

Course Outline

School Name:	KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name:	Science
Ministry of Education Course Title:	Science
Grade Level:	12
Ministry Course Code:	SNC4M

Teacher's Name: Sangchul Yu

Developed by: Raj Budhram Date: July 2012

Revision Date: September 2022

Developed from:

Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 11 and 12: Science*. Queen's Printer for Ontario.

Text: None

Prerequisite:

SNC2P, SNC2D or any grade 11 college, university/college, or university preparation course in science

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 19, 2022

Course Description/Rationale

This course enables students, including those pursuing postsecondary programs outside the sciences, to increase their understanding of science and contemporary social and environmental issues in health-related fields. Students will explore a variety of medical technologies, pathogens and disease, nutritional science, public health issues, and biotechnology. The course focuses on the theoretical aspects of the topics under study and helps refine students' scientific investigation skills.

Overall Curriculum Expectations

Scientific Investigation Skills and Career Exploration

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

Medical Technologies

- Assess the impact of medical technologies and therapies, both conventional and alternative, used to diagnose and treat human health condition;
- Investigate the uses of, and analyse the information provided by, a variety of medical technologies;
- Demonstrate an understanding of the function and use of a variety of medical technologies and the information they provide about the human body.

Pathogens and Disease

- Evaluate the impact of scientific and technological knowledge and individual behaviour on the control of pathogens and the prevention of disease;
- Investigate the nature and growth of pathogens and the effectiveness of measures intended to prevent their spread;
- Demonstrate an understanding of pathogens, the diseases they cause, and ways of controlling their spread.

Nutritional Science

- Assess how personal and societal factors affect eating behaviours, and evaluate the social and economic impact of the use of non-nutrient food additives;
- Investigate chemical components of and energy in food, and the processes by which food is digested;
- Demonstrate an understanding of chemical components of and energy in food, and the processes by which food is digested.

Science and Public Health Issues

- Assess the impact of scientific research, technological advances, and government initiatives on public health;
- Investigate various strategies related to contemporary public health issues;
- Demonstrate an understanding of major public health issues, past and present.

Biotechnology

- Analyse a variety of social, ethical, and legal issues related to applications of biotechnology in the health, agricultural, or environmental sector;
- Investigate various techniques used in biotechnology and how they are applied in the food industry and the health and agricultural sectors;
- Demonstrate an understanding of biological processes related to biotechnology and of applications of biotechnology in the health, agricultural, and environmental sectors.

Course Content

Unit	Length
1. Medical Technologies	22 hours
2. Pathogens and Disease	25 hours
3. Nutritional Science	22 hours
4. Science and Public Health Issues	19 hours
5. Biotechnology	22 hours
Total	110 hours

Unit Descriptions

Unit 1 – Medical Technologies

In this unit, students use a variety of medical technologies to collect data. They will learn that medical technologies can have positive and negative effects on society, human health, the economy, and the environment. Moreover, the knowledge of medical technologies, and the science behind them, can help students better understand their diagnoses and treatment options.

Unit 2 – Pathogens and Disease

In this unit, students will analyze the effectiveness of various mouthwashes, and the properties, characteristics, and virulence of bacteria. They will learn that appropriate technologies and informed choices with respect to personal behaviour can limit the spread of pathogens and diseases. Additionally, they will learn that the methods used to control the spread of pathogens and diseases can have both positive and negative effects on human health.

Unit 3 – Nutritional Science

In this unit, students will investigate titration to determine the effects of various antacids on hydrochloric acid. They will also investigate the energy content in selected food samples. They will develop an understanding of the role of nutrients and other substances found in food that will enable them to make healthy lifestyle choices.

Unit 4 – Science and Public Health Issues

In this unit, students will analyze the effectiveness of safe injection sites, and they will investigate health strategies that were used to combat SARS in Toronto. Students will be aware that threats to public health helps individuals and societies adopt appropriate practices to protect their health and the health of others. Furthermore, students will conceive that a global approach to public health is necessary to help prevent future pandemics

Unit 5 – Biotechnology

In this unit, students will inquire about the use of yeast in bread-making, the use of gel electrophoresis for separating and purifying DNA fragments, and the use of various technologies in the cloning of corn. They will learn about the wide applications of biotechnology. However, students will also learn that in order to determine the appropriate uses of biotechnology many social, ethical, and legal issues and conflicting interests should be taken into consideration.

Teaching/Learning Strategies

This course is organized into an eight-week series of lessons and activities that is presented to students in remote northern communities via the internet. The eighth week is used for course consolidation, review, and the final examination. Teacher and students communicate over the internet through timely activity feedback, emails, messages, video and audio calls. Classroom mentors assume the role of liaison between the teacher and student while also supporting a holistic approach to motivate, engage and support each individual student.

A variety of strategies will be used in the online delivery of this course. Some instructional strategies include:

- Direct instruction (online lecture);
- Adapting to learning styles/multiple intelligences;
- Analysis of student work;
- Discovery/Inquiry based learning;
- Generating and testing hypotheses;
- Graphic organizers;
- Hands on learning;
- Homework and practice;
- Identifying similarities and differences;
- Modelling;
- Sketching to learn;
- Mentoring;
- Visualization;
- Independent research;
- Discussion via forums.

Learning goals will be discussed at the beginning of each assignment and success criteria will be provided to students. The success criteria are used to develop the assessment tools in this course, including rubrics and checklists.

Evaluation

The final grade will be determined as follows (Ontario Ministry of Education, 2010):

- 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 should be given to more recent evidence of achievement.
- Thirty percent 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 (p. 41).

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. Toronto ON: Queen's Printer for Ontario.

Type of Assessment	Category	Details	Weighting (%)
Term Work (70%)	Knowledge/ Understanding	Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians and First Nations people, to those fields; Demonstrate an understanding of the function and use of a variety of medical technologies and the information they provide about the human body; Demonstrate an understanding of pathogens, the diseases they cause, and ways of controlling their spread; Demonstrate an understanding of chemical components of and energy in food, and the processes by which food is digested;	12
	Thinking	Demonstrate scientific investigation skills in the four areas of skills	17

		Investigate the uses of, and analyse the information provided by, a variety of medical technologies; Investigate the nature and growth of pathogens and the effectiveness of measures intended to prevent their spread; Investigate chemical components of and energy in food, and the processes by which food is digested; Investigate various strategies related to contemporary public health issues;	
	Communication	Expression and organization of ideas and information; Communication for different audiences and purposes in oral, visual, and/or written forms; Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms.	17
	Application	Assess the impact of medical technologies and therapies, both conventional and alternative, used to diagnose and treat human health conditions; Assess how personal and societal factors affect eating behaviours, and evaluate the social and economic impact of the use of non-nutrient food additives; Assess the impact of scientific research, technological advances, and government initiatives on public health; Analyse a variety of social, ethical, and legal issues related to applications of biotechnology in the health, agricultural, or environmental sector.	24
Final Evaluation (30%)	Culminating Activity (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5
	Exam (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5
TOTAL			100

Assessment/Evaluation Strategies

A variety of assessment and evaluation methods, strategies and tools are required as appropriate to the expectation being assessed. These include diagnostic, formative, and summative within the course and within each unit.

Assessment *for* learning and assessment *as* learning is obtained through a variety of means, including the following:

- Ongoing descriptive feedback feedback (e.g., descriptive feedback on students' online submissions and opinion essay);
- Small-group conversations to develop their opinions and communication skills
- Mentor observations of student's performance while conducting experiments and scientific research

- Conversations with student on a regular basis to verbalize observations, ask questions, and clarify understanding
- Self-assessment (e.g., weekly self-assessment of learning)
- Formative student products (e.g., opinion essay, research project).

Evidence of student achievement (assessment *of* learning) is collected from various sources, including the following:

- Ongoing assessment/observations of most consistent work, with consideration given to most recent work
- Culminating Activity
- Final Exam

The Ministry of Education's 2010 document, *Growing Success*, outlines the seven fundamental principles that guide best practice in the assessment and evaluation of students. KiHS teachers use practices that:

- are fair, transparent, and equitable for all students;
- support all students, including those with special education needs, those who are learning the language of instruction (English or French), and those who are First Nation, Métis, or Inuit;
- are carefully planned to relate to the curriculum expectations and learning goals and, as much as possible, to the interests, learning styles and preferences, needs, and experiences of all students;
- are communicated clearly to students and parents at the beginning of the course and at other points throughout the school year or course;
- are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for students to demonstrate the full range of their learning;
- provide ongoing descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement;
- develop students' self-assessment skills to enable them to assess their own learning, set specific goals, and plan next steps for their learning (p.6).

Resources

American Cancer Society. (2021). *Complementary and alternative medicine*.

<https://www.cancer.org/treatment/treatments-and-side-effects/complementary-and-alternative-medicine.html>

DNA Learning Center. (2010, Mar. 22). *Mechanism of recombination* [Video]. YouTube.

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Drugs.com. (2018, Mar. 27). *How to measure blood pressure using a manual monitor* [Video].

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Government of Canada. (2021). *Canada's food guide*. <https://food-guide.canada.ca/en/>

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MCBiology. (2011, Jul. 6). *Genetically modified corn* [Video]. YouTube.

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<http://www.edu.gov.on.ca/eng/aboriginal/>
- Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 11 and 12: Science*.
http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf
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<https://www.youtube.com/watch?v=T4WY3G3rD-Y>
- rajbudhram. (2021, Aug. 11). *Questions in biotech* [Video]. YouTube.
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<https://www.youtube.com/watch?v=UO6ZBUYfJss>
- rajbudhram. (2021, Aug 11). *SNC4M strand 5* [Video]. YouTube.
<https://www.youtube.com/watch?v=WHp74GNKwzQ>
- SoderholmChemistry. (2012, May 9). *Antacid titration (part 1)* [Video]. YouTube.
<https://www.youtube.com/watch?v=hqsk81zwqlA>
- SoderholmChemistry. (2012, May 9). *Antacid titration (part 2)* [Video]. YouTube.
<https://www.youtube.com/watch?v=nVmlHU-r1cM>
- Soner Efe. (2008, Nov. 11). *Structure of DNA* [Video]. YouTube.
<https://www.youtube.com/watch?v=gPGUz8mwqsA>
- Sullivan, J.A. (2021). *Bacterial cell*. <https://www.cellsalive.com/cells/bactcell.htm>
- Toulouse, P.R. (2016). *What matters in Indigenous education: Implementing a vision committed to holism, diversity and engagement*. <https://peopleforeducation.ca/wp-content/uploads/2017/07/MWM-What-Matters-in-Indigenous-Education.pdf>

Program Planning

This course is offered to Indigenous students living in isolated, northern Ontario communities. It is offered by qualified teachers in a blended classroom with a balance of academic, wellness, land-based learning, local language and culture to support the success of the whole student. This course uses the internet for instruction, demonstration and research. It utilizes a student-centered semi-virtual classroom which capitalizes on the strengths of internet program delivery to minimize the disadvantages of geographic remoteness.

Students are presented with 1320 minutes of instruction/activity via the internet over the period of one week. All lessons, assignments, questions and course material is presented in this manner, with approved print materials available as a student resource in each classroom. The student and

instructor communicate via the internet, while a classroom mentor (a fully qualified teacher) assists students in completing tasks in a timely manner and provides support as required.

Indigenous and local content is used throughout the course to meet students' learning needs. Opportunities for outdoor activities and land-based learning are also incorporated and students are encouraged to use local knowledge in their products. Considerations are made to the learning preferences of the student population and lessons can be adjusted for individual students as required. Opportunities have been provided for students to apply ideas and concepts encountered in this course to their lives as an individual and as a member of a First Nations community. Teachers consult the Ontario Ministry of Education policies, guidelines and important initiatives when planning a comprehensive program in this area.