Course Outline

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: Aug, 2011

Revision Date: August, 2015

Developed from: The Ontario Curriculum, Grades 9 and 10: Science, 2008

Text: Sciencepower 10, McGraw-Hill Ryerson, 2001
Science 10, Nelson, 2001

Prerequisite: Science Grade 9, Academic or Applied

Credits: One (1.0)

Length: 110 hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature)  _____

Approval Date: September 8, 2015

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

A. 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.

B. 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.

C. CHEMISTRY: CHEMICAL REACTIONS

- 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.

D. 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.

E. 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 in lenses.

Course Content

Unit	*Length*
1. Chemical reactions	28 hours
2. Light & Geometric Optics	28 hours
3. Climate Change	27 hours
4. Tissues, Organs & Systems	27 hours
Total	110 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 conduct inquiry to identify chemical change and describe a variety of chemical reactions.

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 identify ways in which the properties of lenses determine their use in cameras.

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 inquiry to determine how greenhouse gases affect climate change, and then they will examine current evidence of climate change, including changes in their community. They will research the effectiveness of some current initiatives that addresses 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 lab dissections to examine cells, tissues, organs and organ systems in animals. They will compare and link the organ systems, their functions and interactions. Students will use this information to research an animal or plant disease and to understand medical imaging technologies (MRI, Ultrasound, etc.). Also, students will research ethical issues related to stem cell research. As an end-of-unit task, students will describe public health strategies related to systems biology.

Teaching/Learning Strategies

This course is organized in a nine-week series of lessons delivered to students via Internet to computers set up at an access site in their communities. The ninth week is used for topic consolidation, review, and the final examination. The delivery of lessons, assignments, questions, and course material uses the Internet connection. Most communication between the students and the teacher is done via the Internet connection with the mentor assuming the role as liaison between the instructor and the students. The teaching of the lessons incorporates the following list of teaching approaches:

- Field Trip
- Retelling
- Sketching to Learn
- Interview
- Mentoring
- Peer Teaching
- Discussion
- Advance Organizer
- Demonstration
- Mnemonic Devices
- Read Along
- Read Aloud
- Textbook
- Visual Stimuli
- Visualization
- Worksheets
- Reports
- Decision Making Models
- Inquiry Process
- Mathematical Problem Solving
- Scientific Method
- Writing Process

Evaluation

Type of Assessment	Category	Details	Weighting (%)
Formative (70%)	Knowledge/ Understanding	Demonstrate an understanding of the hierarchical organization of cells, from tissues, to organs, to systems in animals and plants. Demonstrate an understanding of the general principles of chemical reactions, and various ways to represent them. Demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change. Demonstrate an understanding of various characteristics and properties of light, particularly with respect to reflection in mirrors and reflection and refraction in lenses.	12
	Thinking/ Inquiry	Investigate cell division, cell specialization, organs, and systems in animals and plants, using research and inquiry skills, including various laboratory techniques. Investigate, through inquiry, the characteristics of chemical reactions. Investigate various natural and human factors that influence Earth's climate and climate change. 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.	18
	Communication	Use of scientific terminology, symbols, conventions, standard units (SI). Use of various forms of communication, reports, essays. Use of information technology, graphs, databases.	18

	Application	Evaluate the importance of medical and other technological developments related to systems biology, and analyse their societal and ethical implications. 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. 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. Evaluate the effectiveness of technological devices and procedures designed to make use of light, and assess their social benefits.		22
Summative (30%)	Culminating Activity	Consists of short questions that cover all the overall expectations of the course.	Knowledge/ Understanding	2.5
			Thinking/ Inquiry	4
			Communication	4
			Application	4.5
	Final Exam	Written examination designed to cover all of the overall expectations of the course	Knowledge/ Understanding	2.5
			Thinking/ Inquiry	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 tools such as the following:

- Graphs
- Tables
- Essays
- Tests
- Exams
- Diagrams
- Reports
- Essays
- Performance Task
- Concept maps and other graphic organizers
- Letters
- Select Response

Resources

Text books:
- SciencePower 10, McGraw-Hill + Ryerson, 2001
- Science 10, Nelson, 2001
- Investigating Sciene 10, Pearson, 2009
- Science Links, McGraw-Hill Ryerson, 2010

Document for assessment, evaluation, and reporting:
- Growing Success, Queen's Printer for Ontario, 2010

Ministry's web site:
- http://www.edu.gov.on.ca/eng/webmap.html

Education Network of Ontario:
- http://www.enoreo.on.ca /

Animated interactive science:
- http://www.explorelearning.com/
- http://frog.edschool.virginia.edu//Frog1/

Ontario Ministry of Education (EDU):
- http://www.edu.gov.on.ca/eng/document/curricul/curricul.html

Resources on the web:
- http://www.howstuffworks.com/
- http://www.cellsalive.com/

- http://www.diabetes.ca/
- http://www.hc-sc.gc.ca/hc-ps/dc-ma/diabete-eng.php
- http://www.rfu.org/cacw/PulpPrimer.htm
- http://www.science.ca/scientists/scientistprofile.php?pID=185
- http://www.howstuffworks.com/

Program Planning

This course is offered to students living in isolated northern Canadian communities that do not have access to normal high school facilities, equipment or teachers associated with secondary school education. The course uses the global connections of the Internet for some instruction, direction, online field trips 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. It has the advantage over regular classrooms of allowing the student to become familiar with a wide variety of computer software and Internet-based resources.
The student attends school in full days similar to traditional face-to face programming. The classroom is similar to a computer classroom with a student-to-computer ratio of 1:1. The delivery of lessons, assignments, questions and course material uses the Internet connection. Most communication between students and the teacher instructor is done via an Internet connection. Support is enhanced by a teacher mentor, a trained teacher present in the classroom for the full day. The mentor assists the student in completing tasks on a timely basis, and providing tutoring when required.