

# Curriculum Outcomes

## Sustainability of Ecosystems

*How does sustainability fit into your paradigm and society's paradigm*

- Explain how a paradigm shift can change scientific world views in understanding sustainability (114-1)
- Communicate questions, ideas and intentions and receive, interpret, understand, support and respond to the ideas of others with respect to environmental attitudes (215-1)

*What are the factors affecting the sustainability of an ecosystem*

- Populations in equilibrium and relate this equilibrium to the resource limits of an ecosystem (318-5)
- Describe and apply classification systems and nomenclature with respect to trophic levels in ecosystems (214-1)
- Classify organisms as producer, consumer, autotroph, heterotroph, decomposer, herbivore, carnivore, omnivore, saprobe
- Describe the mechanisms of bioaccumulation, and explain its potential impact on the viability and diversity of consumers at all trophic levels (318-2)
- Explain how biodiversity of an ecosystem contributes to its sustainability (318-6)
- Illustrate the cycling of matter through biotic and abiotic components of an ecosystem by tracking carbon, nitrogen and oxygen (318-1)
- Plan changes to, predict the effects of, and analyse the impact of external factors on an ecosystem (331-6, 213-8, 212-4)

*Sustainability Issues in an Ecosystem*

- Analyse the impact of external factors on the ecosystem (331-6)
- Explain why the ecosystem may respond differently to short-term stress and long-term change (318-4)
- Select, compile and display evidence and information from various sources, in different formats, to support a given view in a presentation about ecosystem change (214-3, 213-7)
- Communicate questions, ideas and intentions, and receive, interpret, understand support and respond to the ideas of others in preparing a report about ecosystem change (215-1)

*Extension to the biosphere*

- Compare the risks and benefits to the biosphere of applying new scientific knowledge and technology to industrial processes (118-1)
- Explain why ecosystems with similar characteristics can exist in different geographical locations (318-3)
- Identify examples where scientific understanding about an ecosystem was enhanced or revised as a result of human invention or related technologies (116-1)
- Describe how soil composition and fertility can be altered and how these changes could affect an ecosystem (331-7)
- Describe how Canadian research projects in environmental science and technology are funded (117-3)

- Propose and defend a course of action on a multi-perspective social issue (118-9, 215-4, 118-5)
- Describe the role peer review has in the development of scientific knowledge (114-5)

### **Chemical Reactions**

*Investigating chemical reactions is a key to understanding nature*

- Provide examples of how science and technology are an integral part of their lives and their community by investigating common examples of combustion (117-5)
- Demonstrate a knowledge of WHMIS standards by selecting and applying proper techniques for handling and disposing of lab materials (213-9)
- Evaluate and select appropriate instruments for collecting evidence and appropriate processes for problem solving, inquiring, and decision-making by investigating the properties of acids, bases and salts (212-8)
- Classify substances as acids, bases, or salts, based on their characteristic properties (319-2)
- Describe how neutralization involves tempering the effects of an acid with a base and vice-versa (312-2)

*An introduction to Formula Writing*

- Name and write formulas for common molecular compounds, including the use of prefixes (319-1)
- Name and write formulas for some common ionic compounds (both binary and complex) using the periodic table, a list of ions and appropriate nomenclature for metal and non-metal ions (319-1)
- Describe the usefulness of IUPAC scientific nomenclature systems to convey chemical information (114-8)
- Classify simple acids, bases and salts based on their name and formula (319-2)
- Illustrate, using chemical formulas, a variety of natural and synthetic compounds that contain carbon (319-3)
- Distinguish between organic and inorganic compounds on the basis of their formulas (319-3)
- Represent chemical reactions and the conservation of mass using molecular models, and balanced symbolic equations (321-1)

*A qualitative introduction to rates of chemical reactions*

- Design, carry out and control variables to illustrate how factors such as heat, concentration and surface area can affect chemical reactions (321-3, 212-3, 213-2)

*What are some of the effects of industrialization and associated pollution*

- Design, carry out and control variables to illustrate how factors such as heat, concentration and surface area can affect chemical reactions (321-3, 212-3, 213-2)

*What are some of the effects of industrialization and associated pollution*

- Compile and organize data on acid precipitation (pH) in order to interpret patterns and trends in these data, and infer or calculate linear and non-linear relationships among variable such as pH versus time and location (213-5, 214-5)

- Work cooperatively with a team to research and describe the relationship between domestic and industrial technologies and the formation of acid rain (116-5, 215-6, 116-3)
- Propose alternative solutions to the problem of acid precipitation, assess each and select one as the basis for a plan of action, defending the decision (214-15, 118-15)
- Identify and describe science-and technology-based careers related to airborne pollution (117-7)
- Compare examples where society has used the presence of airborne pollution to influence decisions concerning science and technology (117-1)

### **Weather Dynamics**

*How are changes in the hydrosphere and atmosphere observed and measured*

- Relate personal activities and technology used with meteorology in the design of a weather station (114-6)
- Identify questions to investigate that arise from the operation and findings of the weather station (212-1)
- Use weather instruments effectively and accurately for collecting local weather data (213-3)
- Use print and electronic sources to collect weather data from regional and national weather observational networks (213-6, 213-7)
- Analyse meteorological data for a given time span and predict future weather conditions, using appropriate technologies and methodologies (331-5)

*What energy source drives the Water Cycle*

- Identify questions to investigate that arise from considering the energy transferred within the water cycle (212-1)
- Describe examples that illustrate the atmosphere and hydrosphere are heat sinks in the water cycle (331-3)
- Explain how scientific knowledge evolves about changing weather patterns with new evidence about changes in ocean temperature (115-6)
- Conduct experiments to compare the specific heats of common earth materials and draw conclusions about the effect of solar radiation on water and land surfaces (213-2, 214-11)
- Plan experiments that can be used to determine the latent heat of fusion and vaporization for water (213-2)
- Identify and explain the uncertainties in measurement and express them in a form that acknowledges the degree of uncertainty (214-10)
- Using scientific theory, illustrate and explain heat energy transfers that occur in the water cycle (115-2, 331-1)

*Heat energy, its transfer, and Weather Dynamics – Is there a connection?*

- Use weather data to describe and explain heat transfers in the hydrosphere and atmosphere showing how these affect air and water currents (214-3, 331-2)
- Select and integrate information about weather from a variety of sources
- Compile and display this information to illustrate a particular hypothesis about weather in the Atlantic region (213-7, 214-3, 215-5)
- Illustrate how science attempts to explain seasonal changes, and variations in weather patterns for a given location (115-2)

*What is the evidence for movement of heat energy and matter in global systems?*

- Using scientific theory, describe and explain heat transfer and its consequences in both the atmosphere and hydrosphere, relating this science to natural phenomena (115-2, 331-2)
- Describe and explain the effects of heat transfer on the development, severity, and movement of weather systems (331-4)
- Describe weather satellite imaging, its benefits to society, and Canada's contribution to this technology (117-10)

*Accurate weather forecasting – What is its impact?*

- Identify examples where improved data gathering technology has resulted in better understanding of weather systems and of forecasting (116-1)
- Describe the impact of Canadian contributions to the field of meteorology (117-10)
- Describe the limitations of scientific knowledge and technology in making predictions related to weather (118-7)
- Relate both personal activities and scientific/technological processes to weather and climate research and the application of the research. Identify why some activities tend to be individual or group oriented (114-6, 117-6)
- Identify the impact of severe weather systems on economic, social and environmental conditions (118-2)

## **Motion**

*Investigate velocity*

- Devise a method of representing the linear motion of two moving people or objects (215-2)
- Develop appropriate sampling procedures for determining the speed of an object's linear motion (219-9)
- Use instruments such as ticker timers, photogates, or motion sensors effectively and accurately for collecting data (213-3)
- Identify and explain sources of errors and uncertainty in distance, time, and speed measurements and express results in a form that indicates the limits of accuracy (214-10)
- Describe quantitatively the relationship among distance, time and average speed of an object's linear motion (325-1, 212-7)
- Predict the time taken for a moving object to complete a course based on initial measurements, estimated values, and an understanding of the displacement, time and velocity relationship (212-4, 213-4)
- Analyse graphically and mathematically the relationship among displacement, time, and velocity (325-2)
- Distinguish between average velocity and instantaneous velocity (325-3)
- Distinguish between uniform and non-uniform motion (acceleration) (325-4)
- Formulate an operational definition for velocity (212-7)

*Investigate the relationship between velocity, time and acceleration*

- Devise a method of representing the Uniformly accelerated linear motion of two moving people or objects (215-2)

- Formulate an operation definition for acceleration (212-7)
- Design an experiment to investigate factors that affect acceleration (212-6, 212-9)
- Use instruments effectively and accurately for collecting data on Uniformly accelerated linear motion (213-3)
- Analyse a natural or technological structure that can affect the acceleration of a moving object (116-7)
- Identify potential sources of error in collecting data on linear acceleration (214-10)
- Evaluate and suggest possible improvements to data collection methods while determining acceleration (214-8)
- Interpret patterns in data collected for motion and identify intervals of uniform motion and accelerated motion (214-5)
- Describe quantitatively the relationship among velocity, time and acceleration (325-4)

*Technological improvements based on design testing and analysis*

- Distinguish between scientific questions and technological problems related to a motion research topic (115-1)
- Describe the historic development of a motion technology (115-4)
- Evaluate the design of a motion technology and the way it functions with relation to safety, construction and cost (118-3)
- Evaluate the role of continued testing in the development and improvement of a motion technology (114-3)

*Present and future development*

- Describe examples of Canadian contributions to science and technology in the area of motion (117-10)
- Relate a research project on motion to studies in specific science disciplines and interdisciplinary studies (114-6)
- Identify areas of further study related to science and technology of motion (117-8)