# NIAGARA ACADEMY
# SCIENCE, GRADE 10, ACADEMIC
# COURSE OUTLINE

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| COURSE CODE: | SNC2D |
| DEVELOPED BY: | V. Rows, September, 2004 |
| REVISED BY: | J. Mocha, 2009, V. Rows, 2010, L Cousineau, 2011, M. Wilson, 2013, M. Richter, 2015, 2016, 2017, J. Pauls, 2018, 2019 |
| DEVELOPED FROM: | The Ontario Curriculum Grades 9 and 10, Science, 2008, Website: http:// www.edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf |
| PREREQUISITE: | None |
| COURSE DURATION: | 110 hours |
| COURSE VALUE: | 1.0 credits |

**COURSE DESCRIPTION AND RATIONALE**

This course enables students to enhance their understanding of concepts in biology, chemistry, earth and space science, and physics, and of the interrelationships between science, technology, society, and the environment. Students are also given opportunities to further develop their scientific investigation skills. Students will plan and conduct investigations and develop their understanding of scientific theories related to the connections between cells and systems in animals and plants; chemical reactions, with a particular focus on acid–base reactions; forces that affect climate and climate change; and the interaction of light and matter.

## OVERALL CURRICULUM EXPECTATIONS

| **A. Scientific Investigation Skills and Career Exploration**<br>By the end of this course, students will: | |
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| **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 a variety of careers related to the fields of science under study, and identify scientists, including Canadians, who have made contributions to those fields. |

| **B. Biology: Tissues, Organs, and Systems of Living Things**<br>By the end of this course, students will: | |
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| **B1.** | evaluate the importance of medical and other technological developments related to systems biology, and analyse their societal and ethical implications; |
| **B2.** | investigate cell division, cell specialization, organs, and systems in animals and plants, using research and inquiry skills, including various laboratory techniques; |
| **B3.** | demonstrate an understanding of the hierarchical organization of cells, from tissues, to organs, to systems in animals and plants. |

| **C. Chemistry: Chemical Reactions**<br>By the end of this course, students will: | |
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| **C1.** | analyse a variety of safety and environmental issues associated with chemical reactions, including the ways in which chemical reactions can be applied to address environmental challenges; |
| **C2.** | investigate, through inquiry, the characteristics of chemical reactions; |
| **C3.** | demonstrate an understanding of the general principles of chemical reactions, and various ways to represent them. |

| **D. Earth and Space Science: Climate Change**<br>By the end of this course, students will: | |
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| **D1.** | analyse some of the effects of climate change around the world, and assess the effectiveness of initiatives that attempt to address the issue of climate change; |
| **D2.** | investigate various natural and human factors that influence Earth's climate and climate change; |
| **D3.** | demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change. |

| **E. Physics: Light and Geometric Optics** | |
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| **E1.** | evaluate the effectiveness of technological devices and procedures designed to make use of light, and assess their social benefits; |
| **E2.** | investigate, through inquiry, the properties of light, and predict its behaviour, particularly with respect to reflection in plane and curved mirrors and refraction in converging lenses; |
| **E3.** | demonstrate an understanding of various characteristics and properties of light, particularly with respect to reflection in mirrors and reflection and refraction in lenses. |

## COURSE CONTENT AND EVALUATION

| Unit | Description | Evaluation | Percentage Hours |
|---|---|---|---|
| Unit One | **Biology: Tissues, Organs and Systems of Living Things**<br>1. Cells and More Cells: the structure of cells, genes, cells reproduction, the cell cycle<br>2. Plants: From Cells to systems: plant cells, tissues, and organs, plant organ systems<br>3. Animals: From Cells to Systems: cells and tissues, organs and systems, maintaining healthy systems | 17.5% | 27.5 hrs |
| Unit Two | **Chemistry: Chemical Reactions**<br>4. Developing Chemical Equations: representing ionic compounds, representing molecular compounds, conservation of mass and chemical equations<br>5. Classifying Chemical Reactions: synthesis and decomposition reactions, displacement reactions, reactions and environmental issues<br>6. Acids and Bases: identifying acids and bases, the pH scale and indicators, reactions of acids and bases | 17.5% | 27.5 hrs |
| Unit Three | **Climate Change**<br>7. Earth's Climate Systems: Factors that affect climate change, describing climates, indicators and effects of climate change<br>8. Dynamics of Climate Change: Energy transfer in the climate system, greenhouse gases and human activities, cycling of matter and the climate system<br>9. Addressing Climate Change: discovering past climates, monitoring and modelling climate changes, taking action to slow climate change | 17.5% | 27.5 hrs |
| Unit Four | **Light and Geometric Optics**<br>10. Light and Reflection: sources and nature of light, properties of light and reflection, images of concave mirrors, images in concave mirrors, images in convex mirrors<br>11. Refraction: refraction of light, partial refraction and total internal reflection, optical phenomena in nature<br>12. Lens and Lens Technologies: Characteristics of lenses, images formed by lenses, lens technologies and the human eye | 17.5% | 27.5 hrs |
| | **Total Term Work** | **70%** | **110 hrs** |
| **Final Evaluation** | **Culminating Activity**<br>**Final Exam** | **10%**<br>**20%** | |
| | **Final Mark** | **100%** | |

## ASSESSMENT AND EVALUATION

| Knowledge /Understanding (15%) | Thinking (25%) | Communication (25%) | Making Connections (35%) |
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| - Class work<br>- Discussions<br>- Research Report<br>- Textbook readings<br>- Final Exam | - Gizmos<br>- Research report<br>- Tests<br>- Quizzes | - Report writing<br>- Science journal<br>- Short essay questions | - Investigating careers<br>- Home electricity practices<br>- Tests<br>- Quizzes |

**Evaluation and Reporting of Student Achievement:** Student achievement is communicated formally to students and parents by means of the Provincial Report Card, Grades 9–12. The report card provides a record of the student's achievement of the curriculum expectations in every course, at particular points in the school year or semester, in the form of a percentage grade. The percentage grade represents the quality of the student's over- all achievement of the expectations for the course which are described in the achievement chart on pages 26-27 of The Ontario Curriculum Grades 9 and 10, Science, 2008, Website: http://www. edu.gov.on.ca/eng/curriculum/secondary/science910_2008.pdf.

**Learning Skills** will also be assessed and reported on the Provincial Report Card, Grades 9-12. The quality of the learning skills demonstrated by a student are recorded in six categories – Responsibility, Organization, Independent Work, Collaboration, Initiative, Self-Regulation – are assessed throughout the semester using a four-point scale (E - Excellent, G - Good, S - Satisfactory, N - Needs Improvement), and the document page 11, Growing Success: Assessment, Evaluation and Reporting in Ontario Schools, 2010, as a guide (http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf).

**Assessment for Learning** will be used as a process for seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go, and how best to get there. Teachers will use diagnostic assessment before instruction and formative assessment will occur frequently and in an ongoing manner to monitor students' progress. Observation and conversation will be used to determine the needs of individual student learning.

**Assessment as Learning** will focus on the explicit fostering of student's capacity over time to be their own best assessors, but teachers need to start by presenting and modelling external, structured opportunities for students to assess themselves. Formative assessment be used by students to monitor their own and their peers' progress.

**Assessment of Learning** will be used as the assessment that becomes public and results in statements or symbols about how well students are learning. Summative assessment will be used by the teacher to summarize learning at a given point in time. (Ref: page 31 of Growing Success)

A student's achievement of the overall curriculum expectations will be evaluated in accordance with the achievement charts in the provincial curriculum and will be reported using percentage marks. It is expected that both mathematical calculations and professional judgement will inform the determination of percentage marks

The teacher will use assessment strategies that:

- are fair, transparent and equitable for all students;

- are clearly communicated to students at the beginning of the course and at other points throughout the semester
- are varied in nature, administered over a period of time and designed to provide opportunities for students to demonstrate the full range of their learning
- are appropriate for the learning activities used, the purposes of instruction and the needs and experiences of the students
- 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
- accommodate students with special education needs, consistent with the strategies outlined in their Individual Education Plan
- accommodate the needs of students who are learning the language of instruction
- ensure that each student is given clear directions for improvement
- promote students' ability to assess their own learning and to set specific goals
- ensure that each student is given clear directions for improvement

A final grade is recorded for every course, and a credit is granted and recorded for every course in which the student's grade is 50% or higher. The final grade for each course in Grades 9–12 will be determined as follows:

- Seventy per cent of the grade will be based on evaluations 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. Please see the chart below for an explanation of how course work marks will be obtained.
- Thirty per cent of the grade will be based on a final evaluation in the form of an examination, performance, essay, and/or other method of evaluation suitable to the course content and administered towards the end of the course. This final evaluation consists of the following: Culminating Activity 10% and Final Exam 20%.

## TEACHING AND LEARNING STRATEGIES

Effective instructional approaches and learning activities draw on students' prior knowledge, capture their interest, and encourage meaningful practice both inside and outside the classroom. Students will be engaged when they are able to see the connection between the scientific concepts they are learning and their application in the world around them and in real-life situations. The following are specific strategies for teaching and learning.

- Assessment of prior knowledge and provision of differentiated instruction for individual students
- Teaching and modelling of learning strategies
- Problem posing and problem solving
- Individual and cooperative small group learning, teamwork
- Hands-on experiments
- Brainstorming
- Creation of scenarios for decision making
- Independent research

- Issue-based analysis
- Personal reflection
- Seminar presentations
- Use of technology
- Hands-on applications
- Constructive or creative dialogue

## CONSIDERATIONS FOR PROGRAM PLANNING

The planning and administering of this course is based on the premise that all students can be successful language learners. The teacher will provide quality instruction that respects students' strengths and address their learning needs, using assessment information to plan instruction.

Teachers of science will incorporate appropriate strategies for instruction and assessment to facilitate the success of the ELL students in their classrooms. These strategies include:

- modification of some or all of the course expectations, based on the student's level of English proficiency;
- use of a variety of instructional strategies (e.g. extensive use of visual cues, manipulatives, pictures, diagrams, graphic organizers; attention to clarity of instructions; modelling of preferred ways of working in mathematics; previewing of textbooks; pre-teaching of key specialized vocabulary; encouragement of peer tutoring and class discussion; strategic use of students' first languages);
- use of a variety of learning resources (e.g., visual material, simplified text, bilingual dictionaries, culturally diverse materials);
- use of assessment accommodations (e.g., granting of extra time; use of alternative forms of assessment, such as oral interviews, learning logs, or portfolios; simplification of language used in problems and instructions).

Information and communications technology will be used throughout the course where it is appropriate. The program will also include opportunities for students to apply their language skills to work-related situations, to explore educational and career options, and to become self-directed learners.

## RESOURCES

- ON Science 10, McGraw-Hill Ryerson, 2009, ISBN 9780070722224
- Pearson Investigating Science 10, Pearson Education Canada © 2009, ISBN 9780132080712
- Science 10, Nelson Thomson Learning, 2001
- Biology 11, Nelson Thomson Learning, 2002
- Physics 11, Nelson Thomson Learning, 2002
- TED Talks, www.TED.com
- Crash Course Science, https://www.youtube.com/user/crashcourse/
- Teachers Try Science, http://www.teacherstryscience.org/
- How Stuff Works, https://science.howstuffworks.com/
- Science News for Students, https://www.sciencenewsforstudents.org/