



Ontario eSecondary School Course Outline 2024-2025

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| Ministry of Education Course Title: Biology, College Preparation | |
| Ministry Course Code: SBI3C | |
| Course Type: College Preparation | |
| Grade: 11 | |
| Credit: 1.0 | |
| Prerequisite(s): Science, Grade 10, Academic or Applied | |
| Department: Science | |
| Course developed by: Sabrina Bieber | Date: March 1, 2019 |
| Length: One Semester | Hours: 110 |
| This course has been developed based on the following Ministry documents: <ol style="list-style-type: none"> 1. <i>Science, The Ontario Curriculum, Grades 9 and 10</i>, 2008, (revised) 2. <i>Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)</i> 3. <i>Learning for All (2013)</i> | |

COURSE DESCRIPTION/RATIONALE

This course focuses on the processes that occur in biological systems. Students will learn concepts and theories as they conduct investigations in the areas of cellular biology, microbiology, genetics, the anatomy of mammals, and the structure of plants and their role in the natural environment. Emphasis will be placed on the practical application of concepts, and on the skills needed for further study in various branches of the life sciences and related fields. Prerequisite: Science, Grade 10, Academic or Applied

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 communicating);
2. identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Cellular Biology

By the end of this course, students will:

1. evaluate the impact of environmental factors and medical technologies on certain cellular processes that occur in the human body;
2. investigate the structures and functions of cells, and the factors that influence cellular activity, using appropriate laboratory equipment and techniques;
3. demonstrate an understanding of the basic processes of cellular biology

Genetics

By the end of this course, students will:

1. evaluate some social, ethical, and environmental implications of genetic research and related technologies;
2. investigate the process of meiosis, and analyse data related to the laws of heredity;
3. demonstrate an understanding of the process of meiosis, and explain the roles of genes in the transmission of hereditary characteristics.

Microbiology

By the end of this course, students will:

1. assess the effects of microorganisms in the environment, and analyse the ethical issues related to their use in biotechnology;
2. investigate the development and physical characteristics of microorganisms, using appropriate laboratory equipment and techniques;

3. demonstrate an understanding of the diversity of microorganisms and the relationships that exist between them.

Anatomy of Mammals

By the end of this course, students will:

1. analyse the social or economic impact of technology used to treat systems in the human body, and the impact of lifestyle choices on human health;
2. investigate, through laboratory inquiry or computer simulation, the anatomy, physiology, and response mechanisms of mammals;
3. demonstrate an understanding of the structure, function, and interactions of the circulatory, digestive, and respiratory systems of mammals.

Plants in the Natural Environment

By the end of this course, students will:

1. analyse the roles of plants in ecosystems, and assess the impact of human activities on the balance of plants within those ecosystems;
2. investigate some of the factors that affect plant growth;
3. demonstrate an understanding of the structure and physiology of plants and their role in the natural environment.

COURSE CONTENT

| <i>Unit</i> | <i>Length</i> |
|---|----------------------|
| Unit 1: Cellular Biology | 20 hours |
| Unit 2: Genetics | 25 hours |
| Unit 3: Microbiology | 15 hours |
| Unit 4: Anatomy of Mammals | 25 hours |
| Unit 5: Plants in the Natural Environment | 20 hours |
| Culminating Activity | 7 hours |
| Final Exam | 3 hours |
| Total | 110 hours |

UNIT DESCRIPTIONS

Cellular Biology

Students will analyze life processes that are determined by the structures and functions of biochemical compounds, cell organelles, and body systems. They will explore different technological devices that support cellular functions and processes can be used to improve human health. They will reflect on how substances that are present in our everyday lives can affect cellular functions and processes in positive and negative ways.

Genetics

Students will be able to connect real world genetic research and biotechnology from an applicable point of view and how they have social, environmental, and ethical implications. Looking at various theories and studying hereditary, student will connect the variability and diversity of living organisms and how it results from the distribution of genetic materials during the process of meiosis.

Microbiology

Students will compare and contrast groups of microorganisms that have common characteristics, and these characteristics enable them to interact with other organisms in the environment. They will be able to understand how microorganisms can have both positive and negative effects on the environment. Students will study the technological use of microorganisms and how it may or may not raise many ethical issues.

Anatomy of Mammals

Students will identify different groups of organs with specific structures and summarize how their functions work together as systems, which interact with other systems in the body. Students will review and connect different technologies that are used to maintain human health have social and economic benefits and costs. Students will reflect on environmental factors, including natural factors and those resulting from human activity, and how they can have a wide range of effects on human health.

Plants in the Natural Environment

Students will be able to identify different plants and their specialized structures with distinct functions that enable each plant to respond and adapt to their environment. Students will be able to highlight and argue how plants are critical to the survival of ecosystems. Students will connect the humans effects on sustainability of ecosystems and when humans alter the balance of plants within those ecosystems.

TEACHING AND LEARNING STRATEGIES

In this course, students will experience the following activities.

Presentations with embedded videos are utilized to outline concepts, explain theory with the use of examples and practice questions, and incorporate multi-media opportunities for students to learn more (e.g. online simulations, quizzes, etc.).

End of unit conversations and Poodlls are opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

Reflection is an opportunity for students to look back at concepts and theories with new eyes, to relate theory to practice, and to align learning with their own values and beliefs.

Discussions with the instructor are facilitated through video conferencing, discussing the concepts and skills being studied. This enables two-way communication between the student and the instructor, to share ideas and ask questions in dialogue. This also helps to build a relationship between the student and instructor.

Instructor demonstrations (research skills, etc.) are opportunities for the instructor to lead a student through a concept or skill through video conferencing, videos, or emailing with the student.

Discussion forums are an opportunity for students to summarize and share their ideas and perspectives with their peers, which deepens understanding through expression. It also provides an opportunity for peer-to-peer feedback.

Practical extension and application of knowledge are integrated throughout the course. The goal is to help students make connections between what they learn in the classroom and how they understand and relate to the world around them and their own lives. Learning becomes a dynamic opportunity for students to be more aware that their learning is all around them and enable them to create more meaning in their lives.

Individual activities/assignments assessments are completed individually at a student's own pace and are intended to expand and consolidate the learning in each lesson. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. For this reason, students are encouraged to discuss IEPs (Individual Education Plans) with their teacher and to ask to modify assessments if they have a unique interest that they feel could be pursued in the assessment. The teacher plays an important role in supporting these activities by providing ongoing feedback to students, both orally and in writing.

Research is an opportunity to apply inquiry skills to a practical problem or question. Students perform research to gather information, evaluate quality sources, analyze findings, evaluate their analysis, and synthesize their findings into conclusions. Throughout, students apply both creative thinking and critical thinking. New questions are also developed to further learning.

Writing as a learning tool helps students to think critically about course material while grasping, organizing, and integrating prior knowledge with new concepts. Good communication skills are important both in and out of the classroom.

Virtual simulations are interactive websites that provide students with an opportunity to ask questions, explore hypotheses, relate variables, examine relationships, and make connections between theory and application in a safe environment that promotes intellectual risk taking and curiosity.

Virtual labs are interactive websites that provide students with an opportunity to follow a procedure to test hypotheses using scientific apparatus, gather and record observations, analyze observations using formula and relevant theory/concepts, and then formulate conclusions that relate hypotheses to analysis.

Diagrams are visual representations of scientific ideas and concepts. They provide another perspective to organize ideas. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Graphics/images are visual representations of ideas/concepts. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Charts are visual representations of scientific ideas and concepts using math that support analysis. For example, you can have a pie chart that shows Canada's energy sources.

Tables involve organizing information in terms of categories (rows and columns). This helps us to understand the relationships between ideas and data, as well as highlight trends.

Drawings and schematics are scientific and engineering ideas explained visually. For example, an electric circuit can be explained using symbols, which makes it possible to communicate ideas universally, clearly, and succinctly.

Practice problems provide students with a scenario/problem to solve by applying concepts and skills learned in a context. This helps students to understand the relevance of their learning.

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.

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. The teacher is encouraged to involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool.

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 (K) | 17.5 |
| Thinking/Inquiry (T) | 17.5 |
| Communication (C) | 20 |
| Application (A) | 15 |
| Final | 30 |
| Culminating Activity (5K, 4T, 2C, 4A) | 15 |
| Final Exam (5K, 4.5T, 3C, 2.5A) | 15 |

TERM WORK EVALUATIONS (70%)

| Evaluation Item | Description | Category | Weight |
|------------------------------------|--|-----------------|---------------|
| Unit 1 Gizmo Lab | Students will complete simulation labs where they will practice concepts learned and record their scientific findings. | K, T, C, A | 16 |
| Unit 1 STSE Presentation | Students will present their findings and research. | T, C | |
| Unit 1 Test | Unit tests evaluate student growth in knowledge of unit concepts and terms. | K, T, C | |
| Unit 2 Gene Expression Lab | Students will complete simulation labs where they will practice concepts learned and record their scientific findings. | K, T, C, A | 13 |
| Unit 2 Test | Unit tests evaluate student growth in knowledge of unit concepts and terms. | K, T, C | |
| Unit 3 Lab | Students will complete simulation labs where they will practice concepts learned and record their scientific findings. | K, T, C, A | 15 |
| Unit 3 Vaccine Research Assignment | Students will complete larger assignments to consolidate learning from the unit. | K, T, C, A | |
| Unit 3 Test | Unit tests evaluate student growth in knowledge of unit concepts and terms. | K, T, C | |
| Unit 4 Digestive System Lab | Students will complete simulation labs where they will practice concepts learned and record their scientific findings. | K, T, C, A | 11 |
| Unit 4 Test | Unit tests evaluate student growth in knowledge of unit concepts and terms. | K, T, C | |
| Unit 5 Dichotomous Assignment | Students will complete larger assignments to consolidate learning from the unit. | K, T, C, A | 15 |
| Unit 5 Seed Germination Lab | Students will complete simulation labs where they will practice concepts learned and record their scientific findings. | K, T, C, A | |
| Unit 5 Test | Unit tests evaluate student growth in knowledge of unit concepts and terms. | K, T, C | |

FINAL EVALUATIONS (30%)

| Evaluation Item | Description | Category | Weight |
|------------------------|---|-----------------|---------------|
| Final Project | A comprehensive project, covering all overall curriculum expectations for the course. | K, T, C, A | 10 |
| Final Exam | A final, written examination, covering all curriculum expectations for the course. | K, T, C, A | 20 |

AFL/AAL/AOL TRACKING SHEET

Unit 1:

| AAL | AFL | AOL |
|---|---|--|
| Unit 1 Self Reflection Forum Reflections | 1.1 Lesson Questions | Culminating Assign. Checkpoint 1 |
| | 1.2 Lesson Questions | STSE Presentation: Canadian Scientists in Cellular Biology |
| | 1.3 Lesson Questions | Unit 1 Test |
| | 2.1 Cell Alive! And Microscope Assignment Questions | |
| | 2.2 Lesson Questions | |

Unit 2:

| AAL | AFL | AOL |
|---|--|----------------------------------|
| Unit 2 Self Reflection Forum Reflections | 3.1 GIZMOS Questions | Culminating Assign. Checkpoint 2 |
| | 4.2 Punnett Square Questions | Gene Expression Lab Simulation |
| | 4.3 Genetic Disorder Slideshow Assign. | Unit 2 Test |

Unit 3:

| AAL | AFL | AOL |
|---|----------------------|----------------------------------|
| Unit 3 Self Reflection Forum Reflections | 6.1 Lesson Questions | Culminating Assign. Checkpoint 3 |
| | 6.2 Lesson Questions | Unit 3 GIZMO Lab |
| | 6.3 Lesson Questions | Vaccine Research Assignment |
| | | Unit 3 Test |

Unit 4:

| AAL | AFL | AOL |
|---|---|---------------------------------------|
| Unit 4 Self Reflection Forum Reflections | 8.1 Lesson Questions | Culminating Assign. Checkpoint 4 |
| | 8.2 Worksheet Assignment | |
| | 8.3 Health and Care Circulatory System Assignment | Career Exploration Audio Presentation |
| | 9.1 Respiratory Assignment | |
| | 9.2 Health and Care Respiratory System Assignment | |
| | 10.1 Digestive Assignment | Unit 4 Test |
| | 10.2 Health and Care of the Digestive System Assignment | |

Unit 5:

| AAL | AFL | AOL |
|---|---------------------------------------|----------------------------------|
| Unit 5 Self Reflection Forum Reflections | 11.1 Sustainable Ecosystems Worksheet | Culminating Assign. Checkpoint 5 |
| | 11.2 Lesson Questions | |
| | 12.1 Dichotomous Assignment | Unit 5 Test |
| | 12.2 Lesson Questions | |
| | 12.3 Lesson Questions | |

Finals

| AOL |
|------------------------|
| Culminating Assignment |
| Final Exam |

CONSIDERATION FOR PROGRAM PLANNING

PLANNING ENGLISH PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

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 SCIENCE 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.