Ontario eSecondary School
Course Outline
2024-2025

Ministry of Education Course Title: Chemistry, University Preparation	
Ministry Course Code: SCH3U	
Course Type: University Preparation	
Grade: 11	
Credit Value: 1.0	
Prerequisite(s): SNC2D, Grade 10 Science, Academic Level	
Department: Science	
Course developed by: **Sara McCormick**	**Date: March 6th, 2019** **Revised: April 1st, 2021**
Length: **One Semester**	**Hours:** **110**
This course has been developed based on the following Ministry documents: 1. *Science, The Ontario Curriculum, Grades 11 and 12*, 2008, (revised) 2. *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)* 3. *Learning for All (2013)*	

COURSE DESCRIPTION/RATIONALE

This course enables students to deepen their understanding of chemistry through the study of the properties of chemicals and chemical bonds; chemical reactions and quantitative relationships in those reactions; solutions and solubility; and atmospheric chemistry and the behaviour of gases. Students will further develop their analytical skills and investigate the qualitative and quantitative properties of matter, as well as the impact of some common chemical reactions on society and the environment.

OVERALL CURRICULUM EXPECTATIONS

Scientific Investigation Skills and Career Exploration
By the end of the course, students will:

- 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)

Matter, Chemical Trends, and Chemical Bonds
By the end of this course, students will:

- analyse the properties of commonly used chemical substances and their effects on human health and the environment, and propose ways to lessen their impact;
- investigate physical and chemical properties of elements and compounds, and use various methods to visually represent them;
- demonstrate an understanding of periodic trends in the periodic table and how elements combine to form chemical bonds.

Chemical Reactions
By the end of this course, students will:

- analyse chemical reactions used in a variety of applications, and assess their impact on society and the environment;
- investigate different types of chemical reactions;
- demonstrate an understanding of the different types of chemical reactions.

Quantities in Chemical Reactions
By the end of this course, students will:

- analyse processes in the home, the workplace, and the environmental sector that use chemical quantities and calculations, and assess the importance of quantitative accuracy in industrial chemical processes;
- investigate quantitative relationships in chemical reactions, and solve related problems;
- demonstrate an understanding of the mole concept and its significance to the quantitative analysis of chemical reactions.

Solutions and Solubility
By the end of this course, students will:

- analyse the origins and effects of water pollution, and a variety of economic, social, and environmental issues related to drinking water;
- investigate qualitative and quantitative properties of solutions, and solve related problems;
- demonstrate an understanding of qualitative and quantitative properties of solutions.

Gases and Atmospheric Chemistry
By the end of this course, students will:

- analyse the cumulative effects of human activities and technologies on air quality, and describe some Canadian initiatives to reduce air pollution, including ways to reduce their own carbon footprint;

- investigate gas laws that explain the behaviour of gases, and solve related problems;
- demonstrate an understanding of the laws that explain the behaviour of gases.

COURSE CONTENT

Unit	*Length*
Unit 1: Matter, Chemical Trends, and Chemical Bonding	21 hours
Unit 2: Chemical Reactions	15 hours
Unit 3: Quantities in Chemical Reactions	20 hours
Unit 4: Solutions and Solubility	22.5 hours
Unit 5: Gases and Atmospheric Chemistry	22.5 hours
Unit 6: Course Review and Exam	9 hours
	Total 110 Hours

UNIT DESCRIPTIONS

UNIT 1: MATTER, CHEMICAL TRENDS, AND CHEMICAL BONDING

In this unit, students will investigate physical and chemical properties of elements and compounds, and use various methods to visually represent them. Students will also demonstrate an understanding of periodic trends in the periodic table and how elements combine to form chemical bonds. Lastly, students will analyse the properties of commonly used chemical substances and their effects on human health and the environment, and propose ways to lessen their impact.

UNIT 2: CHEMICAL REACTIONS

In this unit, students will investigate different types of chemical reactions and demonstrate an understanding of the different types of chemical reactions. Lastly, students will analyse chemical reactions used in a variety of applications, and assess their impact on society and the environment.

UNIT 3: QUANTITIES IN CHEMICAL REACTIONS

In this unit, students will investigate quantitative relationships in chemical reactions, and solve related problems. Students will also demonstrate an understanding of the mole concept and its significance to the quantitative analysis of chemical reactions. Lastly, students will analyse processes in the home, the workplace, and the environmental sector that use chemical quantities and calculations, and assess the importance of quantitative accuracy in industrial chemical processes.

UNIT 4: SOLUTIONS AND SOLUBILITY

In this unit, students will demonstrate an understanding of qualitative and quantitative properties of solutions. Students will also investigate qualitative and quantitative properties of solutions, and solve related problems. Lastly, students will analyse the origins and effects of water pollution, and a variety of economic, social, and environmental issues related to drinking water.

UNIT 5: GASES AND ATMOSPHERIC CHEMISTRY

In this unit, students will demonstrate an understanding of the laws that explain the behaviour of gases. Students will also investigate gas laws that explain the behaviour of gases, and solve related problems. Lastly, students will analyse the cumulative effects of human activities and technologies on air quality, and describe some Canadian initiatives to reduce air pollution, including ways to reduce their own carbon footprint.

TEACHING AND LEARNING STRATEGIES

In this course, students will experience the following activities.

Presentations with embedded videos are utilized to outline concepts, explain theory with the use of examples and practice questions, and incorporate multi-media opportunities for students to learn more (e.g. online simulations, quizzes, etc.).

End of unit conversations and Poodlls are opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

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

Discussions with the instructor are facilitated through video conferencing, discussing the concepts and skills being studied. This enables two-way communication between the student and the instructor, to share ideas and ask questions in dialogue. This also helps to build a relationship between the student and instructor.

Instructor demonstrations (research skills, etc.) are opportunities for the instructor to lead a student through a concept or skill through video conferencing, videos, or emailing with the student.

Practical extension and application of knowledge are integrated throughout the course. The goal is to help students make connections between what they learn in the classroom and how they understand and relate to the world around them and their own lives. Learning becomes a dynamic opportunity for students to be more aware that their learning is all around them and enable them to create more meaning in their lives.

Individual activities/assignments assessments are completed individually at a student's own pace and are intended to expand and consolidate the learning in each lesson. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. For this reason, students are encouraged to discuss IEPs (Individual Education Plans) with their teacher and to ask to modify assessments if they have a unique interest that they feel could be pursued in the assessment. The teacher plays an important role in supporting these activities by providing ongoing feedback to students, both orally and in writing.

Research is an opportunity to apply inquiry skills to a practical problem or question. Students perform research to gather information, evaluate quality sources, analyze findings, evaluate their analysis, and synthesize their findings into conclusions. Throughout, students apply both creative thinking and critical thinking. New questions are also developed to further learning.

Writing as a learning tool helps students to think critically about course material while grasping, organizing, and integrating prior knowledge with new concepts. Good communication skills are important both in and out of the classroom.

Virtual simulations are interactive websites that provide students with an opportunity to ask questions, explore hypotheses, relate variables, examine relationships, and make connections between theory and application in a safe environment that promotes intellectual risk taking and curiosity.

Virtual labs are interactive websites that provide students with an opportunity to follow a procedure to test hypotheses using scientific apparatus, gather and record observations, analyze observations using formula and relevant theory/concepts, and then formulate conclusions that relate hypotheses to analysis.

Diagrams are visual representations of scientific ideas and concepts. They provide another perspective to organize ideas. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Graphics/images are visual representations of ideas/concepts. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Charts are visual representations of scientific ideas and concepts using math that support analysis. For example, you can have a pie chart that shows Canada's energy sources.

Tables involve organizing information in terms of categories (rows and columns). This helps us to understand the relationships between ideas and data, as well as highlight trends.

Drawings and schematics are scientific and engineering ideas explained visually. For example, an electric circuit can be explained using symbols, which makes it possible to communicate ideas universally, clearly, and succinctly.

Articles are examples of concepts and theories being discussed in the public realm and with respect to current events. They are snapshots not only of why scientific theories/concepts/applications are relevant but also provide a window into the broader context of scientific knowledge and understanding. Students learn through reading and analysis that science is deeply related to, and intertwined with, society and the diverse perspectives of lived experience.

Practice problems provide students with a scenario/problem to solve by applying concepts and skills learned in a context. This helps students to understand the relevance of their learning.

ASSESSMENT, EVALUATION, AND REPORTING

Assessment: The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

Evaluation: Assessment of Learning focuses on Evaluation, which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

Reporting: Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists and inventories, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress.

Units conclude with unit tests and performance tasks (student designed inquiry projects and lab reports). Teachers are encouraged to share goals with students early in the course and to connect Unit learning experiences frequently and explicitly with big ideas, overall expectations, and performance tasks. The teacher could also involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool that can support the writing process and practice.

ASSESSMENT ACTIVITIES

- ❑ You Try! Self-check problems
- ❑ Homework assignments
- ❑ Individual conference meetings
- ❑ Diagnostic quizzes
- ❑ e-Portfolio contributions (including oral and written submissions)

- ❑ Oral presentations (conferences)
- ❑ Research projects (STSE focused)
- ❑ Inquiry Projects
- ❑ Tests & Exam

EVALUATION

The final grade will be determined as follows:

- ❑ Seventy per cent of the grade will be based on evaluation 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 will be given to more recent evidence of achievement.
- ❑ Thirty percent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course.

  (*Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. Ontario Ministry of Education Publication, 2010 p.41)

Weightings	
Course Work	**70**
Knowledge/Understanding (K)	21
Thinking/Inquiry (T)	15.5
Communication (C)	15.5
Application (A)	18
Final	**30**
Performance Task (1.5K, 1.7T, 5.3C, 1.5A)	10
Final Exam (5K, 5T, 5C, 5A)	20

TERM WORK EVALUATIONS (70%)

Evaluation Item	Description	Category	Weight
Unit 1 Nomenclature Quiz	Students will be evaluated on unit concepts and terms.	K	12
Unit 1 Test	All students must write the Unit Test for each Unit.	KA	
Unit 2 Types of Reactions Quiz	Students will be evaluated on unit concepts and terms.	K	16
Unit 2 Classifying Reactions Assignment	Students will extend and transfer their understanding of unit concepts by completing engaging assignments.	T, C,	
Unit 2 Lab	Two term Inquiry Labs will be completed	K, T, C, A	

Unit 2 Test	All students must write the Unit Test for each Unit.	K, T, C, A	
Unit 3 Limiting Reagents Assignment	Students will extend and transfer their understanding of unit concepts by completing engaging assignments.	T, C	16
Unit 3 STSE Assignment	Two STSE Projects will be completed	K, T, C, A	
Unit 3 Test	All students must write the Unit Test for each Unit.	K, A	
Unit 4 Solubility Curve Assignment	Students will extend and transfer their understanding of unit concepts by completing engaging assignments.	T, C	14
Unit 4 Test	All students must write the Unit Test for each Unit.	K, T, C, A	
Unit 4 Lab	Two term Inquiry Labs will be completed	K, T, C, A	
Unit 5 Gas law Quiz	Students will be evaluated on unit concepts and terms.	K	12
Unit 5 STSE Assignment	Two STSE Projects will be completed	T, C	
Unit 5 Test	All students must write the Unit Test for each Unit.	KA	

FINAL EVALUATIONS (30%)

Evaluation Item	Description	Category	Weight
Final Project	A comprehensive project, covering all overall curriculum expectations for the course.	K, T, C, A	10
Final Exam	A final, written examination, covering all curriculum expectations for the course.	K, T, C, A	20

AAL/AFL/AOL TRACKING SHEET

Unit 1: Matter, Chemical Trends, and Chemical Bonding

AAL	**AFL**	**AOL**
Isotopes Worksheet	Atomic Theory Chart	Nomenclature Quiz
Polarity of Bonds Worksheet	Periodic Trends	Unit 1 Test
Unit 1 Self Assesssment	Testable Questions	
Teacher check in	Lab Report	
	Molecular Polarity Predictions	
	Intermolecular Forcces	
	Unit 1 Review	

Unit 2: Chemical Reactions

AAL	**AFL**	**AOL**
Word and Chemical Equations Worksheet	Balancing Simulation	Classify Reactions Assignment
Synthesis and Decomposition Workshet	Incomplete Combustion and Pollutants	Types of Reactions
Single Displacement Reactions Worksheet	Unit Review	Lab Investigation Simulation

Double Displacement Reactions	Word and Chemical Equations Practice	Unit 2 Test
Unit 2 Self Assessment		
End of Unit Check in		

Unit 3: Quantities in Chemical Reactions

AAL	**AFL**	**AOL**
Mole Calculations Worksheet	Mole Quiz	Limiting Reagents Assignment
Mole Worksheet	Gizmo Quantities in Chemical Reactions	STSE Project
Percent Composition	Stoichiometry Gizmo	Unit 3 Test
Empirical and molecular formula worksheet	Limiting Reactants Gizmo	
Stoichiometry Practice	Unit 3 Review	
Limiting Reactants and Percent Yield Worksheet		
Limiting Reactants and Percent Yield Worksheet		
Unit 3 Self Assessment		
End of Unit Check in		

Unit 4: Solutions and Solubility

AAL	**AFL**	**AOL**
Concentration Worksheet	Solubility Temperature	Solubility Curve Assignment
Concentration and Dilution Worksheet	Acids and Bases Assignment	Lab Investigation
net Iconic Equations Worksheet	Properties and Bases Quiz	Unit 4 Test
Acids and Bases Worksheet	Case Study: Drugs in Drinking Water	
Neutralization Worksheet	Unit 4 Review	
Unit Self Assessment		
End of unit Check in		

Unit 5: Gases and Atmospheric Chemistry

AAL	**AFL**	**AOL**
Pressure Conversion Worksheet	Gizmos Activity	Gas Law Quiz
Boyle's Charles' and Gay-Lussac's Gas Laws	Unit 5 Review	STSE Project
Combined Cas Law		Unit 5 Test
Dalton's Law of Partial Pressure		
Simulation and Questions		
Ideal Gas Laws Worksheet		
Gas Stoichiometry Worksheet		
Self Assessment		
Unit Check In		

Unit 6: Cumulative Assessments

AOL
Final Project
Final Exam

CONSIDERATION FOR PROGRAM PLANNING

PLANNING SCIENCE PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 percent of the students in Ontario's English language schools is a language other than English. Ontario's linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

THE ROLE OF TECHNOLOGY IN THE SCIENCE PROGRAM

Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

ACCOMMODATIONS

Accommodations will be based on meeting with parents, teachers, administration and external educational assessment reports. The following three types of accommodations may be provided:

- ***Instructional accommodations:*** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia.
- ***Environmental accommodations:*** such as preferential seating or special lighting.
- ***Assessment accommodations:*** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids, which may be used in this course, are:

- Provide step-by-step instructions.
- Help students create organizers for planning tasks.
- Allow students to report verbally using a voice or video recording.

- ❑ Permit students a range of options for reporting tasks.
- ❑ Provide opportunities for enrichment.