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: 'Eli' K. A. Pivnick Revision Date: Sept 2009

Developed by: 'Eli' K. A. Pivnick Date: March 2009

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

Profile Name: None

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: Darrin Potter

Principal's Approval (signature) _____

Approval Date:

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 analyse 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

- 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;

- 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

- 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;

- 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	24 hours
2. Light & Geometric Optics	24 hours
3. Climate Change	24 hours
4. Tissues, Organs & Systems	24 hours
5. Making Connections	14 hours
Total	110 hours

Unit Descriptions

Unit 1: Chemical Reactions

In this unit, students 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, they learn that chemical reactions react with each other in predictable ways and are subject to the Law of Conservation of Mass. Students research some of the negative impacts on the environment which are caused by chemical reactions. In the end-of-unit task, students evaluate an environmental challenge and its solution involving chemistry

Unit 2: Light and Geometric Optics

In this unit, students study the nature of light. They design and conduct experiments and analyze results to understand the use of plane and curved mirrors, and convergent and divergent lenses in many kinds of optical technology. They investigate refraction through different materials to gain an understanding of the index of refraction. They also investigate different forms of light emission and their uses. Students analyse the difference between a telescope and microscope in theory and construction. The end-of-unit task requires students to examine local night lighting: its purpose, energy consumption, design and the unnecessary light pollution it causes.

Unit 3: Climate Change

In this unit, students develop an understanding of the physical factors that create and affect global weather systems, both normal and extreme. They will examine and create a model of the greenhouse effect, and then to move on to an examination of the current evidence for climate change and its causes. For perspective, they will research one of the other human-caused atmospheric environmental concerns (ozone depletion, acid rain, smog). In the end-of-unit task, students will assess the state of the problem and the effectiveness of current efforts (on all levels) to mitigate it.

Unit 4: Tissues, Organs and Systems

In this unit, students carry out investigations with microscopes and lab dissections to examine cells, tissues, organs and organ systems in animals and plants. 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.). Public health strategies will be examined and, as an end-of-unit task, students will examine an ethical issue involving a medical technology (stem cell research, drug company funding, etc.).

Unit 5: Making Connections

In this culminating unit, students focus on the environmental and economic issues related to local Greenhouse Production. There are two parts to this. In the first, students gather data and analyse one aspect of their community's contribution to greenhouse gases. In the second part, they come up with a proposal to significantly reduce the community's greenhouse gas production backed by both discussion with community leaders and the required calculations. This unit integrates Relating Science to Technology and Society and the Environment expectations from all four strands and can be used as a major component of the final summative (30%) evaluation.

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 students and the teacher is done using the Internet connection with the teacher mentor assuming the role as liaison between the instructor and the student. However, there are also two live sessions with students and teacher via the Elluminate or Breeze platforms making use of a common whiteboard, images, and an audio (and visual) connection.

The teaching of the lessons incorporates the following list of teaching approaches:

*Direct Instruction (on-line)
*Interactive lessons (Elluminate or Breeze)
*On-line inquiry
*Demonstration (both laboratory work in the classroom as well as animated on-line demonstrations)
*Laboratory dissections, chemistry experiments, lens and mirror investigations
*Case study
*Outside data collection
*Internet research
*Internet virtual lessons
*Group work
*Independent Study Evaluation
*Interviews of local individuals

Evaluation

Type of Assessment	*Category*	*Details*	*Weighting (%)*

Formative (70%)	*Knowledge/ Understanding*	**B3. Demonstrate an understanding of the hierarchical organization of cells, from tissues, to organs, to systems in animals and plants.** **C3. Demonstrate an understanding of the general principles of chemical reactions, and various ways to represent them.** **D3. demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change.** **E3. 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 and Investigation	**B2. Investigate cell division, cell specialization, organs, and systems in animals and plants, using research and inquiry skills, including various laboratory techniques.** **C2. Investigate, through inquiry, the characteristics of chemical reactions.** **D2. investigate various natural and human factors that influence Earth's climate and climate change.** **E2. 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	**B1. Evaluate the importance of medical and other technological developments related to systems biology, and analyse their societal and ethical implications.** **C1. 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.** **D1. 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.** **E1. Evaluate the effectiveness of technological devices and procedures designed to make use of light, and assess their social benefits.**		*22*
Summative (30%)	*Culminating Activity (15%)*	*Research + Report on Greenhouse Gas Production in Northern Ontario communities and proposed solutions*	*knowledge/ understanding*	*2.5*
			thinking/investigation	*4*
			communication	*4*
			application	*4.5*
	Final Exam (15%)	*Written examination designed to cover all of the overall expectations of the course*	*knowledge/ understanding*	*2.5*
			thinking/investigation	*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:

Online submissions
Checklists
Paper and pencil activities (scanned for submission)
Rubrics (general and task specific)
Projects
Drawing or Map-making (photographed/scanned/printscreen for submission)
Rating scales
Worksheets
Achievement chart
Graphs
Essays
Research project (Culminating assignment)
Exams

Resources listed in Bibliographical style

Text books: SciencePower 10, McGraw-Hill + Ryerson, 2001
Science 10, Nelson, 2001

Other key resources:
http://boyles.sdsmt.edu/

Site shows on-line chemical lab experiments
http://tech.nscdiscovery.org/newtech/science_links.htm
http://www.theweathernetwork.com/
http://www.sciencejoywagon.com/physicszone/
http://workbench.concord.org/

Ministry's web site.
http://www.edu.gov.on.ca/eng/webmap.html
Education Network of Ontario
http://www.enoreo.on.ca /

Education resources on the web
http://www.educ.uvic.ca/depts/snsc/pages/weblinks/weblinks.htm
http://www.howstuffworks.com/
http://www.grc.nasa.gov/WWW/K-12/teacher.htm

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

Regional Education Teachers Association of Ontario (STAO) links to science sites
http://www.stao.org/hotlinks.htm

Animated interactive science
http://www.explorelearning.com/
http://ippex.pppl.gov/interactive/matter/intro.html
http://frog.edschool.virginia.edu//Frog1/

Other inportant sites
http://www.howstuffworks.com/
http://www.grc.nasa.gov/WWW/K-12/teacher.htm

http://www.uq.edu.au/_School_Science_Lessons/
http://kidshealth.org/kid/htbw/htbw_main_page.html
http://periodic.lanl.gov/default.htm
http://www.kentchemistry.com/moviesfiles/movieindex.htm

http://www.webelements.com/
http://www.globalwarming101.com/
http://www.epa.gov/climatechange/emissions/
http://www.chem1.com/acad/webtext/virtualtextbook.html
http://www.chemmybear.com/
http://www.google.com/mars/
http://www.nrel.gov/
http://www.drinking-water.org/flash/splash.html
http://www.sciencemuseum.org.uk/onlinestuff/games/team_plastics.aspx
http://www.chemcollective.org/tutorials.php
http://nemo.sciencecourseware.org/eec/Earthquake/

Program Planning

This course is offered to students living in isolated northern Canadian communities which do not have access to normal high school facilities, equipment or teachers associated with secondary education. The course uses the global connections of the Internet for some instruction, direction, on-line 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 at home 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: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 using an Internet connection including two weekly interactive sessions (using Elluminate or Breeze platforms or videoconference) involving the entire class and the teacher. Support is enhanced by the 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 where required.