

Course Outline

School Name: KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name: Science

Ministry of Education Course Title: Chemistry

Grade Level: 11

Ministry Course Code: SCH3U

Teacher's Name: Raj Budhram

Developed by: Raj Budhram Date: July, 2013

Revision Date: August 2021

Developed from:

Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 11 and 12: Science*.
Toronto ON: Queen's Printer for Ontario.

Text: None

Prerequisite: SNC2D

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval:



Approval Date: September 16, 2021

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

- 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);
- Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Matter, Chemical Trends, and Chemical Bonding

- 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

- 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

- 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.

Solutions and Solubility

- 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

- 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
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1. Matter, Chemical Trends and Chemical Bonding	19 hours
2. Chemical Reactions	19 hours
3. Quantities in Chemical Reactions	25 hours
4. Solutions and Solubility	22 hours
5. Gases and Atmospheric Chemistry	25 hours
Total	110 hours

Unit Descriptions

Unit 1 – Matter, Chemical Trends, and Chemical Bonding

In this unit, students build molecular models for molecular compounds and an ionic crystalline structure and they learn that every element has predictable chemical and physical properties determined by its structure. Also, they learn that the type of chemical bond in a compound determines the physical and chemical properties of that compound. Students learn about commonly used but potentially harmful chemical substances and how the substances affect their community and the environment. Then, students propose ways to lessen the harmfulness of the substances.

Unit 2 – Chemical Reactions

In this unit, students learn that chemicals react in predictable ways. Students learn that chemical reactions and their applications have significant implications for society and the environment. Students conduct investigations on different types of chemical reactions and make predictions on the products of the reactions. Also, students learn that local mining operations in or near their communities can result in pollution of the environment. Subsequently, students learn about the ways to minimize the effects of the mining operations.

Unit 3 – Quantities in Chemical Reactions

In this unit, students learn that relationships in chemical reactions can be described quantitatively and the efficiency of chemical reactions can be determined and optimized by applying an understanding of quantitative relationships in such reactions. Students analyse processes that involve the use of chemical quantities and calculations, and they assess, on the basis of research, the importance of quantitative accuracy in industrial chemical processes and the potential impact on the environment if quantitative accuracy is not observed. In the home, students analyse the use of bleach as a disinfectant. In the water treatment plant in their communities, students analyse the use of various chemicals used in several processes. Also, students analyse the use of sand in their communities during winter to facilitate traction.

Unit 4 – Solutions and Solubility

In this unit, students learn that the properties of solutions can be described qualitatively and quantitatively, and can be predicted. They conduct an investigation to analyze the properties of solutions and they determine the concentration of an acid or base in a solution. Also, they learn that living things depend on the unique physical and chemical properties of water for their survival, and people have a responsibility to protect the integrity of Earth's water resources. Students conduct an investigation to determine the concentrations of pollutants in their local treated drinking water, and compare the results to commonly used guidelines and standards. Moreover, students learn about the sources of water contamination in their communities, the effects of the contaminants on the health of Indigenous peoples, and the short-term and long term plans to ensure that the people in the communities are not affected by the contaminants.

Unit 5 – Gases and Atmospheric Chemistry

In this unit, students learn that the properties of gases can be described qualitatively and quantitatively, and can be predicted. They investigate the gas laws and determine the quantitative and graphical relationships between pressure and volume. They also learn that air quality can be affected by human activities and technology and people have a responsibility to protect the integrity of Earth's atmosphere. Specifically, students learn about the negative impacts of mining

operations and forest fires on air quality and what steps should be taken to minimize the impacts of mining operations and forest fires within their local community.

Teaching/Learning Strategies

This course is organized into an eight-week series of lessons and activities that are presented to students in remote northern communities via the internet. The eighth week is used for course consolidation, review, and the final examination. Teacher and students communicate over the internet through timely activity feedback, emails, messages, video and audio calls. Mentors in the classrooms assume the role of liaison between the teacher and student while also supporting a holistic approach to motivate, engage and support each individual student.

A variety of strategies will be used in the online delivery of this course. Some instructional strategies include:

- Academic vocabulary and language
- Cooperative learning
- Adapting to learning styles/multiple intelligences
- Analysis of student work
- Conferencing
- Discovery/Inquiry-based learning
- Generating and testing hypotheses
- Graphic organizers
- Hands-on learning
- Homework and practice
- Identifying similarities and differences
- Modelling
- Sketching to learn
- Mentoring
- Visualization

Learning goals will be discussed at the beginning of each assignment and success criteria will be provided to students. The success criteria are used to develop the assessment tools in this course, including rubrics and checklists.

Evaluation

The final grade will be determined as follows (Ontario Ministry of Education, 2010):

- Seventy percent 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 should 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 (p. 41).

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. Toronto ON: Queen's Printer for Ontario.

Type of Assessment	Category	Details	Weighting (%)
Term Work (70%)	Knowledge/ Understanding	-Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields;	12

		<p>Demonstrate an understanding of periodic trends in the periodic table and how elements combine to form chemical bonds;</p> <p>Demonstrate an understanding of the different types of chemical reactions;</p> <p>Demonstrate an understanding of the mole concept and its significance to the quantitative analysis of chemical reactions;</p> <p>Demonstrate an understanding of qualitative and quantitative properties of solutions;</p> <p>Demonstrate an understanding of the laws that explain the behaviour of gases.</p>	
	Thinking	<p>Investigate physical and chemical properties of elements and compounds, and use various methods to visually represent them;</p> <p>Investigate different types of chemical reactions. Investigate quantitative relationships in chemical reactions, and solve related problems;</p> <p>Investigate qualitative and quantitative properties of solutions, and solve related problems;</p> <p>Investigate gas laws that explain the behaviour of gases, and solve related problems.</p>	17
	Communication	<p>Expression and organization of ideas and information;</p> <p>Communication for different audiences and purposes in oral, visual, and/or written forms;</p> <p>Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms.</p>	17
	Application	<p>Analyse the properties of commonly used chemical substances and their effects on human health and the environment, and propose ways to lessen their impact;</p> <p>Analyse chemical reactions used in a variety of applications, and assess their impact on society and the environment;</p> <p>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;</p> <p>Analyse the origins and effects of water pollution, and a variety of economic, social, and environmental issues related to drinking water;</p> <p>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.</p>	24
Final Evaluation (30%)	Culminating Activity (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5
	Exam (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5

TOTAL	100
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Assessment/Evaluation Strategies

A variety of assessment and evaluation methods, strategies and tools are required as appropriate to the expectation being assessed. These include diagnostic, formative and summative within the course and within each unit.

Assessment for learning and assessment as learning are obtained through a variety of means, including the following:

- Ongoing descriptive feedback
- Conversations with the student on a regular basis to verbalize observations, ask questions, and clarify understanding
- Self-assessment (e.g., weekly self-assessment of learning, relative to specific course content as well as in contextual school, community and Land-based learning);
- Peer assessment (e.g., peer feedback on personal goals related to course specific content and generalised throughout the school day);
- Mentor observations (e.g. of specific course expectations during Land-based and cultural activities as well as during course specific activities);

Evidence of student achievement (assessment of learning) is collected from various sources, including the following:

- Ongoing assessment/observations of most consistent work, with consideration given to most recent work;
- Conversations with students (e.g., discussion on the mining operations used in FN communities and their effects on air and water quality);
- Summative unit activities (e.g., the quantities of chemicals that are used in the various processes in the water treatment plants in their communities.);
- Culminating Activity;
- Final Exam

The Ministry of Education's 2010 document, *Growing Success*, outlines the seven fundamental principles that guide best practice in the assessment and evaluation of students. KiHS teachers use practices 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 course and at other 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 (p.6).

Resources

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<https://www.youtube.com/watch?v=a8EFY2kfCZ4>

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Program Planning

This course is offered to Indigenous students living in isolated, northern Ontario communities. It is offered by qualified teachers in a blended classroom with a balance of academic, wellness, land-based learning, local language and culture to support the success of the whole student. This course uses the internet for instruction, demonstration and research. It utilizes a student-centered semi-virtual classroom which capitalizes on the strengths of internet program delivery to minimize the disadvantages of geographic remoteness.

Students are presented with 1320 minutes of instruction/activity via the internet over the period of one week. All lessons, assignments, questions and course material is presented in this manner, with approved print materials available as a student resource in each classroom. The student and instructor communicate via the internet, while a classroom mentor (a fully qualified teacher) assists students in completing tasks in a timely manner and provides support as required.

Indigenous and local content is used throughout the course to meet students' learning needs. Opportunities for outdoor activities and land-based learning are also incorporated and students are encouraged to use local knowledge in their products. Considerations are made to the learning preferences of the student population and lessons can be adjusted for individual students as required. Opportunities have been provided for students to apply ideas and concepts encountered in this course to their lives as an individual and as a member of a First Nations community. Teachers consult the Ontario Ministry of Education policies, guidelines and important initiatives when planning a comprehensive program in this area.