SCH4U – Chemistry, Grade 12

GENERAL INFORMATION

Name of School: Rosedale Academy Global High School

Department: Science

Course Developer: Eli Fogle

Development Date: October 2014

Revised By: Richard Kibalenko

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Course Title: Chemistry, Grade 12

Grade: 12

Course Type: University Preparation

Course Code: SCH4U

Credit Value: 1

Curriculum Policy Document: The Ontario Curriculum Grades 11 and 12 Science, Ministry of Education 2008 (Revised)

Prerequisite: SCH3U

COURSE DESCRIPTION

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.

OVERALL EXPECTATIONS

Scientific Investigation Skills and Career Exploration

1. 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)
2. Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Organic Chemistry

1. 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
2. Investigate organic compounds and organic chemical reactions, and use various methods to represent the compounds
3. Demonstrate an understanding of the structure, properties, and chemical behaviour of compounds within each class of organic compounds.

Structure and Properties of Matter

1. 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
2. Investigate the molecular shapes and physical properties of various types of matter
3. 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.

Energy Change and Rate of Reaction

1. Analyze technologies and chemical processes that are based on energy changes, and evaluate them in terms of their efficiency and their effects on the environment
2. Investigate and analyze energy changes and rates of reaction in physical and chemical processes, and solve related problems
3. Demonstrate an understanding of energy changes and rates of reaction.

Chemical Systems and Equilibrium

1. Analyze chemical equilibrium processes, and assess their impact on biological, biochemical, and technological systems
2. Investigate the qualitative and quantitative nature of chemical systems at equilibrium, and solve related problems
3. Demonstrate an understanding of the concept of dynamic equilibrium and the variables that cause shifts in the equilibrium of chemical systems.

Electrochemistry

1. Analyse technologies and processes relating to electrochemistry, and their implications for society, health and safety, and the environment
2. Investigate oxidation-reduction reactions using a galvanic cell, and analyse electrochemical reactions in qualitative and quantitative terms
3. Demonstrate an understanding of the principles of oxidation-reduction reactions and the many practical applications of electrochemistry.

Unit Titles and Descriptions:

Unit	Description	Hours
Unit 1	**Structure and Properties of Matter:** Throughout this unit, students will learn about the crucially important role that electrons play in the structures and properties of atoms and molecules. The structures and properties of matter have implications in every aspect of science and our everyday lives. By the end of this unit, students will understand how these principles are used today to improve their lives through technology and will be familiar with some of the important scientists who have contributed to this field of knowledge.	26
Unit 2	**Organic Chemistry:** This unit will cover how we classify and identify different types of organic compounds, the important structures and properties relating to these organic compounds, the chemical reactions involving organic compounds and finally the tremendous impact organic compounds have on our planet and our way of life.	21
Unit 3	**Energy Changes and Rates of Reaction:** In this unit, students will explore transformations in energy related to chemical processes and how these transformations effect society and the environment.	23
Unit 4	**Chemical Systems and Equilibrium:** In this unit, students will explore chemical processes and discover the nature of these systems at equilibrium.	20

Unit 5	**Electrochemistry:** In this unit, students will explore chemical reactions known as redox reactions and how these reactions can be applied in technologies that help humanity survive and thrive.	18
Final Evaluation	**Final Written Exam:** The final proctored exam evaluates the overall expectations of the course.	2
	TOTAL HOURS	110

RESOURCES REQUIRED BY THE STUDENT

SCH4U Online Course of Study in Rosedale LMS.

Students should have access to a computer that has a functioning audio, video camera, and a standard calculator.

FINAL GRADE

Final grades are calculated as outlined in Growing Success. The percentage grade represents the quality of the students' overall achievement of the expectations for the science courses reflects the corresponding achievement as described in the achievement chart in the arts curriculum documents. A credit is granted if the student achieves 50% or higher in the course.

The final mark will be calculated as follows:

1. 70% of the mark will be based on evaluation throughout the course. This portion of the grade will reflect the student's most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
2. 30% of the mark will be based on a final evaluation administered at or towards the end of the course. In this course, the final evaluation will be comprised of a final project (30%). The final project will provide a comprehensive evaluation of all the overall expectations.

Report Cards:

A formal written report card communicating student achievement as a percentage grade will be issued to students and parents at two points throughout the school year. The first is midway through the course (Midterm Report Card) and the second is after the completion of final evaluations for the course (Final Report Card). The report cards will also report on the development of the student's learning skills and work habits using a four-point scale as follows: E – Excellent G – Good S – Satisfactory N – Needs Improvement.

Achievement Chart

A student's achievement of the overall curriculum expectations will be evaluated in accordance with the achievement charts in the provincial curriculum for Science and will be reported using percentage marks. The achievement chart measures student achievement in the categories of Knowledge and Understanding, Thinking and Inquiry, Communication and Application.

In this course, the four categories of the achievement chart are weighted as follows:

Knowledge and Understanding (K)	Thinking (I)	Communication (C)	Application (A)
20%	30%	20%	30%

Summary of Course Evaluations

A summary of the course evaluations in this course and their breakdown according to the achievement chart is shown below:

Distribution	Evaluation	Evaluation Type	Max Grade	Max Value	Grade Value			
					K	I	C	A
70%	1-2G: Atomic Quantum Mechanical Model of the Atom	Project	1.8%	17	5	0	4	8
	1-3G: Electron Configuration	Project	2.7%	25	14	0	2	9
	1-5G: VSEPR Shape and Polarity Lab	Project	2.1%	20	3	5	4	8
	1-7G: Nanotechnology Report	Project	2.1%	20	0	0	10	10
	Unit 1 Test	Test	5.3%	50	10	15	10	15
	2-2K: Naming and Drawing Organic Compounds	Project	1.1%	10	3	0	2	5
	2-3J: Properties of Organic Compounds Lab	Project	3.4%	32	0	32	0	0
	2-4I: Organic Chemistry Reactions Lab	Project	1.6%	15	0	15	0	0
	2-5B: Organic Compounds: Environmental Impact	Project	2.1%	20	0	0	8	12
	Unit 2 Test	Test	5.3%	50	10	15	10	15
	3-2G: Calorimetry Lab	Project	1.6%	15	0	15	0	0
	3-3F: Hess' Law Lab	Project	1.9%	18	18	0	0	0

	3-4I: Rates of Reaction Simulation Lab	Project	1.5%	14	14	0	0	0
	3-5B: Application of Rates of Reaction	Project	3.2%	30	0	0	15	15
	Unit 3 Speaker's Corner	Quiz	0.9%	8	0	0	8	0
	Unit 3 Test	Test	5.3%	50	10	15	10	15
	4-1F: Chemical Equilibrium	Project	1.6%	15	2	0	1	12
	4-2F: Equilibrium Constants	Project	2.7%	25	2	18	2	3
	4-3J: Titration Lab	Project	1.6%	15	0	15	0	0
	4-4C: Equilibrium in the World	Project	2.1%	20	0	0	10	10
	Unit 4 Test	Test	5.3%	50	10	15	10	15
	5-1H: Assigning Oxidation Numbers	Project	1.6%	15	3	12	0	0
	5-2H: Balancing Redox Reactions Assignment	Project	2.7%	25	21	0	4	0
	5-3H: Galvanic Cell Lab	Project	1.5%	14	0	14	0	0
	5-4H: Electrochemistry and Environment	Project	2.1%	20	0	0	10	10
	Unit 5 Speaker's Corner	Quiz	0.9%	8	0	0	8	0
	Unit 5 Test	Test	5.3%	50	10	15	10	15
30%	FINAL EXAM	Exam	30%	100	20	30	20	30
TOTAL			**100%**		**20%**	**30%**	**20%**	**30%**

TEACHING / LEARNING STRATEGIES

Rosedale courses are designed to create engaging and transformative learning experiences for students through the use of a wide variety of instructional strategies that support students with different interests, learning preferences, and abilities. The teaching and learning strategies used in this course have been chosen to provide students with engaging and authentic learning experiences that support the mastery of concepts, the development of research and inquiry skills, critical thinking and real world problem solving, and the making of connections between course content and the world around them.

In this course, the following teaching/ learning strategies are used:

Differentiated Instruction: Learning materials are presented in a variety of ways to meet the needs of all learners. This includes: direct instruction, independent instruction, scaffolding, concept mapping, and use of multimedia (e.g., simulations, video, infographics, text, images, and audio).

Collaborative Activities: Collaborative activities are used to promote collaboration and communication with their peers as they investigate real world issues, conduct laboratory investigations, discuss ideas, make decisions, and learn from and with each other. Students will participate in: brainstorming, team work, and diverse group activities to improve collaboration and communication skills.

Inquiry: Inquiry activities are used to engage students in exploring a wide variety of topics in the course. This includes: laboratory investigations,case study analysis, cause and effect analysis, data interpretation, independent reading, problem solving, and research of science related topics.

Experiential Learning: Experiential learning provides students with hands-on opportunities to learn and apply their learning. Students will have the opportunity to do this through conducting simulations, laboratory investigations, and real-world problem solving.

STRATEGIES FOR ASSESSMENT AND EVALUATION OF STUDENT PERFORMANCE

The purpose of assessment and evaluation is to improve student learning. In this course, students have many opportunities to receive feedback on their progress and suggestions for improvement. Information on student progress and achievement is gathered using a variety of strategies, including the assessment of conversations, observations, and products.

Throughout the course, a variety of assessment for, as, and of learning strategies are used to allow students to receive feedback about their learning prior to evaluations.

Assessment for learning strategies are used to provide students with feedback as they progress through the content, prior to evaluation. Assessment for learning strategies used in this course include:

- practice worksheets, diagnostic quizzes, self-check quizzes, discussion forum posts, small group and whole class discussions, and student-teacher dialogue.

Assessment as learning strategies encourage students to reflect and self-assess their own learning as they move through the course. Assessment as learning strategies used in this course include:

- personal reflections, self-assessment activities, success criteria checklists, and exit cards.

Assessment of Learning (Evaluations): Evaluations are used to measure student achievement of overall expectations throughout the course and determine a percentage grade for students.

Evaluation strategies used in this course include:

- assignments, case study analysis, tests, student-teacher conference, presentations, projects, video and oral responses, reflections, and the final exam.

PROGRAM PLANNING CONSIDERATIONS

The science curriculum outlines a number of program planning considerations that should be addressed in each course. The chart below outlines how Rosedale addresses these considerations in this course:

Consideration	Rosedale Approach
Instructional Approaches	This course uses a wide variety of teaching and learning strategies that are based on an assessment of students' individual needs, proven learning theory, and best practices. *Refer to the Teaching / Learning Strategies section for a list of approaches used in the course.*
Planning Programs for Students with Special Needs	Provisions for students with special education needs will be determined by examination of the course expectations and the individual learning needs of the students as identified in their Individual Education Plan (IEP). Where required, teachers will accommodate students using appropriate instructional accommodations, environmental accommodations, and assessment accommodations to ensure student success.
Planning Considerations for English Language Learners	All courses at Rosedale are designed to support English Language Learners. Courses include specific instructional strategies that support English Language Learners, including pre-teaching vocabulary, use of visual cues, use of graphic organizers, and scaffolding. Courses also use a wide range of differentiated learning materials, in addition to resources that are culturally diverse and appropriate for English Language Learners. Our English Language Learners have access to the following accommodations: extended time for tests and exams; chunking of assignments and tests; a safe space for asking questions; formative feedback; and access to ESL resources and expert discussion.
Antidiscrimination Education in Science	Rosedale is committed to providing an inclusive and equitable learning experience for students. Lessons, resources, and activities are designed to ensure that all students, regardless of background, are able to achieve their full potential and achieve a positive self-image. Rosedale is also committed to ensuring our students develop the skills of global citizenship. This means that our courses encourage equity-seeking and underrepresented groups to pursue interests in STEM related fields. Additionally, our science courses prompt students to consider the scientific impact and contributions of underrepresented groups such as Indigenous and people of colour.

Health and Safety in the in science	In all of Rosedale's science courses teachers ensure that students have opportunities to consider health and safety issues. Students are instructed of the safety precautions and health risks associated when conducting science experimentations in a physical setting. In doing so, students are taught to establish their own safety protocols to ensure their safety and those of other.
Environmental Education and Science	The science curriculum prompts students to become environmentally responsible citizens by exploring environmental issues and solutions. By encouraging students to practise and promote environmental stewardship, both in the school and in the community, students are becoming dedicated to living more sustainably. By understanding natural and human causes towards climate change and being critically reflective of their own actions towards their environment, students can develop alternative solutions to reduce the environmental footprint.
Critical Thinking and Critical Literacy in Science	Rosedale courses are designed to includes skills such as questioning, predicting, analysing, synthesizing, examining opinions, identifying values and issues, detecting bias, and distinguishing between alternatives. Using an art-based approach, students use critical thinking skills to assess, analyse, and/or evaluate the impact of a course theme or concept; and when they form an opinion about something and support that opinion with a rationale.
The Role of ICT in Science	This science course integrates a wide range of information and communication technologies (ICT) which represents a natural extension of the learning expectations associated with each discussion form. The course encourages students to use ICT since it allows students to organize and present the developments of their research and creative endeavors to their classmates and others.
Role of Technology in the Curriculum in Science	Rosedale's technology enhanced delivery model leverages the power of information and communication technologies to provide relevant, meaningful, and interactive learning experiences for students. Students use a wide array of digital tools to explore, evaluate, and demonstrate their learning. Throughout the course, students are required to demonstrate their learning through text, video, voice and visual assignments that teach multi-literacy and media skills.
Literacy, Numeracy, and Inquiry/Research Skills	Students have the opportunity to develop their written, oral, and visual communication skills throughout the course by their involvement in research projects, investigations, and related activities. Students will learn how to locate relevant information in a variety of print and electronic

	sources, including books and articles, manuals, newspapers, websites, databases, tables, diagrams, and charts. They will also have the opportunity to apply their mathematical skills in the analysis of data and information.
Career Education	Lessons and learning activities are designed to teach students about the skills and knowledge needed in this course to help prepare them for diverse areas such machine engineer, geologist, physicist, data analyst, chemist, software engineer, health care provider, veterinarian, pharmacist, environmental engineer etc., . Students have the opportunity to identify career-option that are best suited to their personal interests and backgrounds through discussion and learning activities.
The Ontario Skills Passport and Essential Skills	This course is designed to help students develop the essential skills required for the workplace and future careers. Emphasis is placed on the transferable skills or competencies that students will require once they leave school. Opportunities to learn about, practice, and reflect on the essential skills or competencies required for future success are embedded into all lessons and learning activities.

ACADEMIC POLICIES:

All members of Rosedale Academy and Partner Schools must adhere to the expectations and guidelines outlined in Rosedale Academy: Academic Policies.