NIAGARA ACADEMY
CHEMISTRY, GRADE 12, UNIVERSITY PREPARATION
COURSE OUTLINE

COURSE CODE:	SCH4U
DEVELOPED BY:	V. Rows, September, 2002
REVISED BY:	V. Rows, 2009, L. Cousineau, 2012, 2013, M. Wilson, 2014, J. Zelic, 2016, J. Aparicio
DEVELOPED FROM:	The Ontario Curriculum Grades 11 and 12, Science, 2008, http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf
PREREQUISITE:	Grade 10 Science, Academic
COURSE DURATION:	110 hours
COURSE VALUE:	1.0 credits

COURSE DESCRIPTION AND 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: By the end of this course, students will:	
A1.	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);
A2.	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. Organic Chemistry: By the end of this course, students will:	
B1.	assess the social and environmental impact of organic compounds used in everyday life, and propose a course of action to reduce the use of compounds that are harmful to human health and the environment;
B2.	investigate organic compounds and organic chemical reactions, and use various methods to represent the compounds;
B3.	demonstrate an understanding of the structure, properties, and chemical behaviour of compounds within each class of organic compounds.

C. Structure and Properties of Matter: By the end of this course, students will:	
C1.	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;
C2.	investigate the molecular shapes and physical properties of various types of matter;
C3.	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: By the end of this course, students will:	
D1.	analyse technologies and chemical processes that are based on energy changes, and evaluate them in terms of their efficiency and their effects on the environment;
D2.	investigate and analyse energy changes and rates of reaction in physical and chemical processes, and solve related problems;
D3.	demonstrate an understanding of energy changes and rates of reaction.

E. Chemical Systems and Equilibrium:	
E1.	analyse chemical equilibrium processes, and assess their impact on biological, biochemical, and technological systems;
E2.	investigate the qualitative and quantitative nature of chemical systems at equilibrium, and solve related problems; demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause;
E3.	shifts in the equilibrium of chemical systems.

COURSE CONTENT AND EVALUATION

Evaluation in each unit will include Knowledge/Understanding - 25%, Thinking - 25%, Communication - 25%, Application - 25%. Examples of term work to be assessed are notebooks, lab activities, reflections/journals, presentations, case studies, discussions, research/graphing/model creating/investigative assignments, reports, performance tasks, quizzes, unit tests. **Strand A, Scientific Investigation Skills and Career Exploration** will be included and evaluated in each unit.

Unit	Description	Evaluation	Hours
Unit One	**Review of Basic Chemistry:** 1. Nomenclature 2. Chemical Equations 3. Calculations and Predictions	5%	10
Unit Two	**Structure and Properties of Matter:** 1. Atomic structure and properties 2. Types of chemical bonding 3. Polarity and molecular shapes	13%	20
Unit Three	**Organic Chemistry:** 1. Classes of organic compounds 2. Organic reactions and predicting products 3. Molecular model	13%	20
Unit Four	**Energy Changes and Rates of Reaction:** 1. Solving heat transfer problems 2. Compare energy changes in various types of reactions 3. Chemical processes	13%	20
Unit Five	**Chemical Systems and Equilibrium:** 1. Factors affecting equilibrium 2. Problem solving 3. Acids and bases	13%	20
Unit Six	**Electrochemistry:** 1. Oxidation-reduction reactions 2. Electrochemical reactions 3. Applications and Implications	13%	20
	Total Term Work	**70%**	**110 hrs**
Final Evaluation	**Culminating Activity** **Final Exam**	**10%** **20%**	
	Final Mark	**100%**	

TEACHING AND LEARNING STRATEGIES

Effective instructional approaches and learning activities draw on students' prior knowledge, capture their interest, and encourage meaningful practice both inside and outside the classroom. Students will be engaged when they are able to see the connection between the scientific concepts they are learning and their application in the world around them and in real-life situations. The following are specific strategies for teaching and learning.

- Assessment of prior knowledge and provision of differentiated instruction for individual students
- Teaching and modelling of learning strategies
- Problem posing and problem solving
- Individual and cooperative small group learning, teamwork
- Hands-on experiments
- Brainstorming
- Creation of scenarios for decision making
- Independent research
- Issue-based analysis
- Personal reflection
- Seminar presentations
- Use of technology
- Hands-on applications
- Constructive or creative dialogue

ASSESSMENT AND EVALUATION

Evaluation and Reporting of Student Achievement: Student achievement is communicated formally to students and parents by means of the Provincial Report Card, Grades 9–12. The report card provides a record of the student's achievement of the curriculum expectations in every course, at particular points in the school year or semester, in the form of a percentage grade. The percentage grade represents the quality of the student's overall achievement of the expectations for the course which are described in the achievement chart on pages 26-27 of The Ontario Curriculum Grades 11 and 12, Science, 2008, Website: http:// www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf

Learning Skills will also be assessed and reported on the Provincial Report Card, Grades 9-12. The quality of the learning skills demonstrated by a student are recorded in six categories – Responsibility, Organization, Independent Work, Collaboration, Initiative, Self-Regulation – are assessed throughout the semester using a four-point scale (E - Excellent, G - Good, S - Satisfactory, N - Needs Improvement), and the document page 11, Growing Success: Assessment, Evaluation and Reporting in Ontario Schools, 2010, as a guide (http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf).

Assessment for Learning will be used as a process for seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go, and how best to get there. Teachers will use diagnostic assessment before instruction and formative

assessment will occur frequently and in an ongoing manner to monitor students' progress. Observation and conversation will be used to determine the needs of individual student learning.

Assessment as Learning will focus on the explicit fostering of student's capacity over time to be their own best assessors, but teachers need to start by presenting and modelling external, structured opportunities for students to assess themselves. Formative assessment be used by students to monitor their own and their peers' progress.

Assessment of Learning will be used as the assessment that becomes public and results in statements or symbols about how well students are learning. Summative assessment will be used by the teacher to summarize learning at a given point in time. (Ref: page 31 of Growing Success)

A student's achievement of the overall curriculum expectations will be evaluated in accordance with the achievement charts in the provincial curriculum and will be reported using percentage marks. It is expected that both mathematical calculations and professional judgement will inform the determination of percentage marks

The teacher will use assessment strategies that:

- are fair, transparent and equitable for all students;
- are clearly communicated to students at the beginning of the course and at other points throughout the semester
- are varied in nature, administered over a period of time and designed to provide opportunities for students to demonstrate the full range of their learning
- are appropriate for the learning activities used, the purposes of instruction and the needs and experiences of the students
- 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
- accommodate students with special education needs, consistent with the strategies outlined in their Individual Education Plan
- accommodate the needs of students who are learning the language of instruction
- ensure that each student is given clear directions for improvement
- promote students' ability to assess their own learning and to set specific goals
- ensure that each student is given clear directions for improvement

A final grade is recorded for every course, and a credit is granted and recorded for every course in which the student's grade is 50% or higher. The final grade for each course in Grades 9–12 will be determined as follows:

- Seventy per cent of the grade will be based on evaluations 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. Please see the chart below for an explanation of how course work marks will be obtained.
- Thirty per cent 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. This final evaluation consists of the following: Culminating Activity 10% and Final Exam 20%.

CONSIDERATIONS FOR PROGRAM PLANNING

The planning and administering of this course is based on the premise that all students can be successful language learners. The teacher will provide quality instruction that respects students' strengths and address their learning needs, using assessment information to plan instruction.

Teachers of science will incorporate appropriate strategies for instruction and assessment to facilitate the success of the ELL students in their classrooms. These strategies include:

- modification of some or all of the course expectations, based on the student's level of English proficiency;
- use of a variety of instructional strategies (e.g. extensive use of visual cues, manipulatives, pictures, diagrams, graphic organizers; attention to clarity of instructions; modelling of preferred ways of working in mathematics; previewing of textbooks; pre-teaching of key specialized vocabulary; encouragement of peer tutoring and class discussion; strategic use of students' first languages);
- use of a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, culturally diverse materials);
- use of assessment accommodations (e.g., granting of extra time; use of alternative forms of assessment, such as oral interviews, learning logs, or portfolios; simplification of language used in problems and instructions).

Information and communications technology will be used throughout the course where it is appropriate. The program will also include opportunities for students to apply their skills to work-related situations, to explore educational and career options, and to become self-directed learners.

Teachers will model safe practices at all time and communicate safety requirements to students in accordance with the school, the Ministry of Education policies and Ministry of Labour regulations. This is particularly important in the case of off-site excursions. Teachers will also adhere to the policies of the First Nation, Métis and Inuit Education policy framework should the class include students from these communities

RESOURCES

Nelson Chemistry 12, Thomson Nelson, 2003