and PHYS 1008, or PHYS 1003 and PHYS 1004;
8. 1.5 credits in MATH 1007, MATH 1107, STAT 2507;
9. 1.5 credits in COMP 1005, COMP 1006, COMP 2002;
10. 0.5 credit in Computer Science at the 2000-level or above;
11. 0.5 credits in NSCI 1000 or Approved Arts or Social Sciences;
12. 1.5 credits in Approved Arts or Social Sciences;
13. 0.5 credit in free elective.

**Computational Biology with Specialization in Biodiversity
B.Sc. Honours (20.0 credits)**

A. Credits Included in the Major CGPA (11.0 credits):

1. 4.0 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200 BIOL 2600, BIOL 4901;
2. 0.5 credit in either BIOL 3205 or BIOL 3305;
3. 1.5 credits in CMPS 2800, CMPS 4909 [1.0];
4. 0.5 credit in either CMPS 3604 or CMPS 3800;
5. 2.0 credits in BIOL 3601, BIOL 3602, BIOL 3604, BIOL 4103;
6. 0.5 credit in either BIOL 4104 or BIOL 4609;
7. 2.0 credits in Biology at the 3000-level or above;

B. Credits Not Included in the Major CGPA (9.0 credits):

8. 1.0 credit in CHEM 1000 [1.0];
9. 1.0 credit in Physics: PHYS 1007 and PHYS 1008, or PHYS 1003 and PHYS 1004;
10. 1.5 credits in MATH 1007, MATH 1107, STAT 2507;
11. 1.5 credits in COMP 1005, COMP 1006, COMP 2002;
12. 0.5 credit in Computer Science at the 2000-level or above;

13. 0.5 credits in NSCI 1000 or Approved Arts or Social Sciences;
14. 1.5 credits in Approved Arts or Social Sciences;
15. 1.5 credit in free elective.

**Biology and Physical Geography
B.Sc. Combined Honours (20.0 credits)**

A. Credits Included in the Major CGPA (13.0 credits):

1. 2.0 credits in BIOL 1003, BIOL 1004, GEOL 1006, GEOG 2100;
2. 10.0 credits in Biology (or Biochemistry) and Science Geography at the 2000-level or above satisfying collectively:
 - a) 0.5 credits chosen from BIOL 3605, BIOL 3606, GEOG 3000, GEOG 4000;
 - b) at least 4.0 credits in Biology or Biochemistry;
 - c) at least 4.0 credits in Geography;
 - d) at least 4.0 credits are at the 3000-level or above;
3. 1.0 credit in BIOL 4908 [1.0] or GEOG 4906 [1.0];

B. Credits Not Included in the Major CGPA (7.0 credits):

4. 1.5 credits in CHEM 1000 [1.0], MATH 1007;
5. 0.5 credit in either MATH 1107 or STAT 2507;
6. 0.5 credit in NSCI 1000 or Approved Arts or Social Sciences;
7. 1.5 credits in Approved Arts or Social Sciences;
8. 1.0 credit in Science Faculty Electives;
9. 1.0 credit in Science Faculty Electives or Computer Science (COMP), not in Biology or Geography, at the 2000-level or above;
10. 1.0 credit in free electives.

Notes

1. Courses in Physical Geography are listed in the *Academic Regulations for the Bachelor of Science Degree* section of this Calendar as Science Geography courses.
2. For item 7 above, 1.0 credit in Geography, other than the Physical Geography, is recommended;
3. For item 8 above, either (PHYS 1003 and PHYS 1004), or (PHYS 1007 and PHYS 1008) is required unless OAC Physics is presented on admission.

**Biology and Geology
B.Sc. Combined Honours (20.0 credits)**

A. Credits Included in the Major CGPA (13.0 credits):

1. 1.0 credit in BIOL 1003 and BIOL 1004;
2. 1.0 credit in GEOL 1008 and either GEOL 1006 or GEOL 1007;
3. 10.0 credits in Biology (or Biochemistry) and Geology at the 2000-level or above collectively satisfying:
 - a) 0.5 credit from BIOL 3605, BIOL 3606, GEOL 2801, GEOL 4807;
 - b) at least 4.0 credits in Biology or Biochemistry;
 - c) at least 4.0 credits in Geology;
 - d) at least 4.0 credits are at the 3000-level or above;
4. 1.0 credit in BIOL 4908 or GEOL 4908;

B. Credits Not Included in the Major CGPA (7.0 credits):

5. 1.0 credit in MATH 1007 and MATH 1107;
6. 1.0 credit in CHEM 1000 [1.0], PHYS 1003 and PHYS 1004, or PHYS 1007 and PHYS 1008 (The omitted subject, i.e) Chemistry or Physics, must have been taken at the OAC level);
7. 0.5 credit in Statistics (STAT 2507 is recommended);
8. 0.5 credit in Computer Science (COMP 1004 is recommended);
9. 1.0 credit in Science Faculty Electives;
10. 0.5 credits in NSCI 1000 or Approved Arts or Social Sciences;
11. 1.5 credits in Approved Arts or Social Sciences;
12. 1.0 credit in free electives.

C. Additional Non-credit Requirement:

13. The Earth Sciences Departmental Language Requirement must be satisfied. (See the Earth Sciences program entry for more information.)

Biology and Physics**B.Sc. Combined Honours (20.0 credits)****A. Credits Included in the Major CGPA (13.0 credits):**

1. 1.0 credit in (PHYS 1001 and PHYS 1002), or (PHYS 1003 and PHYS 1004), or (PHYS 1007 and PHYS 1008);
2. 2.5 credits in PHYS 2604, PHYS 2202, PHYS 4409, ECOR 2606, ELEC 3105;
3. 2.0 credits in PHYS 3007, PHYS 3207, PHYS 3606, PHYS 3701;
4. 1.0 credit from PHYS 3802, PHYS 4007, PHYS 4203, PHYS 4508, PHYS 4707, ELEC 3909;
5. 4.0 credits in BIOL 1003, BIOL 1004, BIOL 2200, BIOL 2104, BIOL 2001, BIOL 3201, BIOL 3104, BIOL 3305;
6. 1.0 credit from BIOL 4106, BIOL 4109, BIOL 4202, BIOL 4301, BIOL 4302, BIOL 4306;
7. 1.5 credits in BIOL 4901 and BIOL 4908 [1.0], or PHYS 4909 [1.0] and 0.5 credit in free elective;

B. Credits Not Included in the Major CGPA (7.0 credits):

8. 1.0 credit in CHEM 1000 [1.0];
9. 0.5 credit in MATH 1004 or MATH 1007;
10. 0.5 credit in MATH 1104 or MATH 1107;
11. 2.0 credit in STAT 2507, MATH 1005, MATH 2004, MATH 3705;
12. 0.5 credit in COMP 1005 or COMP 1007;
13. 0.5 credits in NSCI 1000 or Approved Arts or Social Sciences;
14. 1.5 credits in Approved Arts or Social Sciences;
15. 0.5 credit in free elective.

Note: in items 3 and 4 above, PHYS 3008 may replace PHYS 3007; PHYS 4008 may replace PHYS 4007.

Neuroscience**B.Sc. Combined Honours (20.0 credits)****A. Credits Included in the Major CGPA (11.0 credits):**

1. 3.5 credit in BIOL 1003, BIOL 1004; BIOL 2001, BIOL 2200, BIOL 2104, BIOL 3305, BIOL 4306;

2. 1.0 credit in Biology or Biochemistry;
3. 1.5 credit in Biology or Biochemistry at the 3000-level or above;
4. 1.0 credit in either PSYC 1001 and PSYC 1002, or PSYC 1000 [1.0];
5. 2.0 credit in PSYC 2000 [1.0], PSYC 2200 and PSYC 2700;
6. 1.0 credit in PSYC 3200 [1.0] or PSYC 3700 [1.0];
7. 1.0 credit in PSYC 4907 [1.0] or BIOL 4908 [1.0];

B. Credits Not Included in the Major CGPA (9.0 credits):

8. 1.0 credit in MATH 1007, MATH 1107;
9. 1.0 credit in either STAT 2507 and STAT 2509 or PSYC 3000 [1.0];
10. 2.0 credit in CHEM 1000 [1.0], CHEM 2203, CHEM 2204;
11. 1.0 credit in either PHYS 1001 and PHYS 1002, or PHYS 1007 and PHYS 1008;
12. 2.0 credit from Science Psychology excluding PSYC 3000;
13. 0.5 credits in NSCI 1000 or Approved Arts or Social Sciences, not in Psychology;
14. 0.5 credit in Approved Arts or Social Sciences other than Psychology;
15. 1.0 credit in free electives.

Note: the topic for item 7 above must be in neurophysiology, animal behaviour, neuropsychology or a related topic.

Biology**B.A. Honours (20.0 credits)****A. Credits Included in the Major CGPA (8.0 credits):**

1. 3.5 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200, BIOL 2600;
2. 0.5 credit in either BIOL 3205 or BIOL 3305;
3. 1.0 credit in Biology at the 4000-level;
4. 2.0 credits in Biology;
5. 1.0 credit in BIOL 4907 [1.0] or BIOL 4908 [1.0];

B. Credits Not Included in the Major CGPA: (12.0 credits):

6. 1.0 credit in CHEM 1000 [1.0];
7. 1.0 credit in Science Faculty Electives at the 2000-level or above, not in Biology;
8. 1.0 credit in Science Faculty Electives not in Biology;
9. 2.0 credits in Arts or Social Sciences at the 2000-level or above;
10. 4.0 credits in Arts or Social Sciences;
11. 1.0 credit at the 3000- or 4000-level approved by the Undergraduate Adviser;
12. 2.0 credits in free electives.

Biology**B.A. General (15.0 credits)****A. Credits Included in the Major CGPA (6.0 credits):**

1. 3.5 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200, BIOL 2600;
2. 2.5 credits in Biology;

B. Credits Not Included in the Major CGPA (9.0 credits):

3. 1.0 credit in CHEM 1000 [1.0];
4. 1.0 credit in Science Faculty Electives, not in Biology;
5. 4.0 credits in Arts and Social Sciences;
6. 1.0 credit at the 2000-level or above;
7. 1.0 credit in electives not in Biology;
8. 1.0 credit in free electives.

Biology

B.A. Combined Honours (20.0 credits)

A. Credits Included in the Biology Major CGPA (6.0 credits):

1. 3.5 credits in BIOL 1003, BIOL 1004, BIOL 2001, BIOL 2002, BIOL 2104, BIOL 2200, BIOL 2600;
2. 1.0 credit in Biology at the 4000-level;
3. 1.5 credits in Biology;

B. Additional Requirements (14.0 credits):

4. 1.0 credit in CHEM 1000 [1.0];
5. 1.0 credit in an Honours project: Biology BIOL 4907 [1.0] or BIOL 4908 [1.0], or equivalent from the other Honours department;
6. 1.0 credit in Science Faculty Electives, not in Biology, at the 2000-level or above;
7. 1.0 credit in Science Faculty Electives not in Biology;
8. 7.0 credits in Arts or Social Sciences to include the requirements for the other discipline;
9. 2.0 credits in free electives not in Biology or the other discipline;
10. 1.0 credit in free electives.

Minor in Biology

The Minor in Biology is available to students registered in degree programs other than those offered by the Department of Biology. Consultation with the undergraduate advisor is required.

Requirements (4.0 credits):

1. 1.0 credit in BIOL 1003 and BIOL 1004;
2. 1.0 credit in BIOL 2001 and BIOL 2002;
3. 0.5 credit in BIOL 2104;
4. 0.5 credit from BIOL 2200, BIOL 2303 or BIOL 2600;
4. 1.0 credit in Biology (BIOL) at the 3000-level or above.

Note: at least 2.0 of these credits must be taken at Carleton University.