Science 10
Brookmere Secondary - Coquitlam College
Course Overview

This course enables students to enhance their understanding of concepts in biology, chemistry, earth 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.

Students will be encouraged to communicate their ideas and consider the thoughts and opinions of others. Students will also work to develop themselves as communicating, caring, inquiring, risk taking, knowledgeable, reflective, open-minded, principled, balanced, and thinking individuals.

This course fulfills the requirements for Science - Grade 10 (4 total credits).

It is an academic science course.

Big Ideas: What students will UNDERSTAND

- DNA is the basis for the diversity of living things.
- Energy change is required as atoms rearrange in chemical processes.
- Energy is conserved, and its transformation can affect living things and the environment.
- The formation of the universe can be explained by the big bang theory.

Curricular Competencies: What students will DO	**Concepts & Content:** What students will KNOW
Questioning and predicting • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest • Make observations aimed at identifying their own questions, including increasingly complex ones, about the natural world • Formulate multiple hypotheses and predict multiple outcomes Planning and conducting • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods and those of others • Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data • Ensure that safety and ethical guidelines are followed in their investigations **Processing and analyzing data and information** • Experience and interpret the local environment • Apply **First Peoples perspectives and knowledge**, other **ways of knowing**, and local knowledge as sources of information • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies • Construct, analyze, and interpret graphs (including interpolation and extrapolation), models, and/or diagrams	• DNA structure and function • patterns of inheritance • mechanisms for the diversity of life: 1) mutation and its impact on evolution 2) natural selection and artificial selection • applied genetics and ethical considerations • rearrangement of atoms in chemical reactions • acid-base chemistry • law of conservation of mass • energy change during chemical reactions • practical applications and implications of chemical processes, including First Peoples knowledge • nuclear energy and radiation • law of conservation of energy • potential and kinetic energy • transformation of energy • local and global impacts of energy transformations from technologies • formation of the universe: 1) big bang theory 2) components of the universe over time • astronomical data and collection methods

• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Analyze cause-and-effect relationships **Evaluating** • Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions • Describe specific ways to improve their investigation methods and the quality of the data • Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled • Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and secondary sources • Consider the changes in knowledge over time as tools and technologies have developed • Connect scientific explorations to careers in science • Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations and to evaluate claims in secondary sources • Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Critically analyze the validity of information in secondary sources and evaluate the approaches used to solve problems **Applying and innovating** • Contribute to care for self, others, community, and world through individual or collaborative approaches • Transfer and apply learning to new situations • Generate and introduce new or refined ideas when problem solving • Contribute to finding solutions to problems at a local and/or global level through inquiry • Consider the role of scientists in innovation	

Communicating • Formulate physical or mental theoretical models to describe a phenomenon • Communicate scientific ideas, claims, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Express and reflect on a variety of experiences, perspectives, and worldviews through **place**	

Assessment:

- Your learning will be evaluated through various methods.
- Teacher observation
- Worksheets/Vocabulary/Journals
- Student self-assessment
- Quizzes and tests
- Projects and presentations
- Oral and written reports/essays/labs

Evaluation:

Marks:	Tests (6 at 5% Each)	30%
	Homework (6 units at 3% per unit)	18%
	Assignment/Labs (4 at 5% each)	20%
	Mid-Term (15%) + Final Exam (15%)	30%

Mid-Term + Final Exam will be written by all students.
Your success in this course depends on your willingness to apply yourself and work hard.

Principles of Learning generally reflect First Peoples pedagogy

Because these principles of learning represent an attempt to identify common elements in the varied teaching and learning approaches that prevail within particular First Peoples societies, it must be recognized that they do not capture the full reality of the approach used in any single First Peoples society.

- Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.
- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions.
- Learning involves generational roles and responsibilities.
- Learning recognizes the role of indigenous knowledge. Learning is embedded in memory, history, and story.
- Learning involves patience and time.
- Learning requires exploration of one's identity.

Learning involves recognizing that some knowledge is sacred and only shared with permission and/or in certain situations.

Unit 1 Biology: DNA Patterns & Patterns of Inheritance	DNA Structure and Function	~2 classes
	Patterns of inheritance	~3 classes
	Mutations	~2 classes
	Natural selection and Artificial selection	~3 classes
	Applied genetics and Ethical considerations	~5 classes
Unit 2 Chemical Reactions and Radioactivity	Atomic Theory (review from Science 9)	~2 classes
	Chemical reactions: Rearrangement of Atoms Energy change Law of Conservation of Mass	~4 classes
	Acid-base chemistry	~2 classes
	Nuclear energy and radiation	~2 classes
Unit 3 Physics: Law of Conservation of Energy	Potential and Kinetic energy	~3 classes
	Transformation of energy	~3 classes
	Local and global impacts of energy transformations from technologies	~3 classes
Unit 4 Earth Science	The formation of the Universe The big bang theory Components of the universe over time	~3 classes
	Astronomical data and collection methods	~3 classes

UNIT OVERVIEW

Unit 1: Biology: DNA Patterns & Patterns of Inheritance

Curricular Competency: Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies
Curricular Competency: Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources
Curricular Competency: Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods and those of others
Curricular Competency: Consider the role of scientists in innovation
Curricular Competency: Communicate scientific ideas, claims, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations
Curricular Competency: Formulate multiple hypotheses and predict multiple outcomes
Curricular Competency: Contribute to care for self, others, community, and world through individual or collaborative approaches
Curricular Competency: Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data

Assignments:

- Vinegar and Sodium Bicarbonate Lab Assignment
- Microscope Assignment/Lab (Scientific and Technical Drawings)
- Quizzes
- Workbook Activities

Key Questions:

- How would you gather genetic data to study certain traits?
- How would you use genetic data to predict traits of offspring
- How can the probability of specific genetic traits in individuals be determined?
- How would you prepare for a debate on the pros and cons of genetically modified organisms?

First Peoples Learning embedded within unit:

Learning involves patience and time
Learning is embedded in memory, history, and story

Unit Assessment:

Students reflect on learning at end of unit
Labs
Workbook activities
Homework
Unit quiz

Resources:

https://www.arcgis.com/index.html
Studies in Physical Geography - ISBN 978-0-9735999-8-5
Geography 12 Student Textbook/Workbook/Study Guide
https://www.esri.com/en-us/arcgis/products/arcgis-storymaps/resources
https://www.gac-cs.ca/publications/JohnArmstrong_VancouverGeology.pdf
https://searcharchives.vancouver.ca/geology

Unit 2: Chemical Reactions and Reactivity

Curricular Competency: Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest
Curricular Competency: Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative)
Curricular Competency: Experience and interpret the local environment
Curricular Competency: Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information
Curricular Competency: Connect scientific explorations to careers in science
Curricular Competency: Make observations aimed at identifying their own questions, including increasingly complex ones, about the natural world
Curricular Competency: Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies
Curricular Competency: Construct, analyze, and interpret graphs (including interpolation and extrapolation), models, and/or diagrams
Curricular Competency: Use knowledge of scientific concepts to draw conclusions that are consistent with evidence
Curricular Competency: Transfer and apply learning to new situations

Assignments:

- Students will be introduced to ESRI Arc GIS Online to collect and interpret data
- Students will research Periodic Table and its relevance to human health, mining industry and technological uses
- Students will research careers and work entry options (direct entry, apprentice/internship, post-secondary education)
- Students will analyze antacids and design an experiment to investigate and compare different antacids.

Key Questions:

- How can you determine how to work safely with different substances?
- How did early scientists form hypotheses and predictions about particles that they could not see or manipulate?
- How are elements and compounds constructed?
- How do elements combine?
- How has scientific inquiry into chemical and physical properties of substances helped researchers develop useful chemical products?
- How can scientific theories explain why certain substances have certain useful properties?

First Peoples Learning embedded within unit:

Learning involves patience and time
Learning is embedded in memory, history, and story

Unit Assessment:

Students reflect on learning at end of unit
Labs
Homework
Unit quiz

Resources:

Science Focus 10 (Textbook)
Chapter 1 – Atoms, Elements and Compounds
Chapter 2 – Names, Formulas and Properties
Chapter 3 – Chemical Reactions

Unit 3: Physics - Energy Flow in Technological Systems

Curricular Competency: Analyze cause-and-effect relationships
Curricular Competency: Describe specific ways to improve their investigation methods and the quality of the data
Curricular Competency: Consider the changes in knowledge over time as tools and technologies have developed
Curricular Competency: Generate and introduce new or refined ideas when problem solving
Curricular Competency: Consider the role of scientists in innovation

Assignments:

Quizzes
Workbook Activities
Predict Weather with Real-Time Data - Explore real-time weather data, make predictions, and interpolate surfaces – Arc GIS Online Lesson, Activity & Formative Learning

Key Questions:

- What types of information do geoscientists use to reconstruct past landscapes, environments, and geological conditions?
- Collect data to establish where most earthquakes tend to occur.
- Are their climate patterns which are dependent on location?
- How can we predict weather and climate? Is it accurate?

First Peoples Learning embedded within unit:

Learning involves patience and time
Learning is embedded in memory, history, and story

Unit Assessment:

- Students reflect on learning at end of unit
- Content is not assessed except for completion; the writing is intended to provide students a chance to internalize the material by finding personal emotional connections to the material
- Unit quiz

Resources:

Science Focus 10
Chapter 4 – Thermal Energy and Work
Chapter 5 – Energy and Motion
Chapter 6 – Energy Conversions and Efficiency

Unit 4: Earth Science (Week 7-8)

Curricular Competency: Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods
Curricular Competency: Construct, analyze, and interpret graphs, models, and/or diagrams
Curricular Competency: Analyze cause-and-effect relationships
Curricular Competency: Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources
Curricular Competency: Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems
Curricular Competency: Communicate scientific ideas and information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations
Curricular Competency: Consider social, ethical, and environmental implications of the findings from their own and others' investigations
Curricular Competency: Express and reflect on a variety of experiences, perspectives, and worldviews through place

Assignments:

- Quizzes
- Workbook Activities
- ESRI Arc GIS Online Story Map Assignment
- Soil Survey
  https://www.glbrc.org/sites/default/files/document/Teacher%20Guide_0.pdf
- Measuring Soil Microbial Activity

Key Questions:

- Are geologic databases useful and practical for Gr. 10 students?
- How do Canadian scientists classify soils within Canada?
- How does soil relate to water cycle, and/or carbon cycle?
- What evidence supports the big bang theory?
- How has the advancement o technology deepened our understanding of the universe?

First Peoples Learning embedded within unit:

- Learning involves patience and time
- Learning is embedded in memory, history, and story

Unit Assessment:

- Students reflect on learning at end of unit
- Content is not assessed except for completion; the writing is intended to provide students a chance to internalize the material by finding personal emotional connections to the material
- Unit quiz

Resources:

Studies in Physical Geography - ISBN 978-0-9735999-8-5
Geography 12 Student Textbook/Workbook/Study Guide
https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
Soils - http://www.arcgis.com/home/item.html?id=204d94c9b1374de9a21574c9efa31164 - https://www.glbrc.org/outreach/educational-materials/measuring-soil-microbial-activity

Unit 5: Topographic Mapping & Nautical Charts (Week 9-11)
Curricular Competency: Use knowledge of scientific concepts to draw conclusions that are consistent with evidence
Curricular Competency: Express and reflect on a variety of experiences, perspectives, and worldviews through place
Curricular Competency: Contribute to care for self, others, community, and world through individual or collaborative approaches

Assignments
Quizzes
Workbook Activities
Constructing a 3D Topographic Map (https://www.usgs.gov/science-support/osqi/yes/resources-teachers/constructing-a-3d-topographic-map?qt-science_support_page_related_con=1#qt-science_support_page_related_con)
How do I construct a topographic profile?
(https://serc.carleton.edu/mathyouneed/slope/topoprofile.html)
Plot Your Course Assignment
(https://oceanservice.noaa.gov/education/lessons/plot_course.html)

Key Questions:
How are geologic maps and 3D block models used by different interest groups?
How are 2D and 3D topographic maps created?
Do mariners still use paper charts (maps)? When are these charts important?

Resources:
Studies in Physical Geography - ISBN 978-0-9735999-8-5
Geography 12 Student Textbook/Workbook/Study Guide
https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/topo101/pdf/mapping_basics_e.pdf
https://oceanservice.noaa.gov/education/lessons/plot_course.html

Unit 6: ESRI Arc GIS Online (Week 12)
Curricular Competency: Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions
Curricular Competency: Describe specific ways to improve their investigation methods and the quality of their data
Curricular Competency: Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled
Curricular Competency: Co-operatively design projects with local and/or global connections and applications

Assignments
Quizzes
Workbook Activities
Creating a swipe story map (https://www.esri.com/content/dam/esrisites/en-us/media/pdf/teach-with-gis/creating-a-swipe-story-map.pdf)
View depth of earthquake and aftershocks in 3D (https://www.esri.com/content/dam/esrisites/en-us/media/pdf/teach-with-gis/responding-to-an-earthquake-off-the-western-coast-of-mexico.pdf)
Understanding the Global Ecosystems Map (http://downloads.esri.com/learnarcgis/educators/global-ecosystems-map.pdf)

Key Questions:
What careers exist in Geographical Information Systems (GIS)? What education options are available for this career?
What industries use GIS?

Resources:
Studies in Physical Geography - ISBN 978-0-9735999-8-5
Geography 12 Student Textbook/Workbook/Study Guide
Teach with GIS (https://learn.arcgis.com/en/educators/#/library)