



Insight Academy of Canada

## Course Outline

<b>Course Title</b>	Chemistry, Grade 12, University Preparation (SCH4U)
<b>Grade</b>	12
<b>Course Type</b>	University
<b>Course Code</b>	SCH4U
<b>Credit Value</b>	1.0
<b>Curriculum Policy Documents</b>	The Ontario Curriculum, Grades 11 and 12: Science, 2008 (revised)  Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools, 2010
<b>Prerequisite(s)</b>	Chemistry, Grade 11, University Preparation (SCH3U)

## Course Description

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

<b>A. Scientific Investigation Skills and Career Exploration</b>	
Throughout 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 careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.
<b>B. Organic Chemistry</b>	
Throughout 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.
<b>C. Structure and Properties of Matter</b>	
Throughout 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.
<b>D. Energy Changes and Rates of Reaction</b>	
Throughout 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.
<b>E. Chemical Systems and Equilibrium</b> Throughout this course, students will:	
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;
E3	Demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause shifts in the equilibrium of chemical systems.
<b>F. Electrochemistry</b> Throughout this course, students will:	
F1	Analyse technologies and processes relating to electrochemistry, and their implications for society, health and safety, and the environment;
F2	Investigate oxidation-reduction reactions using a galvanic cell, and analyse electrochemical reactions in qualitative and quantitative terms;
F3	Demonstrate an understanding of the principles of oxidation-reduction reactions and the many practical applications of electrochemistry.

## Outline of Course Content

Unit No.	Unit Title	Instructional Time	Overall Expectations
1	Introduction	3 hours	A1, A2
2	Organic Chemistry	22 hours	B1, B2, B3
3	Structure and Properties of Matter	21 hours	C1, C2, C3
4	Energy Changes and Rates of Reaction	21 hours	D1, D2, D3
5	Chemical Systems and Equilibrium	22 hours	E1, E2, E3
6	Electrochemistry	21 hours	F1, F2, F3
<b>Total Instructional Time</b>		<b>110 HOURS</b>	
7	Final Exam	2.5 hours	B1 – F3

### Unit Descriptions

The entire course is delivered online

#### Unit 1: Introduction

Students review grade 11 Chemistry, including scientific investigation skills, lab safety skills and Math skills.

**Overall and Specific Expectations: A1, A2****Unit 2: Organic Chemistry**

Students explore organic substances. They distinguish among the different classes of organic substances including hydrocarbons, alcohols, aldehydes, ketones, carboxylic acids, esters, ethers, amines and amides, by name and by structural formula. An inquiry skill such as model building is used to gather data and information about the properties and types of organic compounds. Students investigate the production, uses and importance of polymers in our daily lives.

**Overall and Specific Expectations: B1, B2, B3****Unit 3: Structure and Properties of Matter**

This unit increases student understanding of the structure of the atom by exploring the quantum mechanical model. They describe products and contributions that have advanced the knowledge of atomic and molecular theory, write electronic configurations, and explain the relationship between the position of elements in the periodic table and their properties. Students investigate solids/liquids and explain how types of chemical bonding account for the properties of ionic, molecular, covalent network and metallic substances. Students predict molecular shape using the Valence Shell Electron Pair Repulsion model.

**Overall and Specific Expectations: C1, C2, C3****Unit 4: Energy Changes and Rates of Reaction**

This unit involves the study of energy transformations and kinetics of chemical changes. Energy changes for physical and chemical processes and rates of reaction are studied through experimental data and calculations. Research is done on the dependence of chemical technologies and processes on the energetics of chemical reactions.

**Overall and Specific Expectations: D1, D2, D3****Unit 5: Chemical Systems and Equilibrium**

In this unit, students increase their understanding of solutions to incorporate equilibrium systems. Students investigate the behaviour of different equilibrium systems, e.g., liquid-vapour, insoluble salts, weak acids and bases, and solve problems involving the law of chemical equilibrium. Le Chatelier's principle is used to predict how various factors affect a chemical system at equilibrium. Students explore the importance of equilibrium systems in their daily lives, e.g., how equilibrium systems optimize the production of industrial chemicals and the role they play in biological systems.

**Overall and Specific Expectations: E1, E2, E3****Unit 6: Electrochemistry**

This unit introduces students to the principles of oxidation-reduction reactions and the many practical applications of electrochemistry. They will investigate redox reactions using a galvanic cell, and analyse electrochemical reactions in qualitative and quantitative terms. Students will

analyse technologies and processes relating to electrochemistry, and their implications for society, health and safety, and the environment.

**Overall and Specific Expectations: F1, F2, F3**

## Teaching and Learning Strategies

Effective instruction is key to student success and students learn best when they are engaged in a variety of ways of learning. Teachers at Insight Academy of Canada (IAC) provide numerous opportunities and use a variety of instructional, assessment, and evaluation strategies to help students develop skills of inquiry, problem solving, and communication as they investigate and learn fundamental concepts. The activities offered enable students not only to make connections among these concepts throughout the course but also to relate and apply them to relevant societal, environmental, and economic contexts. Opportunities to relate knowledge and skills to these wider contexts will motivate students to learn and to become lifelong learners.

Each unit of the course contains a Unit Overview, a number of Lessons, a Unit Test, and a Unit Exit Card. Lessons are delivered through the following format.

- **Mind on.** Students are introduced to the content through a variety of exploratory and instructional strategies including watching online videos.
- **Actions.** Students practice and apply their new learning through worked examples, exercises, investigations, explorations, practice quizzes, simulation, research project and virtual lab. Students are actively engaged in their assessment process as they monitor their own learning to determine their next steps and set individual learning goals.
- **Consolidation.** Students are provided opportunities to demonstrate what they have learned through independent practice, reflection assignments, and discussion posts (Exit Slip).
- **Extension Activities.** Students study extra lesson resources, complete homework assignment, and response to teacher's follow-up questions to expand their learning and prepare for unit test.

Along with some of the strategies noted in the assessment and evaluation strategies charts below, teaching and learning strategies will include:

- **Activity Based Strategies:** Student completes assigned activities reflecting the learning goals of the course
- **Cooperative Strategies:** Small group learning providing high levels of student engagement and interdependence through discussion posts/student feedback/debates
- **Direct Instruction Strategies:** Teacher guided instruction on areas for student improvement based on chats, office hours, assignment feedback
- **Independent Learning Strategies:** Students analyze their own strengths and weaknesses through self-assessment
- **Technology and Media Based Applications:** Integrating technology into the course when appropriate is proving to be valuable for enhancing and extending the learning experience for faculty and students.
- **Thinking Skills Strategies:** Independent generation of best learning practices and characteristics
- **Inquiry Research Mode:** Detailed steps focused upon using sources properly in own work and through feedback from teacher and peer

<b>Activity Based Strategies</b>	<b>Cooperative Strategies</b>	<b>Direct Instruction Strategies</b>
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<ul style="list-style-type: none"> <li>• Panel discussion</li> <li>• Online videos</li> <li>• Articles</li> <li>• Simulation</li> <li>• Online research</li> </ul>	<ul style="list-style-type: none"> <li>• Collaborative</li> <li>• Discussion Posts</li> <li>• Peer Commentary</li> <li>• Peer interactive communication</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Review</li> <li>• Articles/Videos</li> <li>• Practice and drill</li> <li>• Worksheets</li> <li>• Guided exploration</li> </ul>
<b>Independent Learning Strategies</b> <ul style="list-style-type: none"> <li>• Homework Q&amp;A</li> <li>• Report</li> <li>• Note making</li> <li>• Discussion Posts</li> <li>• Online Research</li> <li>• Summary Review Grids</li> <li>• Online research</li> <li>• Exit Card</li> <li>• ePortfolio</li> <li>• Self-assessment</li> </ul>	<b>Technology and Media Based Applications</b> <ul style="list-style-type: none"> <li>• Homework Q&amp;A online submissions</li> <li>• Independent Reading</li> <li>• Videos Q&amp;A</li> <li>• Discussion Posts</li> <li>• Online Research</li> <li>• Media Presentation (Slideshow)</li> <li>• Simulation</li> <li>• Exploration</li> <li>• Virtual Lab</li> </ul>	<b>Thinking Skills Strategies</b> <ul style="list-style-type: none"> <li>• Graphing</li> <li>• Experimenting</li> <li>• Sharing opinions/offering commentary</li> <li>• Brainstorming</li> <li>• Questionnaires/Self reflection</li> <li>• Problem Solving</li> <li>• Case Study Analysis</li> <li>• Oral Explanation</li> <li>• Mental calculation</li> <li>• Self-reflection/time management techniques</li> </ul>
<b>Inquiry Research Mode</b> <ul style="list-style-type: none"> <li>• Research Process</li> <li>• Dialogues with Teacher &amp; Peers</li> <li>• Mathematical problem solving</li> <li>• Inquiry process</li> <li>• Scientific method</li> </ul>		

## Strategies for Assessment & Evaluation of Student Performance

Insight Academy of Canada's (IAC) Assessment and Evaluation policy is aligned with the Ministry of Education's Growing Success policy document which outlines the assessment, evaluation, and reporting policies and practices in Ontario schools.

### Basic Considerations

The primary purpose of assessment and evaluation is to improve student learning. Assessment is the process of gathering information from a variety of sources that accurately reflects how well a student is achieving the curriculum expectations in a course. Evaluation refers to the process of judging the quality of student learning on the basis of established performance standards, and assigning a value to represent that quality.

In order to ensure that assessment and evaluation are valid and reliable, and that they lead to the improvement of student learning, IAC teachers will use assessment and evaluation strategies that:

- are fair, transparent, and equitable for all students;
- support all students, including those with special education needs, those who are learning the language of instruction (English or French), and those who are First Nation, Métis, or Inuit;

- are carefully planned to 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;
- are communicated clearly to students and parents at the beginning of the school year or course and at other appropriate points throughout the school year or course;
- are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for students to demonstrate the full range of their learning;
- provide ongoing descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement;
- develop students' self-assessment skills to enable them to assess their own learning, set specific goals, and plan next steps for their learning

## Evaluation and Reporting of Student Achievement

Insight Academy of Canada's (IAC) will use the Provincial Report Card, Grades 9–12, for formal written reports to students and parents two times a semester. The report card provides a record of the student's achievement of the curriculum expectations in the 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 and reflects the corresponding level of achievement as described in the achievement chart for the discipline.

A final grade is recorded for the course, and a credit is granted and recorded for the course in which the student's grade is 50% or higher. The final grade for the course 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 will reflect the student's most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
- Thirty per cent of the grade will be based on a final evaluation in the form of an examination and administered at the end of the course.

Assessment and Evaluation Categories and Weights			
Achievement Categories	Percent	Evaluation for Final Grade	Percent
Knowledge/Understanding	25%	Term Work	70%
Inquiry/Thinking	25%		
Communication	25%	Final Evaluation	30%
Application	25%		

## Reporting on Demonstrated Learning Skills & Work Habits

The report card provides a record of the learning skills demonstrated by the student in every course, in the following six categories: Responsibility, Organization, Independent Work, Collaboration, Initiative & Self-regulation. These learning skills and work habits are evaluated using a four-point scale (E-Excellent, G-Good, S-Satisfactory, N-Needs Improvement). The separate evaluation and reporting of the learning skills and work habits in these six areas reflect their critical role in students' achievement of the curriculum expectations. To the extent possible, the evaluation of learning skills



and work habits, apart from any that may be included as part of a curriculum expectation in a course, should not be considered in the determination of percentage grades.

In order to ensure that assessment and evaluation are valid and reliable, and that they lead to the improvement of student learning, I.A.C teachers use a variety of strategies throughout the course.

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