

Canada Agile Preparatory Academy

Course outline

Ministry of Education Course Title: Chemistry, Grade 12, University Preparation

Ministry Course Code: SCH4U

Course Type: University Preparation

Grade: 12

Credit Value: 1.0

Prerequisite(s): SCH3U Grade 11 Chemistry

Department: Science

Course developer: Canada Agile Preparatory Academy

Development Date: May 15th, 2020

This course has been developed based on the following Ministry documents:

- The Ontario Curriculum, Grades 11 and 12 Science, Revised 2008
- Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)

Revision Date: May 21st 2020

Course Description/Rationale

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.

Big Ideas

Organic Chemistry

- Organic compounds have predictable chemical and physical properties determined by their respective structures.
- Organic chemical reactions and their applications have significant implications for society, human health, and the environment.

Structure and Properties of Matter

- The nature of the attractive forces that exist between particles in a substance determines the properties and limits the uses of that substance.
- Technological devices that are based on the principles of atomic and molecular structures can have societal benefits and costs.

Energy Changes and Rates of Reaction

- Energy changes and rates of chemical reactions can be described quantitatively.
- Efficiency of chemical reactions can be improved by applying optimal conditions.
- Technologies that transform energy can have societal and environmental costs and benefits.

Chemical Systems and Equilibrium

- Chemical systems are dynamic and respond to changing conditions in predictable ways. • Applications of chemical systems at equilibrium have significant implications for nature and industry.

Electrochemistry

- Oxidation and reduction are paired chemical reactions in which electrons are transferred from one substance to another in a predictable way.
- The control and applications of oxidation and reduction reactions have significant implications for industry, health and safety, and the environment.

Overall Curriculum Expectations

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);
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	
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	
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	
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.

Major Units and Corresponding Hours

Course Parts	Time Allocated
Unit 1 – Organic Chemistry	24
Unit 2 – Structure and properties	23
Unit 3 – Energy changes and rate of reactions	23
Unit 4 – Chemical systems and equilibrium	20
Unit 5 – Electrochemistry	18
Final Exam	2 hours
Total Time	110 hours

The curriculum expectations of *Scientific Investigation Skills and Career Exploration* are intertwined with each unit above. Therefore, the expectations of *Scientific Investigation Skills and Career Exploration* will be emphasized and achieved through the execution of each individual unit.

All course content is accessed online.

Teaching & Learning Strategies

The aim of the course is to help students deepen their understanding of chemistry concepts and theories. The course explains difficult concepts in a manner that is easy to understand. The goal is for students to fully understand those important concepts that serve as solid foundations for their post-secondary education.

There will be ample opportunities for students and the teacher to engage in 1 to 1 correspondence and discussion. Independent, self-regulated learning will also be required along with teacher facilitation.

Example exercises and problems will be included in worksheet format, also requiring individual research from external sources.

Strategies for Assessment & Evaluation of Student Performance

The assessment and evaluation strategies of our school follows the Ministry of Education's Growing Success document. Growing Success articulates the vision the Ministry has for the purpose and structure of assessment and evaluation techniques.

Assessments help to monitor student progression and provide reflection and feedback. Evaluation is the process of judging the quality of student work in relation to the achievement chart categories and criteria, and assigning a percentage grade to represent that quality. Evaluation is based on gathering evidence of student achievement through:

- Products
- Observations
- Conversations

The Final Grade

The evaluation for this course is based on the student's achievement of curriculum expectations and the demonstrated skills required for effective learning. The final 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 credit is granted and recorded for this course if the student's grade is 50% or higher. The final grade will be determined as follows:

70% of the grade will be based upon evaluations conducted throughout the course. This portion of the grade will reflect the student's most consistent level of achievement through the course. The balance of 30% of the grade will be based on final evaluations administered at the end of the course. The final assessment may be a final exam, a final project, or a combination of both an exam and a project.

Assessment Tools and Strategies

Assessments are broken down into three categories:

- *Assessments for learning*: Worksheets and quizzes to gauge student progression and provide feedback.
- *Assessments as learning*: Journals to record reflections on the course material and self-assessments.
- *Assessments of learning*: Tests and assignments given a final grade based on how well the learning goals are met towards the course expectations.

Considerations for Program Planning

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. 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.

Our teachers consider it to be his or her responsibility to help students develop their ability to use the English language properly. Appropriate accommodations affecting the teaching, learning, and evaluation strategies in this course may be made in order to help students gain proficiency in English, since students taking English as a second language at the secondary level have limited time in which to develop this proficiency.

For students with special educational needs: Our teachers are committed to ensuring that all students, especially those with special education needs, are provided with the learning opportunities and supports they require to gain the knowledge, skills, and confidence needed to succeed in a rapidly changing society.

Environmental education: This course integrates environmental education into the teaching of Chemistry. Students have opportunities to analyze the environmental impact of modern science.

Equity and inclusive education: Our teachers create an environment that will foster a sense of community where all students feel included and appreciated. Students see themselves reflected in the choices of issues, examples, materials, and resources selected by our teachers.

Literacy and Inquiry/Research Skills: The school emphasizes the importance of the following:

- using clear, concise communication in the classroom involving the use of diagrams, charts, tables, and graphs
- emphasizing students' ability to interpret and use graphic texts.
- acquiring the skills to locate relevant information from a variety of sources, such as books, newspapers, dictionaries, encyclopaedias, interviews, videos, and the Internet.
- learning that all sources of information have a particular point of view
- learning that the recipient of the information has a responsibility to evaluate it, determine its validity and relevance, and use it in appropriate ways.

The role of information and communications technology: Technological tools are first-class citizens at our online school and are used in many ways:

- Students use multimedia resources, databases, Internet websites, digital cameras, and word-processing programs.
- They use technology to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings.
- Students are encouraged to use ICT to support and communicate their learning. For example, students working individually or in groups can use computer technology and/or Internet websites to gain access to museums and archives in Canada and around the world.

- Students use digital cameras, webcams, and screen recording software to design and present the results of their research.

Career Education: Students are given opportunities to develop career-related skills by:

- applying their skills to real-life situations
- exploring educational and career options
- developing research skills
- making oral presentations

Resources required by the student

- Internet access and a modern standards-compliant web browser
- A non-programmable, non-graphing, scientific calculator.
- A scanner, smart phone camera, or similar device to upload handwritten or hand-drawn work
- A front-facing camera such as a webcam to allow for remote proctoring over the internet
- Textbook: Nelson Chemistry 12 University Preparation. ISBN: 9780176520618