The Royal
AGRICULTURAL WINTER FAIR

Ontario Curriculum Connections

SCIENCE & TECHNOLOGY, 2022

Grades 1 - 10

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Elementary Science and Technology Curriculum Overview

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	B. Biology	**C. Chemistry**	**D. Earth and Space Science**	**E. Physics**
Grade 9 Academic	Sustainable Ecosystems	Atoms, Elements, and Compounds	The Study of the Universe	The Characteristics of Electricity
Grade 9 Applied	Sustainable Ecosystems and Human Activity	Exploring Matter	Space Exploration	Electrical Applications
Grade 10 Academic	Tissues, Organs, and Systems of Living Things	Chemical Reactions	Climate Change	Light and Geometric Optics
Grade 10 Applied	Tissues, Organs, and Systems	Chemical Reactions and Their Practical Applications	Earth's Dynamic Climate	Light and Applications of Optics

Areas of Cross Curricular and Integrated Learning

- **Skilled Trades**. The Royal highlights how skilled trades workers apply science and technology concepts as they build and maintain essential agricultural infrastructure and keep the agri-food industries moving. The Royal is an opportunity to learn about technology and innovation related to the skilled trades, providing students with authentic, meaningful, and hands-on experiences and activities that connect directly to their own lives and communities through the foods they eat! The Royal also provides students with a valuable experiential learning opportunity to connect with role models with diverse lived experiences. A trip to The Royal helps lay a foundation for the secondary science curriculum through exposing students to information on the skilled trades and apprenticeships as career pathways.

- **Climate Change**: The Royal aims to foster hope and optimism in teaching and learning about climate change through connect students with sustainability initiatives. At The Royal, students can develop the skills and knowledge needed to understand the causes and potential innovative solutions and mitigation strategies related to climate change and other environmental issues, and how they can make the most environmentally responsible decisions possible, given the choices they have.

- **Food Literacy** The Royal is aimed at developing understanding of where food comes from, including the importance of locally sourced food and how it is grown and prepared, to students investigating the importance of biodiversity in agriculture. It is an experiential, hands-on way to connect to Ontario's diverse agricultural sector, as well as their own lives and communities.

Example Activities and Guiding Questions

Grade 1:

- Talk to real life farmers and ask about the needs of their animals or plants.
- Observe all the different animals at The Fair - how do their different bodies help them meet their needs?
- At The Royal, what do you smell? See? Hear? What parts of your body are connected to each sense?
- Investigate how plants grow - where do they get their energy?

Grade 2

- Talk to real farmers about the machines they use to help them do their work! What kinds of simple machines do you see?
- Observe all the different animals - compare their different stages of life and their different bodies.
- Investigate how all living things depend on water. Where can you observe water at The Fair? Speak to animal caretakers about their animals' water needs.

Grade 3

- Talk to real farmers about the machines they use to help them do their work! What kinds of machines do you see? What forces make them work? How do farmers stay safe?
- Observe all the different plants - compare their different stages of life and their differences.
- Investigate how all things depend on soil.

Grade 4

- Talk to real farmers about the machines they use to help them do their work! What kinds of machines do you see?
- Investigate how food gets to your table. How are we all interconnected in a food web?
- Categorize all the different organisms you see at The Fair as one of the following: Producer, Consumer, Decomposer, Herbivore, Omnivore, Carnivore.

Grade 5

- What kinds of energy does getting your food require? Explore some ways people are working to make the Agri-Food industries more sustainable in terms of energy consumption.
- How do different foods impact your health and body?
- Learn about the nutrition in all different kinds of foods in the Farm to Table Discovery Zone. How does knowing about different kinds of foods help you make healthy choices?

Grade 6

- Talk to real life farmers and researchers and ask about how they are working to protect the biodiversity of the environment.
- Observe the poultry at The Fair. How do their bodies help them to fly?

Grade 7

- Talk to different food producers and researchers about how their approaches to agriculture and to harvesting food can impact an ecosystem, and their strategies that to maintain and/or restore balance to ecosystems.
- Explore the food system - how are you part of a larger food chain?

Grade 8

- Explore how different commodity groups use cellular research in producing food.
- How does farming make use of automated systems?
- Visit the Dairy Education Centre to see automation in action in the food system!
- Through speaking with real producers, become an expert in the specific automation and machines required to produce a certain food commodity, and share with another expert.

Grade 9

- How are STEM fields being applied to solve real-world problems in Food & Farming, towards creating a more sustainable Food System?
- How do established and emergent agricultural practices reflect an understanding of the importance of the dynamic equilibrium of ecosystems?

Grade 10

- Explore the various career pathways that utilize STEM skills in the Agri-Food Industry: from soil science, to geneticist, meteorologist, and more.
- What are the properties of light that make it a crucial part of the Agri-Food system? What are some technologies in the Agri-Food industry that make use of these properties? What are the social benefits of these technologies?

Curriculum Connections

Grades 1-8: Strand A. STEM Skills and Connections

Example Activities and Guiding Questions:

- How is farming a skilled trade?
- What other skilled trades uphold the Agri-Food industry?
- What STEM skills are applied in the world of Food and Farming? What careers are available there?

Curriculum Connections:

- A2. *Coding and Emerging Technologies*: use coding in investigations and to model concepts, and assess the impact of coding and of emerging technologies on everyday life
    - A2.2 identify and describe impacts of coding and of emerging technologies on everyday life, [including the skilled trades, if Grades 4 and up]
- A3. *Applications, Connections, and Contributions*: demonstrate an understanding of the practical applications of science and technology, and of contributions to science and technology from people with diverse lived experiences
    - A3.1 describe practical applications of science and technology concepts in their home and community, and how these applications address real-world problems
    - A3.2 investigate how science and technology can be used with other subject areas to address real-world problems
    - A3.3 analyse contributions to science and technology from various communities

Grade 1

Strand B. Life Systems: Needs and Characteristics of Living Things

- B1. *Relating Science and Technology to Our Changing World* assess the importance of a healthy environment for living and non-living things, and the responsibilities of humans in contributing to a healthy environment
    - B1.1 describe changes or problems that could result from the loss of living and non-living things that are part of everyday life, while taking different perspectives into consideration
    - B1.2 identify actions that can be taken to contribute to a healthy environment
- B2. *Exploring and Understanding Concepts* demonstrate an understanding of the basic needs and characteristics of living things, including humans
    - B2.1 demonstrate an understanding of the natural environment as a place where living and non-living things are interconnected

- B2.2 identify the basic needs of living things, including the need for air, water, food, heat, shelter, and space
- B2.3 identify the physical characteristics of various plants and animals, including humans, and explain how these characteristics help the plants and animals meet their basic needs
- B2.4 identify the location and the function of various parts of the human body, including sensory organs
- B2.5 describe the characteristics of a healthy environment, including clean air and water and nutritious food, and how a healthy environment enables living things to meet their needs
- B2.6 describe ways in which living things provide for the needs of other living things

Strand C. Matter and Energy; Energy in Our Lives

- C1. *Relating Science and Technology to Our Changing World* assess uses of energy at home, at school, and in the community, and suggest ways to use energy responsibly
  - C1.1 describe everyday uses of energy at school and at home, and suggest ways to use energy responsibly
  - C1.2 describe how the lives of people and other living things would be affected if electrical energy were no longer available
- C2. *Exploring and Understanding Concepts* demonstrate an understanding of how energy affects their lives, and that the Sun is the principal source of energy for Earth
  - C2.1 demonstrate an understanding that energy is the ability to move or change something
  - C2.2 demonstrate an understanding that the Sun is Earth's principal source of energy, including how it warms the air, land, and water; is a source of light for Earth; and makes it possible for plants to grow
  - C2.3 identify food as a source of energy for living things
  - C2.4 identify everyday uses of various sources of energy
  - C2.5 demonstrate an understanding that humans get the energy resources they need from the world around them, and that the supply of many of these resources is limited
  - C2.6 describe seasonal differences in how we use energy and in the forms of energy we use

Strand E. Earth and Space Systems Daily and Seasonal Changes

- E1. *Relating Science and Technology to Our Changing World* assess the impact of daily and seasonal changes on living things, including humans
  - E1.1 assess the impact of daily and seasonal changes on human outdoor activities, and identify innovations that enable people to engage in various activities year-round
  - E1.2 assess ways in which daily and seasonal changes have an impact on society, the environment, and living things in the natural environment

- E2. *Exploring and Understanding Concepts* demonstrate an understanding of daily and seasonal changes and of how living things respond to those changes
    - E2.1 demonstrate an understanding of Earth's relationship to the Sun and that this relationship results in daily and seasonal changes on Earth
    - E2.2 demonstrate an understanding that a cycle is a series of repeating events, and that cycles can be observed in daily and seasonal changes
    - E2.3 describe the changes in the amount of light and heat from the Sun that occur throughout the day and in the four seasons
    - E2.4 describe and compare the four seasons in terms of the weather, including precipitation and temperature, in their local area
    - E2.5 describe changes in the appearance or behaviour of living things that are adaptations to seasonal changes
    - E2.6 describe how humans prepare for, and respond to, daily and seasonal changes

Grade 2

Strand B. Life Systems: Growth and Changes in Animals

- B1. *Relating Science and Technology to Our Changing World* assess ways in which animals have an impact on society and the environment, and ways in which human activities have an impact on animals and the places where they live
    - B1.1 examine impacts that animals can have on society and the environment, and describe some ways in which any negative impacts can be minimized
    - B1.2 assess impacts of various human activities on animals and the places where they live, and describe practices that can minimize negative impacts
- B2. *Exploring and Understanding Concepts* demonstrate an understanding that animals grow and change and have distinct characteristics
    - B2.1 compare physical characteristics of various animals, including characteristics that are constant and those that change
    - B2.2 describe the locomotion of various animals
    - B2.3 describe the life cycle of a variety of animals, including insects, amphibians, birds, and mammals
    - B2.4 compare changes in the appearance and behaviour of various animals as they go through a complete life cycle
    - B2.5 describe adaptations, including physical and/or behavioural characteristics, that allow various animals to survive in their natural environment

Strand D. Structures and Mechanisms: Simple Machines and Movement

- D1. *Relating Science and Technology to Our Changing World* assess the impact of simple machines on society and on the environment
    - D1.1 assess the impact of simple machines on the daily lives of people in various communities
    - D1.2 assess the impact on the environment of technologies that use simple machines to facilitate movement

Strand E. Earth and Space Systems: Air and Water in the Environment

- E2. *Exploring and Understanding Concepts* demonstrate an understanding of the properties of air and water, including water in various states, and of ways in which living things depend on air and water for their survival
    - E2.1 demonstrate an understanding of the key properties of air and water
    - E2.2 identify sources of water in the natural and built environments
    - E2.5 describe ways in which living things, including humans, depend on air and water
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Grade 3

Strand B. Life Systems: Growth and Changes in Plants

- B1. *Relating Science and Technology to Our Changing World* assess ways in which plants are beneficial to society and the environment, and ways in which human activity has an impact on plants and plant habitats
    - B1.1 assess ways in which plants are important to humans and other living things, taking different perspectives into consideration, and identify ways in which humans can protect native plant species and their habitats
    - B1.2 assess ways in which human activities have an impact on plants and plant habitats, and identify personal actions that they could take to minimize harmful effects and enhance positive ones
    - B1.3 assess the benefits and limitations of locally grown food
- B2. *Exploring and Understanding Concepts* demonstrate an understanding of characteristics and uses of plants and of plants' responses to the natural environment
    - B2.1 describe the basic needs of plants, including the need for air, water, light, heat, nutrients, and space, and identify environmental conditions that may threaten plant survival
    - B2.2 identify different parts of plants, including the root, stem, flower, stamen, pistil, leaf, seed, cone, and fruit, and describe how each part contributes to plants' survival within their environment
    - B2.3 describe changes that different plants undergo in their life cycles B2.4 describe ways in which a variety of plants adapt and/or react to their environment and to changes in their environment
    - B2.5 demonstrate an understanding that most plants get energy directly from the Sun through the process of photosynthesis, which involves the absorption of carbon dioxide and the release of oxygen
    - B2.6 describe ways in which people, including Indigenous peoples, from various cultures around the world use plants for food, shelter, medicine, and clothing
    - B2.7 describe various plants used for food, including those grown by First Nations, Métis, and Inuit, and identify local settings where these plants are grown or found
    - B2.8 describe ways in which plants and animals, including humans, depend on each other

Strand C. Matter and Energy: Forces and Motion

- C1. *Relating Science and Technology to Our Changing World* assess the impacts of various forces on society and the environment
    - C1.2 assess harmful effects of forces that may result from various human activities, and describe how health and safety devices can minimize these effects
- C2. *Exploring and Understanding Concepts* demonstrate an understanding of how forces cause motion and changes in motion
    - C2.1 describe different types of contact forces and non-contact forces
    - C2.2 describe different ways a force can be exerted on an object
    - C2.3 describe how different forces applied to an object, including forces of varying magnitude, can cause the object to start, stop, or change its direction, speed, or shape
    - C2.4 identify ways in which forces are used in their daily lives

Strand E. Earth and Space Systems: Soils in the Environment

- E1. *Relating Science and Technology to Our Changing World* assess the importance of soils for society and the environment, and the impact of human activity on soils
    - E1.1 assess the importance of soils for society and the environment
    - E1.2 assess the impact of human activity on soils, and describe ways in which humans can improve the quality of soils and/or lessen or prevent harmful effects on soils
- E2. *Exploring and Understanding Concepts* demonstrate an understanding of the composition of soils, of different types of soils, and of processes and practices that can affect the health of soil
    - E2.1 identify the living and non-living components of soil, and describe the characteristics of healthy soil
    - E2.2 identify different substances that are commonly added to, or absorbed by, the soil, and describe their effects on soil health
    - E2.3 examine different types of soils found in Ontario, and describe how different soils are suited to growing different types of food, including crops
    - E2.4 explain the process of erosion, including its causes and its impact on soils
    - E2.5 identify various strategies used to maintain and improve soil health in Ontario
    - E2.6 describe the process of composting, and explain some benefits of composting

Grade 4

Stand B. Life Systems: Habitats and Communities

- B1. *Relating Science and Technology to Our Changing World* assess impacts of human activities on habitats and communities, and analyse actions for minimizing negative impacts and enhancing positive ones
    - B1.1 assess positive and negative impacts of human activities on habitats and communities, while taking different perspectives into account

    - B1.2 analyse the impact of the depletion or extinction of a species on its habitat and community, and describe possible actions to prevent such depletions or extinctions
- B2. *Exploring and Understanding Concepts* demonstrate an understanding of habitats and communities and of interrelationships among the organisms that live in them
    - B2.1 describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities
    - B2.2 describe a community as a group of interacting species sharing a common habitat, and identify factors that affect the ability of a community of plants and animals to survive in a local habitat
    - B2.3 describe the relationship of organisms in a food chain, and classify organisms as producers, consumers, or decomposers
    - B2.4 demonstrate an understanding of a food web as the interconnection of multiple food chains in a natural community
    - B2.5 describe how animals are categorized according to their diet, and categorize various animals as carnivores, herbivores, or omnivores
    - B2.6 describe structural adaptations of a variety of plants and animals and how these adaptations allow the organisms to survive in specific habitats
    - B2.7 explain why all habitats have limits to the number of plants and animals they can support

Strand D. Structures and Mechanisms: Machines and Their Mechanisms

- D1. *Relating Science and Technology to Our Changing World* evaluate the impacts of various machines and their mechanisms on society and the environment
    - D1.1 assess the impacts of machines and their mechanisms on the daily lives of people in various communities
    - D1.2 assess and compare the environmental impacts of using different machines designed for similar purposes
- D2. *Exploring and Understanding Concepts* demonstrate an understanding of the basic principles and functions of machines and their mechanisms
    - D2.1 identify machines that are used in daily life, and describe their purposes
    - D2.2 identify the parts of various mechanisms and describe the purpose of each part
    - D2.3 describe how different mechanisms transmit various types of motion, including rotary motion, from one system to another
    - D2.4 describe how mechanisms transform motion, including how they can change the geometric plane in which the motion occurs and the speed and/or direction of motion
    - D2.5 explain how forces are changed in a variety of machines

Grade 5

Strand B. Life Systems: Human Health and Body Systems

- B1. *Relating Science and Technology to Our Changing World* analyse impacts of various social and environmental factors, human activities, and technologies on human health
    - B1.1 assess effects of a variety of social and environmental factors on human health, and describe ways in which individuals can reduce the harmful effects of these factors and take advantage of those that are beneficial
    - B1.3 explain how food literacy can support decisions that affect physical and mental health

Strand E. Earth and Space Systems: Conservation of Energy and Resources

- E1. *Relating Science and Technology to Our Changing World* assess effects of energy and resource use on society and the environment, and suggest options for conserving energy and resources
    - 1.1 analyse long-term impacts of human uses of energy and natural resources, on society and the environment, including climate change, and suggest ways to mitigate these impacts
    - E1.2 evaluate effects of various technologies on energy consumption, and describe ways in which individuals can use technology to reduce energy consumption
- E2. *Exploring and Understanding Concepts* demonstrate an understanding of the conservation of energy, and the forms, sources, and uses of energy and resources
    - E2.1 identify a variety of forms of energy, and describe how each form is used in everyday life
    - E2.2 demonstrate an understanding of the law of conservation of energy, including how energy cannot be created or destroyed but can only be transformed from one form to another
    - E2.3 describe how energy is stored as potential energy and transformed in a given device or system
    - E2.4 demonstrate an understanding that when energy is transformed from one form to another, some energy may dissipate into the environment in the form of heat, light, and/or sound energy
    - E2.5 identify renewable and non-renewable sources of energy
    - E2.6 explain how the use of energy derived from fossil fuels changes the composition of the atmosphere and how these changes contribute to climate change

Grade 6

Strand B. Life Systems: Biodiversity

- B1. *Relating Science and Technology to Our Changing World* assess the importance of biodiversity, and describe ways of protecting biodiversity
    - B1.1 assess the benefits of biodiversity and the consequences of the diminishing of biodiversity

    - B1.2 analyse a local issue related to biodiversity while considering different perspectives; plan a course of action in response to the issue; and act on their plan
- B2. *Exploring and Understanding Concepts* demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefits to humans
    - B2.1 describe the distinguishing characteristics of different groups of organisms, and use these characteristics to further classify these organisms using a classification system
    - B2.2 demonstrate an understanding of biodiversity as the diversity of life on Earth, including the diversity of organisms within species, among species in a community, and among communities and the habitats that support them
    - B2.3 describe ways in which biodiversity within species is essential for their survival
    - B2.4 describe ways in which biodiversity within and among communities is essential for maintaining the resilience of these communities
    - B2.5 describe interrelationships within species, between species, and between species and their natural environment, and explain how these interrelationships sustain biodiversity
    - B2.6 explain how invasive species reduce biodiversity in local environments
    - B2.7 explain how climate change contributes to a loss of biodiversity, and describe the impact of this loss
    - B2.8 describe the importance of biodiversity in supporting agriculture, including Indigenous agriculture around the world

Strand D. Structures and Mechanisms: Flight

- D2*. Exploring and Understanding Concepts* demonstrate an understanding of the ways in which properties of air can be applied to the principles of flight and flying machines
    - D2.3 describe ways in which flying machines and various organisms use balanced and unbalanced forces to control their flight
    - D2.5 describe characteristics and adaptations that enable organisms to fly

Grade 7

Strand B. Life Systems: Interactions in the Environment

- B1. *Relating Science and Technology to Our Changing World* assess the impact of human activities and technologies on the environment, and analyse ways to mitigate negative impacts and contribute to environmental sustainability
    - B1.1 assess the impact of various technologies on the environment
    - B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment
- B2. *Exploring and Understanding Concepts* demonstrate an understanding of interactions between and among biotic and abiotic components in the environment
    - B2.1 explain that an ecosystem is a network of interactions among living organisms and their environment
    - B2.2 identify biotic and abiotic components in an ecosystem, and describe the interactions between them

- B2.3 describe roles and relationships between producers, consumers, and decomposers within an ecosystem
- B2.4 describe the transfer of energy in a food chain, and explain the effects of altering any part of the chain
- B2.5 describe how matter is cycled within the environment, and explain how the cycling of matter promotes sustainability
- B2.6 explain the differences between primary succession and secondary succession in ecosystems
- B2.7 explain how biotic and abiotic factors limit the number of organisms an ecosystem can sustain
- B2.8 describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems

Strand E. Earth and Space Systems: Heat in the Environment

- E2. *Exploring and Understanding* Concepts demonstrate an understanding of heat as a form of energy that is associated with the movement of particles and is essential for many natural processes within Earth's systems
  - E2.8 identify common sources of greenhouse gases, including sources resulting from human activity, and describe how humans can reduce emissions of these gas

Grade 8

Strand B. Life Systems: Cells

- B1. Relating Science and Technology to Our Changing World assess developments in cell biology and their impact on individuals, society, and the environment
  - B1.1 assess how various technologies have enhanced our understanding of cells and cellular processes
  - B1.2 analyse beneficial and harmful effects of developments in cell biology and associated emerging technologies on human health and the environment, while taking different perspectives into consideration
- B2. Exploring and Understanding Concepts demonstrate an understanding of the basic structure and function of plant and animal cells and cell processes
  - B2.1 demonstrate an understanding of cells, using cell theory
  - B2.2 identify organelles and other cell components, including the nucleus, cell membrane, cell wall, chloroplasts, vacuole, mitochondria, and cytoplasm, and explain their basic functions
  - B2.3 compare the structure and function of plant and animal cells
  - B2.4 explain the processes of diffusion and osmosis within a cell
  - B2.5 describe various unicellular and multicellular organisms, and compare ways in which these two types of organisms meet their basic needs
  - B2.6 describe the organization of cells into tissues, organs, and systems

Strand D. Structures and Mechanisms: Systems in Action

- D1. Relating Science and Technology to Our Changing World assess the social and environmental impacts of various systems, and evaluate improvements to the systems or alternative ways of meeting the same needs
    - D1.1 assess the social, economic, and environmental impacts of automating systems D1.2 assess the impact on individuals, society, and the environment of alternative ways of meeting needs that are currently met by existing systems, taking different points of view into consideration
- D2. Exploring and Understanding Concepts demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation
    - D2.1 identify various types of systems
    - D2.2 describe the purpose, inputs, and outputs of various systems, including systems related to food processing
    - D2.3 identify the various processes and components of a system that allow it to perform its function efficiently and safely
    - D2.4 use the scientific terms displacement, force, work, energy, and efficiency to describe everyday experiences
    - D2.5 demonstrate an understanding of the relationships between work, force, and displacement in simple systems
    - D2.6 explain the relationship between input and output forces and determine the mechanical advantage of various mechanical systems, including simple machines
    - D2.7 identify ways in which energy can dissipate from mechanical systems, and describe technological innovations that make these systems more efficient
    - D2.8 explain how providing information and support to consumers helps to ensure that the systems they use run safely and efficiently
    - D2.9 describe technological innovations involving mechanical systems that have increased productivity in various industries
    - D2.10 identify social factors that influence the evolution of a system

Grade 9

Strand A. STEM Skills, Careers, and Connections

- A2. *Applications, Careers, and Connections* analyse how scientific concepts and processes can be applied in practical ways to address real-world issues and in various careers, and describe contributions to science from people with diverse lived experiences
    - A2.2 describe how scientific innovations and emerging technologies, including artificial intelligence systems, impact society and careers
    - A2.3 analyse how the development and application of science is economically, culturally, and socially contextualized, by investigating real-world issues
    - A2.4 apply scientific literacy skills when investigating social and environmental issues that have personal, local, and/or global impacts
    - A2.5 analyse contributions to science by people from various communities, including communities in Canada

Strand B. Biology: Sustainable Ecosystems and Climate Change

- B1. *Relating Science to Our Changing World* assess impacts of climate change on ecosystem sustainability and on various communities, and describe ways to mitigate these impacts
    - B1.3 investigate and explain how sustainable practices used by various communities, including First Nations, Métis, and Inuit communities, reflect an understanding of the importance of the dynamic equilibrium of ecosystems
- B2. *Investigating and Understanding Concepts* demonstrate an understanding of the dynamic and interconnected nature of ecosystems, including how matter cycles and energy flows through ecosystems
    - B2.1 investigate interactions between the biosphere, hydrosphere, lithosphere, and atmosphere, and explain why these interactions are important for ecosystem sustainability
    - B2.2 explain how naturally occurring phenomena, including the cycling of matter and the flow of energy, contribute to the dynamic equilibrium within and between ecosystems
    - B2.3 compare and contrast the processes of cellular respiration and photosynthesis, and explain how their complementary relationship contributes to the dynamic equilibrium of ecosystems
    - B2.4 investigate factors and processes, including biodiversity, air and water quality, soil health, and succession, and explain how they contribute to ecosystem sustainability
    - B2.5 explain the effects of various human activities on the dynamic equilibrium of ecosystems
    - B2.6 identify and use various indicators of climate change to describe the impacts of climate change on local and global ecosystems, and analyse how human activities contribute to climate change
    - B2.7 explain how sustainable practices related to the cycling of matter and the flow of energy can be applied in agricultural innovations

Strand C. Chemistry: The Nature of Matter

- C1. *Relating Science to Our Changing World* assess social, environmental, and economic impacts of the use of elements, compounds, and associated technologies
    - C1.1 assess social, environmental, and economic impacts of processes associated with the life cycle of consumer products, considering the elements and compounds used to make them, and suggest ways to enhance positive impacts and/or minimize negative impacts
    - C1.2 analyse impacts of using emerging chemical technologies in various fields, including in the skilled trades, and assess factors that influence the development of these technologies

Strand E. Earth and Space Science: Space Exploration

- E1: *Relating Science to Our Changing World* evaluate social, environmental, and economic impacts of space exploration and of technological innovations derived from space exploration

- E1.3 assess ways in which technological innovations related to space observation and exploration are applied in various fields, including their contributions to sustainable practices on Earth

Grade 10

Strand A. Scientific Investigation Skills and Career Exploration

- A2. *Career Exploration* 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
    - A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., meteorologist, medical illustrator, geochemist, optical physicist) and the education and training necessary for these careers

Strand E. Physics: Light and Geometric Optics

- E1. evaluate the effectiveness of technological devices and procedures designed to make use of light, and assess their social benefits;
    - E1.2 analyse a technological device that uses the properties of light (e.g., microscope, retroreflector, solar oven, camera), and explain how it has enhanced society
- E3. demonstrate an understanding of various characteristics and properties of light, particularly with respect to reflection in mirrors and reflection and refraction in lenses
    - E3.1 describe and explain various types of light emissions (e.g., chemiluminescence, bioluminescence, incandescence, fluorescence, phosphorescence, triboluminescence; from an electric discharge or light-emitting diode [LED])
    - E3.2 identify and label the visible and invisible regions of the electromagnetic spectrum
    - E3.8 describe properties of light, and use them to explain naturally occurring optical phenomena (e.g.,apparent depth, shimmering, a mirage, a rainbow)