

Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL

Department Name: Science

Ministry of Education Course Title: Chemistry

Grade Level: 12

Ministry Course Code: SCH4U

Teacher's Name: Raj Budhram

Developed by: Raj Budhram Date: November 2013

Revision Date: September 2017

Developed from: The Ontario Curriculum, Grade 11 and 12: Science 2008 (Revised)

Text: None

Prerequisite: SCH3U

Credits: One

Length: 110 hours

Principal's Name: Kevin Dempsey

Principal's Approval (signature) _____

Approval Date:

Course Description/Rationale

This course enables students to deepen their understanding of chemistry through the study of organic chemistry, the structure and properties of matter, energy changes and rates of reaction, equilibrium in chemical systems, and electrochemistry. Students will further develop their problem-solving and investigation skills as they investigate chemical processes, and will refine their ability to communicate scientific information. Emphasis will be placed on the importance of chemistry in everyday life and on evaluating the impact of chemical technology on the environment.

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, 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.

B. Organic Chemistry

- Assess the social and environmental impact of organic compounds used in everyday life, and a course of action to reduce the use of compounds that are harmful to human health and environment.
- Investigate organic compounds and organic chemical reactions, and use various methods to represent compounds.
- Demonstrate an understanding of the structure, properties, and chemical behaviour of compounds within each class of organic compounds.

C. Structure and Properties of Matter

- Assess the benefits to society and evaluate the environmental impact of products and technologies that apply principles related to the structure and properties of matter
- Investigate the molecular shapes and physical properties of various types of matter.
- Demonstrate an understanding of atomic structure and chemical bonding, and how they relate to the physical properties of ionic, molecular, covalent network, and metallic substances.

D. Energy Changes and Rates of Reaction

- Analyse technologies and chemical processes that are based on energy changes, and evaluate them terms of their efficiency and their effects on the environment.
- Investigate and analyse energy changes and rates of reaction in physical and chemical processes solve related problems.
- Demonstrate an understanding of energy changes and rates of reaction.

E. Chemical Systems and Equilibrium

- Analyse chemical equilibrium processes, and assess their impact on biological, biochemical, technological systems.
- Investigate the qualitative and quantitative nature of chemical systems at equilibrium, and solve problems.
- Demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause shifts in the equilibrium of chemical systems.

F. Electrochemistry

- Analyse technologies and processes relating to electrochemistry, and their implications for , health and safety, and the environment.
- Investigate oxidation-reduction reactions using a galvanic cell, and analyse electrochemical in qualitative and quantitative terms.
- Demonstrate an understanding of the principles of oxidation-reduction reactions and the many practical applications of electrochemistry.

Course Content

Unit	Length
1. Organic Chemistry	19.5 hours
2. Structure and Properties of Matter	19.5 hours
3. Energy Changes and Rates of Reaction	26.00 hours
4. Chemical Systems and Equilibrium	22.75 hours
5. Electrochemistry	26.00 hours
Total	113.75 hours

Unit Descriptions

Unit 1 - Organic Chemistry

In this unit, students will build molecular models of organic compounds and they will conduct an experiment to compare three isomeric alcohols reactions with potassium permanganate. They will learn that organic compounds have predictable chemical and physical properties determined by their respective structures, and organic chemical reactions and their applications have significant implications for society, human health, and the environment.

Unit 2 - Structure and Properties of Matter

In this unit, students will observe and analyze the physical properties of various substances and determine the type of bonding present in each substance. They will learn that the nature of the attractive forces that exist between particles in a substance determines the properties and limits the uses of that substance. Also, they will learn that technological devices based on the principles of atomic and molecular structures can have societal benefits and costs.

Unit 3 - Energy Changes and Rates of Reaction

In this unit, students will conduct an inquiry to determine the heat change for the dissociation of ammonium chloride in water. In addition, they will plan and conduct an inquiry to determine how change in temperature of reactant, concentration of reactant, and surface area of the reactant affect the rate of reaction of chalk and vinegar. Students will learn that Energy changes and rates of chemical reactions can be described quantitatively, efficiency of chemical reactions can be improved by applying optimal conditions, and technologies that transform energy can have societal and environmental costs and benefits.

Unit 4 - Chemical Systems and Equilibrium

In this unit, students will analyze a video on the Le Chatelier Principle. They will learn that chemical systems are dynamic and respond to changing conditions in predictable ways. Moreover, they will learn that applications of chemical systems at equilibrium have significant implications for nature and industry.

Unit 5 - Electrochemistry

In this unit, students will conduct an inquiry to investigate the redox reaction of copper(II) sulphate pentahydrate and magnesium, and they will build a galvanic cell and measure its cell potential. Students will learn that oxidation and reduction are paired chemical reactions in which electrons are transferred from one substance to another in a predictable way, and that the control and applications of oxidation and reduction reactions have significant implications for industry, health and safety, and the environment.

Teaching/Learning Strategies

This course is organized into an eight-week series of lessons and activities that will be presented to students in remote northern communities via the internet. The eighth week will be used for course consolidation, review and the final examination. Teacher and students will communicate over the internet, while mentors in the classrooms will assume the role of liaison between the teacher and 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. 47).

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	<ul style="list-style-type: none"> - identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields; - demonstrate an understanding of the structure, properties, and chemical behaviour of compounds within each class of organic compounds; - demonstrate an understanding of atomic structure and chemical bonding, and how they relate to the physical properties of ionic, molecular, covalent network, and metallic substances; - demonstrate an understanding of energy changes and rates of reaction; - demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause shifts in the equilibrium of chemical systems; - demonstrate an understanding of the principles of oxidation-reduction reactions and the many practical applications of electrochemistry. 	12
	Thinking	<ul style="list-style-type: none"> - 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); - investigate organic compounds and organic chemical reactions, and use various methods to represent compounds; - investigate the molecular shapes and physical properties of various types of matter; - investigate and analyse energy changes and rates of reaction in physical and chemical processes solve related problems; - investigate the qualitative and quantitative nature of chemical systems at equilibrium, and solve problems; - investigate oxidation-reduction reactions using a galvanic cell, and analyse electrochemical in qualitative and quantitative terms. 	17
	Communication	<ul style="list-style-type: none"> - 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 social and environmental impact of organic compounds used in everyday life, and a course of action to reduce the use of compounds that are harmful to human health and environment; - assess the benefits to society and evaluate the environmental impact of products and technologies that apply principles related to the structure and properties of matter; - analyse technologies and chemical processes that are based on energy changes, and evaluate them terms of their efficiency and their effects on the environment; - analyse chemical equilibrium processes, and assess their impact on biological, biochemical, technological systems; - analyse technologies and processes relating to electrochemistry, and their implications for health and safety, and the environment.	24
Final Evaluation (30%)	Culminating Activity (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
	Final Examination (15%)	Application	4.5
		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 are obtained through a variety of means, including the following:

- Ongoing descriptive feedback
- 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)

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

Resources

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

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

Ontario Ministry of Education. (2017). *Indigenous education strategy*. Retrieved from <http://www.edu.gov.on.ca/eng/aboriginal/>

Websites:

<http://www.factmonster.com/ipka/A0775891.html>

http://www.enwave.com/district_cooling_system.html

<http://www.youtube.com/watch?v=RjFW3sml1fY>

<http://web2.0calc.com/>

<http://www.aboriginalaccess.ca/adults/role-models/budd>

<http://hyperphysics.phy-astr.gsu.edu/hbase/tables/electpot.html>

Program Planning

This course is offered to students living in isolated northern Ontario communities which do not have access to regular high school facilities, equipment or teachers associated with secondary education. 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 tutoring as required. Students may also receive support from various programs at KIHS, including the First Nation Student Success Program and the Special Education Program.

Indigenous and local content is used throughout the course to meet students' learning needs. Considerations are made to the learning preferences of the student population and lessons can be adjusted for individual students as required.