



## Grade 12 (SCH4U) University Preparation

### COURSE OVERVIEW

**Ministry Course Code:** SCH4U

**Credit Value:** 1.00

**Prerequisite:** SCH3U

**Teacher:** Ms. Kritika Kajla

**Length:** 110 hours

**Course Development Date:** February 2024

**Policy Document:** The Ontario Curriculum Grades 11 and 12 Science (Revised 2008)

### Course Description

This course enables students to deepen their understanding of chemistry through the study of organic chemistry, energy changes and rates of reaction, chemical systems and equilibrium, electrochemistry, and atomic and molecular structure. Students will further develop problem-solving and laboratory skills as they investigate chemical processes, at the same time refining their ability to communicate scientific information. Emphasis will be placed on the importance of chemistry in daily 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 unit, 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, analyzing 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. Organic Chemistry**

By the end of this unit, 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 behavior of compounds within each class of organic compounds.

## **C. Structure and Properties of Matter**

By the end of this unit, 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 unit, students will:

D1. Analyze technologies and chemical processes that are based on energy changes and evaluate them in terms of efficiency and their effects on the environment.

D2. Investigate and analyze 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**

By the end of this unit, students will:

E1. Analyze 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.

## F. Electrochemistry

By the end of this unit, students will:

F1. Analyze 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 analyze 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	LENGTH
Unit 1: Organic Chemistry	21 hours
Unit 2: Structure and Properties of Matter	21 hours
Unit 3: Energy Changes and Rates of Reaction	20 hours
Unit 4: Chemical Systems and Equilibrium	28 hours
Unit 5: Electrochemistry	15 hours
Final Assessment Tasks	5 hours
<b>TOTAL</b>	<b>110 hours</b>

### **Unit Description:**

#### **Unit 1: Organic Chemistry**

**Time: 21 hours**

Organic chemistry is used to create a whole suite of products that we use in everyday life, including gasoline, toothpaste, hairsprays, and perfumes, to name just a few. In this unit, students will begin by learning about different functional groups and the IUPAC system of nomenclature of these groups. Students will then explore the various reactions of these functional groups, from alkenes and aromatic hydrocarbons, to alcohols and carboxylic acids. In addition, students will briefly investigate the properties of these various functional groups, such as polarity and boiling points. Finally, students will use their knowledge of organic chemistry to study polymers and investigate their use in industrial applications.

#### **Unit 2: Structure and Properties of Matter**

**Time: 21 hours**

In this unit, students will bring by learning about the Bohr-Rutherford model of the atom and how it came to exist. Students will then explore the use of Lewis dot diagrams to represent atoms and molecules and learn about the concepts of chemical bonding and how they relate to the physical properties of molecular and covalent compounds. In addition, students will learn about electronegativities and the differences in properties between polar and non-polar molecules. Finally, students will learn how to predict the shapes of various molecules in relation to the types of bonds that the molecules contain.

**Unit 3: Energy Changes and Rates of Reaction****Time: 20 hours**

In this unit, students develop an understanding of the energy transformations and kinetics of chemical change. Using experimental data and calculations, they determine energy changes for physical and chemical processes and rates of reaction. In addition, students will investigate Hess's Law and enthalpies of formation to determine heat changes for various chemical reactions. Finally, students will develop an understanding of the dependence of chemical technologies and processes on the energetic of chemical reactions.

**Unit 4: Chemical Systems and Equilibrium****Time: 28 hours**

In this unit, students develop an understanding of chemical equilibrium, Le Chatelier's Principle, and solution equilibrium. Students will investigate the behavior of different equilibrium systems and build their problem-solving skills as they solve problems involving the law of chemical equilibrium. In addition, students investigate energy changes and equilibrium by examining entropy and Gibb's Free Energy Change. Finally, students will research and explain the importance of chemical equilibrium in various systems, including ecological, biological, and technological systems.

**Unit 5: Electrochemistry****Time: 15 hours**

In this unit, students build on their knowledge of oxidation-reduction reactions by learning how to assign oxidation numbers to atoms and balancing redox equations in acidic and basic solution. Students will then use their knowledge of redox reactions to investigate oxidation and reduction potentials of various compounds and learn about the electrical potential of cells. In addition, students will use their knowledge of redox reactions to explore the use of galvanic and voltaic cells and their applications in creating different kinds of batteries for industrial and commercial use.

**Final Assessment Task****Time: 5 hours**

This course has provided students with numerous and varied opportunities to demonstrate the full extent of their achievement of the curriculum expectations, across all four categories of knowledge and skill. 30% of the final grade will be based on a final evaluation in the form of a written examination.

**Teaching and Learning Strategies**

A wide range of teaching and learning strategies are employed including reading and taking notes, experimentation and the creation of lab reports, research, discussion, problem sets, and the presentation of visual models that move and allow students to see what is being taught.

Lecture	Problem Solving	Visuals
Independent Study	Direct Instruction	Multimedia Productions
Research Project	Practical Exercise	Problem Posing
Assignments	Graphing Applications	Self-Assessments

Diagnostic assessment is used at the beginning of a unit to assist in determining a starting point for instruction. Assessment for Learning (AFL) provides information to students as they are learning and refining their skills. Assessment as Learning (AAL) acts as a stepping-stone for students to begin applying their understanding using critical thinking; it bridges the gap between AFL and AOL. Assessment of Learning (AOL), at the end of units and course, provides students with the opportunity to synthesize/apply/demonstrate their learning and the achievement of the expectations. The following is a list of specific assessment/evaluation strategies that the teacher may use but is not limited to.

### Assessment and Evaluation

Evaluation in this course will be continuous throughout the year and will include a variety of evaluation methods. The tools highlighted in yellow will be used for the three different types of assessments:

Assessment as Learning	Assessment for Learning	Assessment of Learning
<b>Student Product</b> <p>Journals/Letters/Emails (checklist)</p> <p>Learning Logs (anecdotal)</p> <p><b>Learning Goals (Checklist)</b></p> <p>Entrance tickets</p> <p>Exit tickets.</p>	<b>Student Product</b> <p>Assignment</p> <p>Journals/Letters/Emails (checklist)</p> <p><b>Pre-tests (scale/rubric)</b></p> <p>Peer feedback (anecdotal/checklist)</p> <p>Entrance ticket</p> <p>Vocabulary notebooks (anecdotal)</p>	<b>Student Product</b> <p>Assignment</p> <p>Journals/Letters/Emails (checklist)</p> <p><b>Tests (scale/rubric)</b></p> <p><b>Exam</b></p> <p>Reports (rubric)</p> <p>Essays (rubric)</p>
<b>Observation</b> <p><b>Whole class discussions (anecdotal)</b></p> <p>Self-proofreading (checklist)</p>	<b>Observation</b> <p><b>Class discussions (anecdotal)</b></p> <p>Debate (rubric)</p> <p>Performance tasks (anecdotal/scale)</p>	<b>Observation</b> <p><b>PowerPoint presentations (rubric)</b></p> <p><b>Performance tasks (checklist)</b></p>
<b>Conversation</b> <p>Student teacher conferences (checklist)</p> <p><b>Small Group Discussions (checklist)</b></p> <p><b>Pair work (checklist)</b></p>	<b>Conversation</b> <p>Student teacher conferences (checklist)</p> <p>Small group discussions (checklist)</p> <p>Pair work (anecdotal)</p> <p>Peer-feedback (anecdotal)</p>	<b>Conversation</b> <p>Student teacher conferences (checklist)</p> <p><b>Question and Answer Session (checklist)</b></p> <p>Oral tests (scale/rubric)</p>

	<b>Peer-editing (anecdotal)</b> <b>Oral pre-tests (scale/rubric)</b>	
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### **The Final Grade:**

The percentage grade represents the quality of the students' overall achievement of the expectations for the course and reflects the corresponding achievement as described in the achievement chart for science. The distribution of marks into a grade is based on the departmental assessment and evaluation guide for the course and will reflect the student's most consistent level of achievement where appropriate. Comments on the development of learning skills and contributions to the course will be provided on reports. Term work will be 70% of the overall grade for the course; the final evaluation will be 30% of the overall grade, incorporating a virtual laboratory and a final written examination at the end of the semester.

<b>Assessment and Percentage of Final Mark</b>	
<b>(Term) 70%</b>	Unit 1 Test: Organic Chemistry <b>(7%)</b> [Student Product]
	Unit 2 Test: Atomic Structure and Properties <b>(8%)</b> [Student Product]
	Unit 3 Test: Thermochemistry and Rates of Reactions <b>(9%)</b> [Student Product]
	Unit 4 Test: Equilibrium <b>(10%)</b> [Student Product]
	Unit 5 Test: Electrochemistry <b>(11%)</b> [Student Product]
	Presentations with Question/Answer <b>(10%)</b> [Observation/Conversation]
	Laboratory Investigation – Performance task <b>(15%)</b> [Observation]
<b>30%</b>	Final Culminating Performance task <b>(10%)</b> [Observation]
	Final Evaluation Exam <b>(20%)</b> [Student Product]

### **Cumulative Performance Task (CPT)**

The students are expected to write a short essay question that will assess their ability to take a particular chemistry concept and relate it to everyday phenomenon. The short essay response should be between 300-500 words in length. You must include in-text references and a works cited page using either APA or MLA style.

A Summary Description of Achievement in Each Percentage Grade Range and Corresponding Level of Achievement		
Percentage Grade Range	Achievement Level	Summary Description
80-100%	Level 4	A very high to outstanding level of achievement. Achievement is <i>above</i> the provincial standard.
70-79%	Level 3	A high level of achievement. Achievement is <i>at</i> the provincial standard.
60-69%	Level 2	A moderate level of achievement. Achievement is <i>below, but approaching</i> , the provincial standard.
50-59%	Level 1	A passable level of achievement. Achievement is <i>below</i> the provincial standard.
below 50%	Level R	Insufficient achievement of curriculum expectations. A credit will not be granted.

The student's final mark will include the following weighting and have a balance of the four categories embedded:

Knowledge & Understanding	20 %
Critical Thinking/Inquiry Skills	20 %
Communication	15 %
Application	15 %
Culminating Performance Task/Final Examination	30%
<b>Total</b>	<b>100%</b>

### **Program Planning Considerations:**

**English language learners:** As our school can have multilingual student population, special accommodation will be made to bring a rich diversity of background knowledge and experience to the classroom.

TWS courses can provide a wide range of options to address the needs of ESL/ELD students. Assessment and evaluation exercises will help ESL students in mastering the English language. In addition, since all occupations require employees with a wide range of English skills and abilities, many students will learn how the operation of their own physical world can contribute to their success in their social world. The student whose first language is not English enters Ontario Secondary schools with diverse linguistic and cultural backgrounds. All of these students bring a rich array of background knowledge and experience to the classroom, and all teachers must share in the responsibility for their English-language development. Teachers must incorporate appropriate strategies for instruction and assessment to facilitate the success of the English language learners in their classrooms. These strategies include:

- modification of some or all of the course expectations so that they are challenging but attainable for the learner at his or her present level of English proficiency, given the necessary support from the teacher;
- use of a variety of instructional strategies (e.g., extensive use of visual cues,

scaffolding, manipulatives, pictures, diagrams, graphic organizers; attention to clarity of instructions);

- modelling of preferred ways of working in English; previewing of textbooks; pre-teaching of key vocabulary; peer tutoring; strategic use of students' first languages);
- use of a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, materials that reflect cultural diversity);
- use of assessment accommodations (e.g., granting of extra time; simplification of language used in problems and instructions; use of oral interviews, learning logs, portfolios, demonstrations, visual representations, and tasks requiring completion of graphic organizers or cloze sentences instead of tasks that depend heavily on proficiency in English).

**Literacy education:** Communication skills are fundamental to the development of literacy. Fostering students' communication skills is an important part of the teacher's role in the curriculum. When students read they need to understand vocabulary and terminology. Students are encouraged to use language with care and precision in order to communicate effectively. Students are encouraged to ask questions to their peers/teachers and to also be proactive with solving their own questions.

**The role of information and communications technology:** Information and communication technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning. Teachers can use ICT tools and resources both for whole-class instruction and to design programs that meet diverse student needs. Technology can help to reduce the time spent on routine tasks, allowing students to devote more of their efforts to thinking and concept development.

Information technology is considered a learning tool that must be accessed by students when the situation is appropriate. As a result, students will develop transferable skills through their experience with word processing, internet research, and presentation software, as would be expected in any environment.

Technology also makes possible simulations of complex systems that can be useful for problem-solving purposes or when field studies on a particular topic are not feasible. Information and communications technologies can be used in the classroom to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Although the Internet is a powerful electronic learning tool, there are potential risks attached to its use. All students must be made aware of issues of Internet privacy, safety, and responsible use, as well as of the ways in which this technology is being abused – for example, when it is used to promote hatred.

Teachers, too, will find the various ICT tools useful in their teaching practice, both for whole class instruction and for the design of curriculum units that contain varied approaches to learning to meet diverse student needs.

**Equity and Inclusive Education:** The TWS equity and inclusive education strategy focuses on respecting diversity, promoting inclusive education, and identifying and eliminating discriminatory biases, systemic barriers, and power dynamics that limit the

ability of students to learn, grow, and contribute to society. In an environment based on the principles of inclusive education, all students, parents, caregivers, and other members of the school community - regardless of ancestry, culture, ethnicity, sex, physical or intellectual ability, race, religion, gender identity, sexual orientation, socio-economic status, or other similar factors - are welcomed, included, treated fairly, and respected. Diversity is valued, and all members of the TWS community feel safe, comfortable, and accepted. Every student is supported and inspired to succeed in a culture of high expectations for learning. In an inclusive education system, all students see themselves reflected in the curriculum, their physical surroundings, and the broader environment, so that they can feel engaged in and empowered by their learning experiences. In addition, TWS differentiates the instruction and assessment strategies to take into account the background and experiences, as well as the interests, aptitudes, and learning needs, of all students.

### **Plagiarism/Cheating:**

Any incident of plagiarism or cheating will result in a re-submission/rewrite of that particular assignment/test at the end of the course on the student's own time and at his/her own expense to pay for the creation and marking of a new assessment. The incident will be documented in the office. A second incident of plagiarism or cheating in any course will result in a mark of zero for that assignment. For example, if you cheat on a math test and then plagiarize an English essay, you will receive a zero on the essay.

### **Missed and Late Assignment Policy:**

Teachers will make it clear to the students and parents/guardian early in the school year that they are responsible not only for their behaviour in the classroom/school but also for providing evidence of their achievement of the overall expectations within the time frame specified by the teacher and in a form approved by the teacher. Students must understand that there will be consequences for not completing assignments for evaluation or for submitting those assignments late. Where in the teacher's professional judgment it is appropriate to do so, a number of strategies will be used to encourage the student to modify his/her behaviour. Some of these may include:

- Asking the student to clarify the reason for not completing the assignment taking into consideration legitimate reasons for missed deadlines
- Maintaining ongoing communication with students and/or parents about due dates and late assignments, and scheduling conferences with parents if the problem persists
- Setting up a student contract
- Providing alternative assignments or tests/exams where, in the teacher's professional judgment, it is reasonable and appropriate to do so
- Deducting marks for late assignments, up to and including the full value of the assignment

Students and parent/guardians will be informed in a timely fashion via phone call, face to face conference, e-mail and if need be a formal letter about the importance of submitting assignments for evaluation when they are due and about the consequences for students who submit assignments late or fail to submit assignments. **If the above**

**measures have been put into place and the behaviour of the student has no provided sufficient evidence, then 0 will be inserted as the mark for the missed assignment.**

### **Resources**

Chemistry 12, McGraw-Hill Ryerson, 2002

Growing Success: Assessment Evaluation and Reporting in Ontario Schools, First Edition  
Covering Grades 1-12

### **Attendance Policy:**

Consistent log-in is crucial to a student's success in Toronto World School's online program. The guidelines of the Ministry of Education require that students receive at least 110 hours of scheduled instruction time for each credit course. Attendance patterns will be monitored to ensure a student is actively logging into their course.

Students who have not completed the course within 12 months of enrolment will be automatically removed from the course. Only under extenuating circumstances, with proper documentation and the permission of the Principal, can a student be reinstated.

### **Acceptable Online Use Policy**

Toronto World School uses the ConnectED Integrated Learning Platform and is intended for educational purposes only. The use of this program or any tools within TWS systems, other than for educational purposes, is strictly prohibited. The inappropriate uses include, but are not limited to, criminal, obscene, commercial, cyber-bullying or illegal purposes.

The administration has the right to review all student work in order to determine the appropriateness of computer use. If TWS online programs are deemed to be used inappropriately, the Administration will levy consequences which may include suspensions and/or removal from the program. In some cases, further action may be taken including contacting day schools, legal representation or the police.

Students need to be very vigilant in order to prevent them getting into a situation where they may be suspected for inappropriate use.

Therefore, students are reminded to

- Always protect their passwords and not share them with anyone
- Always inform their teachers of suspicious messages or other incidents that they encounter
- Always only access content that is intended for educational use.

### **Hardware/software requirements:**

#### *Hardware:*

- PC running Windows 8 or higher
- Mac running Apple OS X or higher
- Chromebook running Chrome OS

*High speed internet is recommended with access to a computer with the following:*

- A processor of 2GHz or faster

- 4 GB RAM or greater
- A high speed internet connection of 1.5 MB/s or faster
- Keyboard and mouse
- Headphone/Speakers/Microphone/Camera

*Recommended Software:*

- Adobe Reader, Shockwave, Flash Player, Java, Office suite

*Browser:*

- Mozilla Firefox4 or higher, Internet Explorer 7 or higher, Safari 5 or higher, Google Chrome 11 or higher