

Course Outline

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| School Name: | KEEWAYTINOOK INTERNET HIGH SCHOOL |
| Department Name: | Science |
| Ministry of Education Course Title: Science | |
| Grade Level: 10 | |
| Ministry Course Code: SNC2D | |

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: SNC1D or SNC1P

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 24, 2021

Course Description/Rationale

This course enables students to enhance their understanding of concepts in biology, chemistry, earth and space science, and physics, and of the interrelationships between science, technology, society, and the environment. Students are also given opportunities to further develop their scientific investigation skills. Students will plan and conduct investigations and develop their understanding of scientific theories related to the connections between cells and systems in animals and plants; chemical reactions, with a particular focus on acid–base reactions; forces that affect climate and 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, analysing 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 of Living Things

- Evaluate the importance of medical and other technological developments related to systems biology, and analyze their societal and ethical implications.
- Investigate cell division, cell specialization, organs, and systems in animals and plants, using research and inquiry skills, including various laboratory techniques.
- Demonstrate an understanding of the hierarchical organization of cells, from tissues, to organs, to systems in animals and plants.

Chemistry: Chemical Reactions

- 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.

Personal and Social Responsibilities

- Analyze a variety of safety and environmental issues associated with chemical reactions, including the ways in which chemical reactions can be applied to address environmental challenges.
- Investigate, through inquiry, the characteristics of chemical reactions.
- Demonstrate an understanding of the general principles of chemical reactions, and various ways to represent them.

Earth and Space Science: Climate Change

- Analyze some of the effects of climate change around the world, and assess the effectiveness of initiatives that attempt to address the issue of climate change.
- Investigate various natural and human factors that influence Earth's climate and climate change.
- Demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change.

Physics: Light and Geometric Optics

- Evaluate the effectiveness of technological devices and procedures designed to make use of light, and assess their social benefits.
- Investigate, through inquiry, the properties of light, and predict its behaviour, particularly with respect to reflection in plane and curved mirrors and refraction in converging lenses.

- Demonstrate an understanding of various characteristics and properties of light, particularly with respect to reflection in mirrors and reflection and refraction lenses.

Course Content

| Unit | Length |
|-------------------------------|------------|
| 1. Chemical Reactions | 24.5 hours |
| 2. Light and Geometric Optics | 28.5 hours |
| 3. Climate Change | 28.5 hours |
| 4. Tissues, Organs & Systems | 28.5 hours |
| Total | 110 hours |

Unit Descriptions

Unit 1 – Chemical Reactions

In this unit students will conduct an experiment to determine the pH of 5 different substances in the classroom and analyze the results. Also, they will conduct an experiment to determine that the reaction of chalk with vinegar is a chemical reaction. Since some FNMI communities do not have access to labs or specific chemicals and equipment, students will use videos and animation to learn and practice concepts: they will use a Gizmo to learn about types of reactions and how to balance chemical equations; they will use a video to learn about neutralization; and they will use a video to learn about the law of conservation of mass. Using the molecular model kit, students will learn how to create 3D models of the reactants and products of chemical reactants. Then they will use Microsoft Paint to make a drawing of the molecular models. Finally, students will conduct research on two issues that affect FNMI communities: acid precipitation and cyanide uses in gold mining.

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 convex 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 bow-fishing, and they will identify ways in which the properties of lenses determine their use in cameras. Finally students will analyze the pros and cons of laser surgery and determine whether they should recommend laser surgery to someone in the Fort Williams reserve.

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 community such as water level changes or migratory patterns of animals affected by temperature change. They will research the effectiveness of some current initiatives that address climate change. In the end-of-unit task, students will design and build a model to illustrate the natural greenhouse effect, and use the model to explain the anthropogenic greenhouse effect.

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. Also, students will research the pros and cons of stem cell research and make a proposal concerning stem cell research. Additionally, students will learn that the use of vaccines in their communities can reduce

health risks and health care costs and that smoking cigarettes 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).

| Type of Assessment | Category | Details | Weighting (%) |
|--------------------|-------------------------|---|---------------|
| Term Work (70%) | Knowledge/Understanding | <p>Demonstrate an understanding of the hierarchical organization of cells, from tissues, to organs, to systems in animals and plants;</p> <p>Demonstrate an understanding of the general principles of chemical reactions, and various ways to represent them;</p> <p>Demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change;</p> <p>Demonstrate an understanding of various characteristics and properties of light, particularly with respect to reflection in mirrors and reflection and refraction in lenses.</p> | 12 |
| | Thinking | <p>Investigate cell division, cell specialization, organs, and systems in animals and plants, using research and inquiry skills, including various laboratory techniques;</p> <p>Investigate, through inquiry, the characteristics of chemical reactions;</p> <p>Investigate various natural and human factors that influence Earth's climate and climate change.</p> <p>Investigate, through inquiry, the properties of light, and predict its behaviour, particularly with respect to reflection in plane and curved mirrors and refraction in converging lenses.</p> | 18 |
| | 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> | 18 |
| | Application | <p>Evaluate the importance of medical and other technological developments related to systems biology, and analyse their societal and ethical implications.</p> <p>Analyse a variety of safety and environmental issues associated with chemical reactions, including the ways in which chemical reactions can be applied to address environmental challenges.</p> <p>Analyse some of the effects of climate change around the world, and assess the effectiveness of initiatives that attempt to address the issue of climate change.</p> <p>Evaluate the effectiveness of technological devices and procedures designed to make use of light, and assess their social benefits.</p> | 22 |
| | | Knowledge/Understanding | 2.5 |

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|------------------------|----------------------------|-------------------------|------------|
| Final Evaluation (30%) | Culminating Activity (15%) | 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
- Small-group conversations to develop their opinions and communication skills
- Conversations with students regularly to verbalize observations, ask questions, and clarify understanding
- 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);
- Mentor observations (e.g. of specific course expectations during Land based and cultural activities as well as during course specific activities);

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
- Conversations with students (e.g., discussion with students about the indicators of climate change in their communities and what are some things individuals should do as well as international bodies to reduce climate change);
- Summative unit activities (e.g., catching a fish, dissecting the fish, and demonstrating the parts of the digestive and circulatory system);
- 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

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BioDigital, Inc. (2008, October 14). *3D Medical animation: What is cancer?* [Video]. YouTube. <https://youtu.be/LEpTTolebqo>

Cells alive! (n.d.). *Cells, microbes and the immune system*. <https://www.cellsalive.com/>

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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.

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Ontario Ministry of Education. (n.d.). *Indigenous education strategy*. <http://www.edu.gov.on.ca/eng/aboriginal/>

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rajbudhram. (2011, April 4). Chemical or physical change adding baking soda to vinegar by Lyndon Rae [Video]. YouTube. https://www.youtube.com/watch?v=O_8bR9At-us&feature=emb_logo

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.