

Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name: Science

Ministry of Education Course Title: Science

Grade Level: 10

Ministry Course Code: SNC2P

Teacher's Name: Raj Budhram

Developed by: Raj Budhram Date: August 2011

Revision Date: August 2021

Developed from:

Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 9 and 10: Science*.
Toronto ON: Queen's Printer for Ontario.

Text: None

Prerequisite: SNC1P or SNC1D

Credits: One

Length: 111 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 14, 2021

Course Description/Rationale

This course enables students to develop a deeper understanding of concepts in biology, chemistry, earth and space science, and physics, and to apply their knowledge of science in real-world situations. Students are given opportunities to develop further practical skills in scientific investigation. Students will plan and conduct investigations into everyday problems and issues related to human cells and body systems; chemical reactions; factors affecting climate change; and the interaction of light and matter.

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 a variety of careers related to the fields of science under study, and identify scientists, including Canadians, who have made contributions to those fields

Biology: Tissues, Organs, and Systems

- Analyze some current technologies or substances that have an impact on human tissues, organs, or systems, and evaluate their effects on human health.
- Investigate cell division, cell specialization, and the organization of systems in animals, including humans, using various laboratory techniques.
- Demonstrate an understanding of the hierarchical organization of cells, from tissues to organs to systems in animals, including humans.

Daily Living Skills

- Demonstrate an understanding of effective decision-making processes and their role in independent living;
- Explain and demonstrate the use of basic money-management skills and techniques needed to manage personal financial resources effectively;
- Describe and demonstrate the use of basic principles and techniques of effective household management.

Chemistry: Chemical Reactions and their Practical Applications

- Analyze how chemical reactions are employed in common products and processes, and assess the safety and environmental hazards associated with them.
- Investigate, through inquiry, the characteristics of simple chemical reactions.
- Demonstrate an understanding of simple chemical reactions and the language and ways to represent them.

Earth and Space Science: Earth's Dynamic Climate

- Analyze effects of human activity on climate change, and effects of climate change on living things and natural systems.
- Investigate various natural and human factors that have an impact on climate change and global warming.
- Demonstrate an understanding of various natural and human factors that contribute to climate change and global warming.

Physics: Light and Applications of Optics

- Analyze how properties of light and colour are applied in technology and the impact of these technologies on society.
- Investigate, through inquiry, properties of light, and predict its behaviour in mirrors and as it passes through different media.
- Demonstrate an understanding of characteristics and properties of light, particularly with respect to reflection and refraction and the addition and subtraction of colour.

Course Content

Unit	Length
1. Chemical Reactions	25.5 hours
2. Light and Geometric Optics	28.5 hours
3. Climate Change	28.5 hours
4. Tissues, Organs & Systems	28.5 hours
Total	111 hours

Unit Descriptions

Unit 1 – Chemical Reactions

In this unit, students will investigate different classes of chemical reactions and develop models, word equations, and balanced chemical equations to represent them. Through investigation, with a focus on laboratory and environmental safety, students will learn that chemicals react with each other in predictable ways and are subject to the Law of Conservation of Mass. Students will also identify practical applications of chemical reaction in the fire-fighting profession and identify other community applications. Finally, students will conduct an experiment to compare the effectiveness of three different types of antacids and an experiment to analyze the pH of 5 different chemicals in their classroom.

Unit 2 – Light and Geometric Optics

In this unit, students will study the nature of light. They will scrutinize computer animations and draw ray diagrams to understand the use of plane and curved mirrors, and convergent lenses. Also, they will investigate how colours are related to the properties of light, refraction through different materials to gain an understanding of the index of refraction, and different forms of light emission and their uses. Students will explain how the properties of light are applied to the compound microscope, and in the end-of-unit task, they will construct a solar oven to apply knowledge that they have acquired in this unit.

Unit 3 – Climate Change

In this unit, students will describe components of the Earth's climate system and the natural and anthropogenic causes of climate change. They will conduct an inquiry to determine how greenhouse gases affect climate change, and then they will examine current evidence of climate change including changes in their communities like water levels, temperatures and forestation. They will research the deforestation of forests in Brazil and how it causes global climate change. In the end-of-unit task, students will compare the tools used in Canada to make decisions on climate change. In addition, they will analyze the biases of petroleum industries on global warming.

Unit 4 – Tissues, Organs, and Systems

In this unit, students will carry out investigations with microscopes and view a video on dissection to examine cells, tissues, organs and organ systems in animals. They will compare and link the organ systems, their functions, and interactions. Students will investigate the rate of division in cancerous and non- cancerous cells, and predict the impact of lung cancer. Additionally, students will learn that smoking cigarettes negatively affects many organs in the human body. As a follow up task, students will need to create a poster to deter youths in their community from smoking cigarettes. Type 2 diabetes is prevalent in FNMI communities so students will conduct research on diabetes to determine why people in FNMI communities are at a higher risk of getting type 2 diabetes than people in communities in Southern Ontario. Then, they will formulate ways in which people in their communities can reduce the risk of Type 2 diabetes. Finally, students will perform a land-based activity in which they will catch a fish, dissect the fish, and demonstrate the parts of the digestive system to the other students

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:

- Academic vocabulary and language
- Cooperative learning
- Adapting to learning styles/multiple intelligences
- Analysis of student work
- Conferencing
- 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

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 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 (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 a variety of careers related to the fields of science under study, and identify scientists, including Canadians, who have made contributions to those fields;	12

		<p>Demonstrate an understanding of the hierarchical organization of cells, from tissues, to organs, to systems in animals, including humans;</p> <p>Demonstrate an understanding of simple chemical reactions and the language and ways to represent them;</p> <p>Demonstrate an understanding of various natural and human factors that contribute to climate change and global warming;</p> <p>Demonstrate an understanding of characteristics and properties of light, particularly with respect to reflection and refraction and the addition and subtraction of colour.</p>	
	Thinking	<p>Demonstrate scientific investigation skills in the four areas of skills;</p> <p>Investigate cell division, cell specialization, and the organization of systems in animals, including humans, using various laboratory techniques;</p> <p>Investigate, through inquiry, the characteristics of simple chemical reactions;</p> <p>Investigate various natural and human factors that have an impact on climate change and global warming.</p> <p>Investigate, through inquiry, properties of light, and predict its behaviour in mirrors and as it passes through different media.</p>	17.5
	Communication	<p>Expression and organization of ideas and information;</p> <p>Communication for different audiences and purposes in oral, visual, and/or written forms;</p> <p>Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms.</p>	17.5
	Application	<p>Analyse some current technologies or substances that have an impact on human tissues, organs, or systems, and evaluate their effects on human health;</p> <p>Analyse how chemical reactions are employed in common products and processes, and assess the safety and environmental hazards associated with them;</p> <p>Analyse effects of human activity on climate change, and effects of climate change on living things and natural systems;</p> <p>Analyse how properties of light and colour are applied in technology and the impact of these technologies on society.</p>	23
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

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
- Small-group conversations to develop their opinions and communication skills
- Mentor observations (e.g. of specific course expectations during Land based and cultural activities as well as during course specific activities);
- Self-assessment (e.g., weekly self-assessment of learning) , relative to specific course content as well as in contextual school, community and Land based learning);
- Peer assessment (e.g., peer feedback on personal goals related to course specific content and generalised throughout the school day);
- Conversations with student on a regular basis to verbalize observations, ask questions, and clarify understanding.

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
- Summative unit activities (e.g., catching a fish, dissecting the fish, and demonstrating the parts of the digestive system);
- Culminating Activity
- Conversations with students (e.g., discussion about why bow fishing is a difficult task and aboriginal people in the past understood the science of bow-fishing so they were able to live off the land)
- 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 Society of Hematology. (2009, February 3). Cancer cells vs. Healthy cells [Video]. YouTube. <https://youtu.be/tjNxBH1qsRM>
- BioDigital, Inc. (2008, October 14). *3D Medical animation: What is cancer?* [Video]. YouTube. <https://youtu.be/LEpTTolebgo>
- Cells alive! (n.d.). *Cells, microbes and the immune system*. <https://www.cellsalive.com/>
- Diabetes Canada. (n.d.). *Diabetes Canada*. <https://www.diabetes.ca/>
- Easy Style Science. (2014, June 5). *Titration NaOH vs HCl* [Video]. YouTube. <https://youtu.be/VADhF7M8bJ8>
- Gizmos. (n.d.). *Online simulations that power inquiry and understanding*. <https://www.explorelarning.com/>
- Grace, E., Mustoe, F., Ivanco, J., Gue, D, Brown, F. D. (2001). *Sciencepower 10*. Toronto, ON: McGraw Hill Ryerson Limited.
- Jumeiriah College Science. (2013, January 27). Virtual images in a plane mirror [Video]. YouTube. <https://youtu.be/0T3CVPlv1D8>
- Ojibwe People's Dictionary. (n.d.). <https://ojibwe.lib.umn.edu/>
- Ontario Ministry of Education. (n.d.). *Indigenous education strategy*. <http://www.edu.gov.on.ca/eng/aboriginal/>
- Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 9 and 10: Science*. http://www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf
- Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. <http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf>
- Ontario Ministry of Education. (2016). *Ontario schools, kindergarten to grade 12: Policy and program requirements*. <http://edu.gov.on.ca/eng/document/policy/os/index.html>
- Ontario Ministry of Labour. (2017). *Youth workers*. <https://www.labour.gov.on.ca/english/atwork/youngworkers.php>
- Owens, Derek. (2009, April 4). *Physics 11.1.1b: The law of reflection* [Video]. YouTube. <https://youtu.be/qKiMGBT1JQc>
- rajbudhram. (2011, April 4). *Finding the PH of vinegar, water, and soap liquid by David Harper* [Video]. YouTube. https://www.youtube.com/watch?v=2RraeSPvdYQ&feature=emb_logo
- rajbudhram. (2011, April 5). *Video on molecular model of a chemical equation by David Harper* [Video]. YouTube. https://www.youtube.com/watch?v=FPZLvoMsOIE&feature=emb_logo
- rajbudhram. (2011, May 7). *Viewing Onion Cells by Riley Meekis* [Video]. YouTube. https://www.youtube.com/watch?v=oJRPIgww2fM&feature=emb_logo
- Ritter, B., Plumb, D., Jenkins, F., Kessel, H.V., Hirsch, A.J. (2001). *Science 10*. Toronto, ON: Nelson Thompson Company.
- The Physics Classroom. (2010, September 30). *Real image*. [Video]. YouTube. <https://youtu.be/KVpSCiCCD9A>

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.