

## Course Outline

**School Name:** Keewaytinook Internet High School

**Department Name:** Science

**Ministry of Education Course Title:** Chemistry

**Grade Level:** 12, University Preparation

**Ministry Course Code:** SCH4U

Teacher's Name: Raj Budhram

Developed by: Raj Budhram      Date: Nov, 2013

Revision Date: Aug, 2015

Developed from: The Ontario Curriculum, Grade 12 Chemistry

Text: None

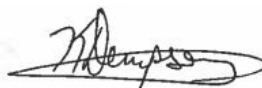
Prerequisite: Grade 11 Chemistry

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 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*

<i>Unit</i>	<i>Length</i>
1. Organic Chemistry	20 hours
2. Structure and Properties of Matter	21 hours
3. Energy Changes and Rates of Reaction	23 hours
4. Chemical Systems and Equilibrium	23 hours
5. Electrochemistry	23 hours
<b>Total</b>	110 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 in an eight-week series of lessons delivered to students via Internet to computers set up at an access site in their communities. The eighth 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. The teaching of the lessons incorporates the following list of teaching approaches:

- Retelling
- Collage
- Sketching to Learn
- 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*

**Seventy per cent (70%)** of the grade will be based on evaluations conducted throughout this course. This portion of the grade should reflect the students' *most consistent level of achievement* throughout the course, although special consideration should be given to the more recent evidence of achievement.

**Thirty per cent (30%)** of the grade will be based on a final evaluation in the form of an examination, performance, essay and /or other method of evaluation suitable to the course content and administered towards the end of the course.

Type of Assessment	Category	Details	Weighting (%)
<b>Term Work</b>  <b>(70%)</b>	Knowledge/ Understanding	<ul style="list-style-type: none"> <li>• Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.</li> <li>• Demonstrate an understanding of the structure, properties, and chemical behaviour of compounds within each class of organic compounds.</li> <li>• 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.</li> <li>• Demonstrate an understanding of energy changes and rates of reaction.</li> <li>• Demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause shifts in the equilibrium of chemical systems.</li> <li>• Demonstrate an understanding of the principles of oxidation-reduction reactions and the many practical applications of electrochemistry.</li> </ul>	12

	Thinking/ Inquiry	<ul style="list-style-type: none"><li>• Investigate organic compounds and organic chemical reactions, and use various methods to represent compounds.</li><li>• Investigate the molecular shapes and physical properties of various types of matter.</li><li>• Investigate and analyse energy changes and rates of reaction in physical and chemical processes solve related problems.</li><li>• Investigate the qualitative and quantitative nature of chemical systems at equilibrium, and solve problems.</li><li>• Investigate oxidation-reduction reactions using a galvanic cell, and analyse electrochemical in qualitative and quantitative terms.</li></ul>	17
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	Communication	<ul style="list-style-type: none"> <li>• Expression and organization of ideas and information;</li> <li>• Communication for different audiences and purposes in oral, visual, and/or written forms;</li> <li>• Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms.</li> </ul>	17
	Application	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• Analyse technologies and chemical processes that are based on energy changes, and evaluate them terms of their efficiency and their effects on the environment.</li> <li>• Analyse chemical equilibrium processes, and assess their impact on biological, biochemical, technological systems.</li> <li>• Analyse technologies and processes relating to electrochemistry, and their implications for , health and safety, and the environment.</li> </ul>	24



<b>Final Assessment (30%)</b>	Culminating Activity	A series of short questions which will enable the students to cover all the overall expectations of the course.	Knowledge/ Understanding	2.5
			Thinking/ Inquiry	4
			Communication	4
			Application	4.5
	Final Exam	A series of short problems and scenarios where the students will be able to use the skills and knowledge gained in the course.	Knowledge/ Understanding	2.5
			Thinking/ Inquiry	4
			Communication	4
			Application	4.5
			<b>TOTAL</b>	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***

### **Document for assessment, evaluation, and reporting:**

Growing Success, Queen's Printer for Ontario, 2010

### **Websites:**

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

[http://www.enwave.com/district\\_cooling\\_system.html](http://www.enwave.com/district_cooling_system.html)

<http://www.youtube.com/watch?v=RjFW3smIfY>

<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 Canadian communities that 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, 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 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 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 using an Internet connection. 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.