



**Ontario eSecondary School
Course Outline
2019-2020**

Ministry of Education Course Title: Biology, University Preparation	
Ministry Course Code: SBI4U	
Course Type: University Preparation	
Grade: 12	
Credit Value: 1.0	
Prerequisite(s): Biology, Grade 11, University Preparation	
Department: Science	
Course developed by: Shah Khan	Date: September 10, 2018
Length: One Semester	Hours: 110
This course has been developed based on the following Ministry documents: 1. <i>The Ontario Curriculum, Grades 11 and 12, 2008, revised</i>	

COURSE DESCRIPTION/RATIONALE

This course provides students with the opportunity for in-depth study of the concepts and processes that occur in biological systems. Students will study theory and conduct investigations in the areas of biochemistry, metabolic processes, molecular genetics, homeostasis, and population dynamics. Emphasis will be placed on the achievement of detailed knowledge and the refinement of skills needed for further study in various branches of the life sciences and related fields.

Prerequisite: Biology, Grade 11, University Preparation

OVERALL CURRICULUM EXPECTATIONS

Scientific Investigation Skills and Career Exploration

By the end of this course, students will:

1. Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communication);
2. Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Biochemistry

By the end of this course, students will:

1. Analyse technological applications of enzymes in some industrial processes, and evaluate technological advances in the field of cellular biology;
2. Investigate the chemical structures, functions, and chemical properties of biological molecules involved in some common cellular processes and biochemical reactions;
3. Demonstrate an understanding of the structures and functions of biological molecules, and the biochemical reactions required to maintain normal cellular function.

Metabolic Processes

By the end of this course, students will:

1. Analyse the role of metabolic processes in the functioning of biotic and abiotic systems, and evaluate the importance of an understanding of these processes and related technologies to personal choices made in everyday life;
2. Investigate the products of metabolic processes such as cellular respiration and photosynthesis;
3. Demonstrate an understanding of the chemical changes and energy conversions that occur in metabolic processes.

Molecular Genetics

By the end of this course, students will:

1. Analyse some of the social, ethical, and legal issues associated with genetic research and biotechnology;
2. Investigate, through laboratory activities, the structures of cell components and their roles in processes that occur within the cell;
3. Demonstrate an understanding of concepts related to molecular genetics, and how genetic modification is applied in industry and agriculture.

Homeostasis

By the end of this course, students will:

1. Evaluate the impact on the human body of selected chemical substances and of environmental factors related to human activity;
2. Investigate the feedback mechanisms that maintain homeostasis in living organisms;
3. Demonstrate an understanding of the anatomy and physiology of human body systems, and explain the mechanisms that enable the body to maintain homeostasis.

Population Dynamics

By the end of this course, students will:

1. Analyse the relationships between population growth, personal consumption, technological development, and our ecological footprint, and assess the effectiveness of some Canadian initiatives intended to assist expanding populations;

2. Investigate the characteristics of population growth, and use models to calculate the growth of populations within an ecosystem;
3. Demonstrate an understanding of concepts related to population growth, and explain the factors that affect the growth of various populations of species.

COURSE CONTENT

<i>Unit</i>	<i>Length</i>
Unit 1: Biochemistry	20 hours
Unit 2: Metabolic Processes	17 hours
Unit 3: Molecular Genetics	25 hours
Unit 4: Homeostasis	24 hours
Unit 5: Population Dynamics	17 hours
Culminating Activity	5 hours
Final Exam	3 hours
Total	110 hours

UNIT DESCRIPTIONS

We grow up thinking of reading and writing as two of the classic ‘three Rs’, and once we learn how to do them well, many assume that there’s no need to think more of them. However, there are nuances to both.

This course explores what writers have known for centuries: there are many, many ways to write and read a text.

UNIT 1: BIOCHEMISTRY

Students will analyse technological applications of enzymes in some industrial processes, and evaluate technological advances in the field of cellular biology; investigate the chemical structures, functions, and chemical properties of biological molecules involved in some common cellular processes and biochemical reactions;

They will also demonstrate an understanding of the structures and functions of biological molecules, and the biochemical reactions required to maintain normal cellular function. They will be assessed through a mini test, biology in the news assignment, unit test and a cumulative assignment.

UNIT 2: METABOLIC PROCESSES

Students will analyse the role of metabolic processes in the functioning of biotic and abiotic systems, and evaluate the importance of an understanding of these processes and related technologies to personal choices made in everyday life; investigate the products of metabolic processes such as cellular respiration and photosynthesis. They will also demonstrate an understanding of the chemical changes and energy conversions that occur in metabolic processes. Students will be assessed through a mini-test, biology in the news assignment, unit test and a cumulative assignment.

UNIT 3: MOLECULAR GENETICS

Students will analyse some of the social, ethical, and legal issues associated with genetic research and biotechnology. They will investigate, through laboratory activities, the structures of cell components and their roles in processes that occur within the cell. Students will demonstrate an understanding of concepts

related to molecular genetics, and how genetic modification is applied in industry and agriculture. They will be assessed through a mini test, biology in the news assignment, unit test and a cumulative assignment.

UNIT 4: HOMEOSTASIS

Students will evaluate the impact on the human body of selected chemical substances and of environmental factors related to human activity. They will investigate the feedback mechanisms that maintain homeostasis in living organisms. They will demonstrate an understanding of the anatomy and physiology of human body systems, and explain the mechanisms that enable the body to maintain homeostasis. Students will be assessed through a mini test, biology in the news assignment, unit test and a cumulative assignment.

UNIT 5: POPULATION DYNAMICS

Students will analyse the relationships between population growth, personal consumption, technological development, and our ecological footprint, and assess the effectiveness of some Canadian initiatives intended to assist expanding populations. They will investigate the characteristics of population growth, and use models to calculate the growth of populations within an ecosystem. Students will demonstrate an understanding of concepts related to population growth, and explain the factors that affect the growth of various populations of species. They will be assessed through a mini test and a short assignment.

TEACHING AND LEARNING STRATEGIES

The students will experience a variety of activities:

Teacher demonstrations (research skills, etc.) through video conferencing, email, or telephone conversations with subject teacher, or videos provided of a teacher or student demonstrating the concepts and skills being studied. This helps the student and teacher create an atmosphere of trust and respect to aid in the online learning environment.

Video presentations and technological aids (research) with videos embedded to enrich the course content and clarify concepts and skills being studied. Also the use of online pre-approved quizzes and games to help a student become more familiar with the concepts and skills being studied.

Diagnostic and review activities (audio and video taping) can be student-lead or teacher lead to work as a review for students through audio and video made to share among each other to help reinforce the concepts and skills being studied.

Brainstorming, charts and graphs are a great way for students to demonstrate their knowledge of subject matter through graphic organizers, pictures, and texts. This is communicated through assignments in Moodle.

Small Group Activities

The teacher sets up small group activities to provide opportunities for active and oral learning as well as to bolster practical communication and teamwork skills. The teacher plays a critical role during group activities by monitoring group progress as well as answering questions that arise and using questions to assist students in their understanding. In this way, the teacher also facilitates student understanding of effective learning, communication, and team building during group activities.

The small group activities include the following:

Practical extension and application of knowledge is used as an effective learning strategy in this course because it allows the students to read and listen to the texts and stories and reflect back with connections to themselves, other texts and the world. Students are encouraged to share their understandings through work submitted each day, phone conversations about course work, or videoconferencing.

Oral presentations in an online environment we have the equipment to have student either live video conference oral presentations, or make videos and submit them for their oral presentations. These oral presentations can be viewed by fellow students (when appropriate) and the teacher. Students can learn from one another, and from their teacher. Such activities include dramatic readings and performances.

Individual Activities

The teacher should provide a variety of individual assignments to expand and consolidate the learning that takes place in the whole-class and small group activities. Individual activities allow the teacher to accommodate interests and needs and to access the progress of individual students. The teacher plays an important role in supporting these activities through the provision of ongoing feedback to the students, both orally and in writing. Teachers are encouraged to include individual activities such as the following in the course:

Research is completed in an online environment by teaching the students first about plagiarism rules and giving examples of good sources to use. The students are not only limited to the online search for information, but have resources available by links on the Moodle page of information that has been scanned and uploaded.

Individual assignments are worked on at a student's own pace. The teacher can support the student in these activities with ongoing feedback.

Oral presentations are facilitated through the use of video conferencing and video recording.

Practical extension and application of knowledge helps students develop their own voice, and gives them the ability to make personal connections, and connections to the world throughout their course. Students are given a variety of reading and viewing texts to give them many chances to apply their new concepts, skills, and knowledge.

Ongoing project work is something that is valued in the earning of an English credit. The ongoing project can be submitted to the teacher for ongoing feedback in both written and oral work.

Written assignments are used to allow students to develop their skills in writing, comprehension, and communication. With the online format students submit their work, and have a chance to get feedback from the teacher, and submit their best work. This can be demonstrated with reading responses, personal writing, report writing, essay writing, script writing, business and technical writing, and individual research assignments.

Journals are used in which the student can self-reflect on their subject matter, and see their progress over time. It allows students a different medium of presenting their thoughts and skills learned.

Reflective/Comparative analysis for students working in their portfolios, giving them an opportunity for self-reflection on their accomplishments, skills, and concepts learned over the year. This can be accomplished with student and teacher conferences as well.

ASSESSMENT, EVALUATION, AND REPORTING

Assessment: The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

Evaluation: Assessment of Learning focuses on Evaluation which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

Reporting: Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists and inventories, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress. Assessment of student acquisition of listening and talking, reading and viewing and writing skills also occurs regularly through unobtrusive teacher observation and conferencing.

Units conclude with performance tasks, e.g., interviews and from essays that build towards and prepare students for the end-of-course culminating task in Unit Five. Teachers are encouraged to share goals with students early in the course and to connect unit learning experiences frequently and explicitly with big ideas, overall expectations, and performance tasks, i.e. check bricks; teacher-adapted generic rubrics available in many sources, including the *Ontario Secondary School Literacy Course (OSSLC) Profile*, so that they are more task-specific. The teacher might ask: "What does the criteria look like for this particular task?" Or "What does limited effectiveness look like?" The teacher could involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool that can support the writing process and practice.

ASSESSMENT ACTIVITIES

- Homework assignments
- Individual conference meetings
- Online Discussion Forums
- Online Conferences
- Readings Activities and Case Studies
- Diagnostic tests and writing tasks
- Reflections Forums
- Online Oral presentation
- Tests & Exam
- Lab Report Writing
- Lab Gizmos (Online Simulations)
- Self-Assessment Tasks

EVALUATION

The final grade will be determined as follows:

- ❑ Seventy per cent of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student's most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
- ❑ Thirty per cent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course.

(Growing Success: Assessment, Evaluation and Reporting in Ontario Schools. Ontario Ministry of Education Publication, 2010 p.41)

Weightings	
Course Work	70
Knowledge/Understanding	20
Thinking/Inquiry	20
Communication	15
Application	15
Final	30
Culminating Activity	15
Final Exam	15

TERM WORK EVALUATIONS (70%):

Evaluation Item	Description	Category
Lab(s)	Unit 2: Flutter of Activity Short Lab Unit 2: Photo Respiration Online Lab Unit 3 Online Forensic Lab	K,I,C,A
Unit Test(s)	Unit 1 Biochemistry Test Unit 2 Metabolism Test Unit 3 Molecular Genetics Test Unit 4 Half Point Quiz Unit 4 Homeostasis Test Unit 5 Population Dynamics Test	K,I,C,A
Cumulative Assignment(s)	Unit 1 Enzyme Action Assignment	K,I,C,A
Online Conferences	Unit 2 Photo Respiration Lab Seminar	K,I,C

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	Unit 3 Transcription Translation Seminar Unit 5 Ecological Footprint Seminar	
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FINAL EVALUATIONS (30%):

Evaluation Item	Description	Category
Cumulative project	Mountain Climbing Research Paper and Presentation	K,I,C,A
Final Exam	Final Examination	K,I,C,A

AFL/AAL/AOL Tracking sheet:

Unit 1: Biochemistry – 20 hours

AAL	AFL	AOL
Lesson 1.1 Isotopes Response Forum	Lesson 1.1 Isotope worksheet	Lesson 1.15 Enzyme Action Assignment
Create a Molecule	Lesson 1.1 Reflect and Summarize Forum	Unit 1 Test
Lesson 1.11 You Are What You Eat? Forum	Lesson 1.3 Covalent Bonds Forum	
Lesson 1.12 Thermodynamics Reflection Forum	Unit 1 Lab Submission	
	Lesson 1.9 Fats Forum	

Unit 2: Metabolic Processes – 17 hours

AAL	AFL	AOL
Lesson 2.4 Cellular Respiration Summary Forum	Lesson 2.1 Cell Membrane Online Think-Share Forum	Lesson 2.4 A Flutter of Activity Short Lab
	Lesson 2.1 Cell Membrane Article Questions	Lesson 2.8 Online Photosynthesis Lab
	Lesson 2.3 Citric Acid Cycle Worksheet	Lesson 2.8 Photo and Cellular Respiration Reflection Seminar + Check brick
	Lesson 2.4 ETC Review Worksheet	Unit 2 Test
	Lesson 2.5 Notes and Worksheets Submission	
	Lesson 2.6 Light Reaction Diagram	

Unit 3: Molecular Genetics – 24.5 hours

AAL	AFL	AOL
Drag and Drop DNA	Lesson 3.1 Genetic Material in	Unit 3 Transcription and

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	Euk vs. Pro Forum	Translation Seminar (ONLINE) + Check brick
Unit 3 Case Study Discussing HIV/AIDS Forum	Lesson 3.3 DNA Replication Forum	Lesson 3.11 Online Forensic Lab + Check brick
	Lesson 3.6 Cell Transcription and Translation Interactive activity (Simulation) Forum	Unit 3 Test
	Protein Synthesis Review worksheet	
	Biotechnology Application Forum	
	Lesson 3.13 Synthesizing DNA Forum	
	Lesson 3.14 Synthesis of a Protein	

Unit 4: Homeostasis – 24 hours

AAL	AFL	AOL
Lesson 4.2 Mood Molecules Questions	Lesson 4.1 Explain Homeostasis Forum	Half Unit 4 Quiz Open Book
Lesson 4.7 Endocrine System Forum	Lesson 4.4 Chemical Synapse Forum	Unit 4 Test
	Lesson 4.5 Drawing the Reflex Arc activity	
	Lesson 4.6 Effect of Drugs Forum	
	Lesson 4.8 Lab Diabetes Case Study	
	Lesson 4.9 Complete Excretion pathways Review	
	Lesson 4.11 Anabolic Steroids Forum	
	Lesson 4.12 Notes and Worksheet Submission	

Unit 5: Population Dynamics – 16.8 hours

AAL	AFL	AOL
Texas Mosquito Flashcards	Lesson 5.1 Characteristics of Populations Cloze activity	Ecological Footprint Discussion + Check brick
	Lesson 5.3 Birds of prey Activity Submission Forum	Unit 5 Test
	Lesson 5.4 Survivor of the Fittest Curve Forum	
	Lesson 5.5 Case Study Forum Response	
	Lesson 5.6 Measuring Population Dynamics Assignment	

	Lesson 5.7 Predator Prey Cycling	
	Lesson 5.9 Notes and Worksheet Submission	
	Lesson 4.12 Notes and Worksheet Submission	

Finals

AOL
Final Exam

CONSIDERATION FOR PROGRAM PLANNING

Students learn best when they are engaged in a variety of ways of learning. Guidance and career education courses lend themselves to a wide range of approaches in that they require students to research, think critically, work cooperatively, discuss relevant issues, and learn through practice in a variety of settings. Helping students become self-directed, lifelong learners is a fundamental aim of the guidance and career education curriculum. When students are engaged in active and experiential learning strategies, they tend to retain knowledge for longer periods and develop meaningful skills. Active and experiential learning strategies also enable students to apply their knowledge and skills to real-life issues and situations.

ANTIDISCRIMINATION EDUCATION IN GUIDANCE AND CAREER EDUCATION

Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 per cent of the students in Ontario’s English language schools is a language other than English. Ontario’s linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

THE ROLE OF TECHNOLOGY IN THE ENGLISH PROGRAM

Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

ACCOMMODATIONS

Accommodations will be based on meeting with parent, teachers, administration and external educational assessment report. The following three types of accommodations may be provided:

- Instructional accommodations:** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia.
- Environmental accommodations:** such as preferential seating or special lighting.
- Assessment accommodations:** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids, which may be used in this course, are:

- Provide step-by-step instructions.
- Help students create organizers for planning writing tasks.
- Record key words on the board or overhead when students are expected to make their own notes.
- Allow students to report verbally to a scribe (teacher/ student) who can help in note taking.
- Permit students a range of options for reading and writing tasks.
- Where an activity requires reading, provide it in advance.
- Provide opportunities for enrichment.

