INSTITUTE OF CANADIAN EDUCATION

Course Title: Chemistry – SCH4U – Grade 12

Course Name: Chemistry

Course Code: SCH4U

Grade: 12

Course Type: University preparation

Credit Value: 1.0

Prerequisite: Chemistry, Grade 11, University Preparation
Curriculum Policy Document: The Ontario Curriculum, Grades 11–12: Science, 2008 (Revised); *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools* (2010)
Course Developer: Institute of Canadian Education.

Department: Science
Head of Department: Sadiya Manjra
Development Date: 2025
Most Recent Revision Date: 2026

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

Prerequisite: Chemistry, Grade 11, University Preparation

COURSE EXPECTATION

UNIT	UNIT NAME	UNIT DESCRIPTION	TIME ALLOCATED
UNIT 1	Organic Chemistry	Study of alkanes, alkenes, alkynes, halides, oxygen- and nitrogen-containing compounds, polymers, and organic reactions.	20 Hours
UNIT 2	Structure and Properties of Matter	Atomic theories, atomic structure, bonding, electron configurations, molecular shapes, and VSEPR theory.	20 Hours
Mid Term Exam	–	Assessment of Units 1–2 concepts and skills.	2 Hours
UNIT 3	Energy Changes and Rates of Reaction	Energy in reactions, enthalpy, bond energy, Hess's Law, and rates of chemical reactions.	20 Hours
UNIT 4	Chemical Systems and Equilibrium	Chemical equilibrium, Le Châtelier's principle, equilibrium constants, solubility, acids, bases, pH, buffers, titrations, and acid-base equilibrium.	25 Hours
UNIT 5	Electrochemistry	Introduction to electrochemistry, redox reactions, galvanic cells, balancing redox reactions, and electrochemical applications.	21 Hours
FINAL	Final Exam	Assessment covering all course content.	2 Hours
TOTAL	–	–	**110 Hours**

Overall Curriculum Expectations:

By the end of this course, students will:

A: Scientific Investigation Skills and Career Exploration
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)

B: Structure and Properties of Matter
B1. 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;
B2. investigate the molecular shapes and physical properties of various types of matter;
B3. 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.

C: Organic Chemistry
C1. 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;
C2. investigate organic compounds and organic chemical reactions, and use various methods to represent the compounds;
C3. demonstrate an understanding of the structure, properties, and chemical behaviour of compounds within each class of organic compounds.

D: Energy Changes and Rates of Reaction
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;
E3. demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause shifts in the equilibrium of chemical systems.

F: Electrochemistry
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.

TEACHING AND LEARNING STRATEGIES

Participation Activities: Seven standardized, course-wide prompts (Teach the Teacher, Concept in Action, Spot the Error, Concept Connections, Take a Position, Claim/Support/Question, and a culminating Course Takeaways video) embedded throughout the course to build metacognitive engagement and contribute to the participation grade.

End of Unit Conversations: Opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

Reflection: An opportunity for students to look back at concepts and theories with new eyes, relate theory to practice, and align learning with their own values and beliefs.

Discussions with the Instructor: Facilitated through video conferencing to discuss concepts and skills, enabling two-way communication and helping build a relationship between student and instructor.

Instructor Demonstrations: Opportunities for the instructor to lead a student through a concept or skill (e.g. research skills) via video conferencing, videos, or email.

Discussion Forums: An opportunity for students to summarize and share ideas and perspectives with peers, deepening understanding through expression and enabling peer-to-peer feedback.

Individual Activities/Assignments: Completed at a student's own pace to expand and consolidate learning, with accommodation for IEPs and unique interests, and ongoing oral and written teacher feedback.

Research: An opportunity to apply inquiry skills to a practical problem or question, involving gathering information, evaluating sources, analyzing findings, and synthesizing conclusions through creative and critical thinking.

Writing as a Learning Tool: Helps students think critically about course material while organizing and integrating prior knowledge with new concepts, reinforcing communication skills.

Diagrams: Visual representations of scientific ideas that organize concepts and promote cognitive plasticity, helping students remember and reframe ideas.

Graphics/Images: Visual representations of ideas/concepts that similarly promote cognitive plasticity.

Charts: Visual, math-based representations of scientific ideas that support analysis (e.g. a pie chart of Canada's energy sources).

Tables: Organize information into categories (rows and columns) to clarify relationships between ideas and data and highlight trends.

Drawings and Schematics: Visual explanations of scientific and engineering ideas (e.g. an electric circuit shown through symbols) that communicate ideas clearly and universally.

Articles: Examples of scientific concepts and theories discussed in relation to current events, showing how science is intertwined with society and diverse lived experiences.

Practice Problems: Provide a scenario or problem for students to solve by applying learned concepts and skills, reinforcing the relevance of their learning.

Assessment

Students will be provided with numerous and varied opportunities to demonstrate the full extent of their achievement of the curriculum expectations, across all four categories of the Achievement Chart. Progress will be monitored on an on-going basis using a variety of assessment tools, including written work, formal testing, quizzes, teacher-student communication, discussion boards and chat rooms.

Assessment FOR Learning	Assessment AS Learning	Assessment OF Learning
Diagnostic quizzes	You Try! Self-check problems	Research projects (STSE focused)

Homework assignments	Oral presentations (conferences)	Inquiry Projects
Individual conference meetings		Tests & Exam

Evaluation

Final Grade

The final grade will be determined as follows (in accordance with Ministry of Education standards):

Term Work Based on evaluations conducted throughout the course.	65%
Final Evaluation A final evaluation in the form of a written exam.	20%
Attendance and Participation	15%

Final Evaluation Breakdown:

- 20% written exam

ATTENDANCE POLICY

Regular attendance and active engagement are important for student success. Attendance and participation are monitored through the school's Learning Management System (LMS).
All online credit courses at ICE are designed to meet or exceed the **minimum 110 hours of instructional time** required for a credit course.

Online instructional time and engagement are monitored through:

- **LMS Engagement:** Students are expected to log in regularly and actively participate in online learning activities. LMS activity records are used to monitor engagement.
- **Biweekly Check-Ins:** Students complete a brief check-in every two weeks to review their progress and engagement. Additional support may be provided when concerns are identified.
- **Post-Unit Quizzes:** Short formative quizzes are completed at the end of each unit to monitor student progress and pacing.

- **Discussion Forums:** Students participate in required unit discussions and peer activities. Participation is monitored based on completion and engagement.

Students are responsible for maintaining regular participation and completing required learning activities within the course schedule.

EVALUATION MODEL – 10% TOTAL ATTENDANCE AND ENGAGEMENT WEIGHT

Component	Weight	Quantifiable Metric	Criteria
Biweekly Check-In	3%	Completed every two weeks	Students completes the required check-in within the scheduled time frame.
Post-Unit Formative Quiz	4%	Completed after each unit	Student completes the formative quiz by the assigned deadline.
Discussion Forum Participation	3%	Required posts and responses	Student submits the required original response and completes assigned peer responses.

CONSIDERATION FOR PROGRAM PLANNING

PLANNING PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

OES teachers support all students, guided by the principles of *Learning for All* (2013). Where a student has an IEP, its accommodations are implemented within the course, and the asynchronous online structure naturally supports extended time, breaks, assistive technology, and repeated review of material.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

OES serves a linguistically diverse population of English language learners, both Canadian-born and newcomers, and follows Ministry ESL/ELD policy in planning appropriate adaptations. Supports include modified instructional language without altering curriculum expectations, visual/multimedia aids, extended time, and accommodations such as bilingual dictionaries.

ENVIRONMENTAL EDUCATION

Consistent with Ministry environmental education policy, environmental education is embedded across the curriculum rather than taught separately, and OES also models environmental responsibility through paperless delivery and no daily commuting. This course's STSE focus naturally incorporates topics like sustainability, resource use, and the environmental impact of human activity.

EQUITY AND INCLUSIVE EDUCATION

The course is planned and delivered in line with Ontario's Equity and Inclusive Education Strategy and PPM No. 119, aiming for an inclusive environment where all students feel welcomed and able to succeed regardless of background. Teachers select diverse learning materials, address bias, and ensure fair, culturally unbiased assessment.

FINANCIAL LITERACY EDUCATION

In accordance with Ministry financial literacy policy, students build the knowledge and skills to make informed financial decisions and think critically about economic forces affecting their lives. The course also incorporates cost-benefit analysis of technologies and the financial implications of health- and environment-related decisions.

FIRST NATIONS, MÉTIS, AND INUIT EDUCATION

Program planning aligns with the Ontario First Nation, Métis, and Inuit Education Policy Framework, incorporating Indigenous perspectives, authors, and content where appropriate to curriculum expectations. Students also gain opportunities to learn about Indigenous histories and contemporary realities, including the residential school legacy and the TRC's Calls to Action.

THE ROLE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

ICT is integral to every aspect of OES courses, from instruction and assessment to teacher-student communication, all delivered through the school's learning management system. Teachers also help students develop digital citizenship skills, including responsible technology use, source evaluation, and academic integrity online.

CAREER EDUCATION

Consistent with *Creating Pathways to Success*, the course helps students explore who they are, their opportunities, and their goals, with many work-related and career-exploration activities embedded throughout. OES guidance staff support course selection and postsecondary planning, and the course connects to pathways in health sciences, engineering, environmental science, research, technology, and skilled trades.

COOPERATIVE EDUCATION AND OTHER FORMS OF EXPERIENTIAL LEARNING

Experiences like job shadowing, work experience, and cooperative education let students see the relevance of classroom learning and explore careers, consistent with Ministry co-op policy; students can earn up to two co-op credits toward their OSSD. Interested students are encouraged to contact OES guidance staff to discuss available options.

HEALTH AND SAFETY

Despite remote learning, OES prioritizes health and safety by promoting sound ergonomics, balanced screen time, and mental well-being, within a safe, respectful virtual environment with clear channels for reporting concerns. For hands-on, at-home investigations, students receive

explicit safety instruction and use only safe materials under stated precautions, with virtual labs/simulations substituted where risk would otherwise be present.

Required Software, Equipment, Textbooks

Required Textbooks and Resources:

- Chemistry textbooks covering organic chemistry, atomic structure, energy changes, equilibrium, and electrochemistry
- Supplementary readings, articles, videos, and online resources on chemistry, energy, and environmental impact
- Teacher-provided worksheets, practice exercises, and virtual simulations

Digital Resources and Software:

- Google Drive – storing, sharing, and submitting assignments
- Internet access for research and chemistry databases
- Microsoft Office Suite (Word, Excel, PowerPoint) or equivalent software for lab reports, presentations, and data analysis

Teacher Considerations:

- Assistive technology (text-to-speech, speech-to-text, screen readers) may be used
- Flexibility in submission formats (Google Docs, PDFs, slides, lab reports)
- Guided notes, concept maps, and scaffolded instruction for complex chemistry concepts

Tips for Success – SCH4U

Welcome to SCH4U: Grade 12 Chemistry – University Preparation

- Check announcements and course messages daily.
- Review the course calendar and meet all assignment and lab deadlines.
- Carefully review assignment/lab instructions and rubrics. Use checklists to ensure accuracy.
- Participate actively in discussions, labs, and simulations.

Ask for help:

- For technical issues, contact the Help Desk.
- For course-related questions, email your teacher (expect a response within 24 hours; mark as “URGENT” if necessary).

Key Elements to Success:

- Time Commitment: 1–2 hours of focused study daily, plus additional lab time.
- Communication: Maintain regular contact with your teacher for guidance and feedback.
- Engagement: Stay curious, persistent, and attentive in all activities.

Remember: This course is designed to help you understand how chemical concepts, processes, and laboratory investigations impact daily life, technology, and the environment. Approach all activities thoughtfully and accurately while developing scientific reasoning, problem-solving, and ethical considerations in chemistry.