UNICEF and Global Education Curriculum (Inc. Environmental) Connections for Ontario

Secondary - Science

(Updated July 2007)

Grade Level	Course	Strand/Learning Expectations
9	**Science, Academic SNC 1D**	**Biology** • Provide examples of how developments in reproductive biology have had an impact on global and local food production, populations, the spread of disease, and the environment; **Chemistry** • Describe the methods used to extract elements in Canada, and outline associated economic and environmental considerations (e.g., use various sources to explain how gold, nickel, carbon, or uranium is obtained and refined); **Physics** • Devise a plan for a self-contained system to generate energy, using renewable energy sources, to meet the energy requirements of a dwelling, farm, or community in Ontario (e.g., design a plan to use any combination of wind, solar, or hydroelectric power);
9	**Science, Applied SNC 1P**	**Biology** • Provide examples of the impact of developments in reproductive biology on global and local food production, populations, the spread of disease, and the environment (e.g., genetic engineering of crops; reproductive technologies and the production of hybrid species); **Chemistry** • Describe the methods used to obtain elements in Canada, and outline local environmental concerns and health and safety issues related to the ways in which they are mined and processed (e.g., explain how gold, nickel, carbon, or uranium is obtained and processed); • Explain how a knowledge of the physical and chemical properties of elements enables people to determine the potential uses of the elements and assess the associated risks (e.g., helium versus hydrogen in balloons, copper versus aluminum in wiring, copper versus lead in plumbing); **Earth and Space Science** • Relate the beliefs of various cultures concerning celestial objects to aspects of their civilization (e.g., aboriginal beliefs, Greek mythology, Mayan civilization); **Physics** • Compare electrical energy production technologies, including risks and benefits (e.g., explain the advantages and disadvantages of using hydro, photovoltaic, wind, and tidal generators to produce electrical energy);

10	**Science, Academic SNC 2D**	**Biology** • Examine the factors (natural and external) that affect the survival and equilibrium of populations in an ecosystem (e.g., resource limits of an ecosystem, competing populations, bioaccumulation, selective decline); • Explain why different ecosystems respond differently to short-term stresses and long-term changes (e.g., short term: the activity of tent caterpillars during a season; long term: the effect of acid rain on maple trees); • Compare a natural and a disturbed ecosystem and suggest ways of assuring their sustainability (e.g., compare a meadow and a lawn); • Explain how soil composition and fertility can be altered in an ecosystem and identify the possible consequences of such changes; • Design and conduct an investigation to examine the effects of one factor on soil composition and fertility and on water quality in an ecosystem; • Assess the impact of technological change and natural change on an ecosystem (e.g., the introduction of fertilizer and pesticides to soil; the introduction of a genetically engineered plant or the effect of polluted water or air on plants and animals; the effect on an ecosystem of forest fire, flood, the natural infection of one species, or the movement of a species in or out of the area); • Describe ways in which the relationships between living organisms and their ecosystems are viewed by other cultures (e.g., First Nations); • Identify and research a local issue involving an ecosystem; propose a course of action, taking into account human and environmental needs; and defend their position in oral or written form (e.g., organize and participate in a debate on converting a grass lot into a parking lot); • Describe the physical and chemical processes involved in the methods used to clean up a contaminated site (e.g., how absorbent chemicals such as charcoal work in cleaning up oil spills); • Identify and evaluate Canadian initiatives in protecting Canada's ecosystems; • Explain changes in popular views about the sustainability of ecosystems and humans' responsibility in preserving them (e.g., the shift from a belief that all resources are inexhaustible to the belief that recycling, reusing, and reducing are important); • Describe careers that involved knowledge of ecology or environmental technologies, and use resources such as the Internet to determine the knowledge and skill requirements of such careers; **Chemistry** • Explain how environmental challenges can be addressed through an understanding of chemical substances (e.g., challenge such as the renewal of the Great Lakes, the neutralization of acid spills, the scrubbing of waste gases in smokestacks); **Earth and Space Science** • Investigate factors which affect the development, severity, and movement of global and local weather systems (e.g., the ozone layer, El Nino, bodies of water, glaciers, smog, rain forests); • Explain the role of weather dynamics in environmental phenomena and consider the consequences to humans of

		changes in weather (e.g., the role of weather in air pollution, acid rain, global warming, and smog; the fact that smog aggravates asthma); • Compare various cultural (e.g., First Nations) and historical views on the origins and interpretations of weather; **Physics** • Evaluate the costs and benefits, including the safety and environmental factors, of technologies which have enabled us to travel at ever-greater speeds, and the impact of the increased capacity for speed on risk behaviour and subsequent injuries (e.g., snowmobiles, automobiles, motorized personal water craft);
10	**Science, Applied SNC 2P**	**Biology** • Illustrate the process of bioaccumulation through an example, and explain its potential impact on the viability and diversity of consumers at all trophic levels; • Show the relationship between the resources available and the equilibrium of a natural population in an ecosystem (e.g., describe the impact on an aquatic ecosystem of fishing or of harvesting a resource such as seaweed); • Describe how different ecosystems respond differently to short-term stresses and long-term changes; • Explain how soil composition and fertility can be altered in an ecosystem and outline the possible consequences of such changes; • Identify a current local concern or issue involving an ecosystem (e.g., the conversion of a grass lot into a parking lot: the impact of fishing on a lake; the building of a pulp and paper mill on a river; the construction of a hydroelectric dam); • Assess the impact of technological change on an ecosystem (e.g., the introduction of fertilizer and pesticides to soil; the introduction of a genetically engineered plant; the effect of polluted water or air on plants and animals); • Describe ways in which relationships between living organisms and their ecosystems are viewed by other cultures (e.g., First Nations); • Identify and evaluate Canadian initiatives in protecting Canada's ecosystems; • Describe some of the technologies used in cleaning up contaminated sites; • Identify and describe careers based on ecology and environmental technology; **Chemistry** • Research the methods of chemical disposal used in Canada and the environmental and individual health and safety consequences of inappropriate disposal methods (e.g., examine the effects of dumping car batteries, tires, plastics, paints, or metals in landfill sites); **Earth and Space Science** • Observe, through experiment and simulation, and describe (a) the effects of atmospheric pressure, (b) the pattern of air movement in convection, (c) the phenomenon of inversion, (d) the greenhouse effect, and (e) heat transfer through radiation; • Identify factors that affect the development, severity, and movement of local weather systems (e.g., microclimates in rural and urban areas, El Nino, bodies of water, frontal systems, smog); • Identify the impact of climate change on economic, social, and environmental conditions;

		Physics • Perform a cost-benefit analysis, including environmental and safety factors, of technologies which have enabled us to attain ever-faster speeds on land and water and in the air, and of alternative modes of transportation; • Investigate the benefits and risks to the community and the individual of alternatives to motor-vehicle transportation (e.g., public transit, high-speed trains, walking, bicycling, in-line skating, horseback riding, skiing);
11	**Biology SBI 3U**	**Cellular Functions** • Present informed opinions on advances in cellular biology and possible applications through related technology (e.g., new treatments for cancer; the possibility of producing ethanol as a fuel; the uses of radioactive labeling, fluorescence of genetic material, or simulations of three-dimensional molecular structure); • Explain how scientific knowledge of cellular processes is used in technological applications (e.g., how knowledge of a particular microbe is used in biotechnological applications in the pulp and paper industry or in the clean-up of oil spills); • Analyse ways in which societal needs have led to technological advances related to cellular processes (e.g., document, using newspaper articles, the impact of public awareness on research to detect and treat diseases such as AIDS and hepatitis C); **Internal Systems and Regulation** • Describe the importance of nutrients and digestion in providing substances needed for energy and growth (e.g., relate the need for carbohydrates in the diet to their role in cellular respiration; describe the many uses of proteins; describe how plants use nutrients); • Analyse and explain how societal needs have led to scientific and technological developments related to internal systems (e.g., explain how the need to maintain wellness in humans led to the development of dietary products and fitness equipment; analyse how social awareness of the importance of organ donation has led to improved techniques for transplanting organs, such as the liver); **Diversity of Living Things** • Demonstrate an understanding of the connection between biodiversity and species survival (e.g., state the advantages to a population of having genetic variations between individuals – such as the resistance to infection of "new" microorganisms, the resistance of insects to pesticides, or the resistance of bacteria to antibiotics; explain why some species and not others survive an environmental stress); **Plants: Anatomy, Growth, and Functions** • Identify various factors that result in trade-offs in the development of food technologies (e.g., explain why vegetable growers might prefer varieties that "travel well" – that is, don't spoil easily – over those with the most flavour or nutritional value); • Describe and explain ways in which society supports and influences plant science and technology (e.g., analyse the influence on food production technologies of the constant demand for fresh fruit at affordable prices); • Express opinions supported by their own research about the case for funding certain projects in plant science or

		technology rather than others (e.g., evaluate the relative merits, for funding purposes, of research projects on genetic manipulation of plants over projects related to the development of organic products); • Describe a technology related to plant function (e.g., long-term use of pesticides, including herbicides), and evaluate it on the basis of identified criteria such as safety, cost, availability, and impact on everyday life and the environment;
11	**Biology SBI 3C**	**Cellular Biology** • Collaboratively or individually, research ways in which knowledge of cell processes and related technologies is relevant to their personal lives and the life of their community (e.g., investigate the effects of good nutrition on health using knowledge of metabolic processes and how they are clinically measured); **Microbiology** • Evaluate the impact of viral, bacterial, and fungal infections on the health of host organisms, and on humans in particular (e.g., examine the relationship between the emergence of new species of bacteria and viruses and the use of antibiotics, and determine the health implications for human populations); • Evaluate the effects of large-scale use of fungicides and pesticides on the diversity of micro-organisms; **Animal Anatomy and Physiology** • Describe how a technology related to treatment of internal systems functions (e.g., kidney dialysis, the use of artificial hearts and artificial blood) and evaluate on the basis of identified criteria such as safety, cost, availability, and impact on everyday life and the environment; **Plant Structure and Physiology** • On the basis of information gathered from print and electronic sources, develop, present, and defend a position or course of action related to the maintenance of plants (e.g., justify or argue against the use of pesticides to control insect infestation); • Explain the vital role of aquatic and marine plants in the purification or urban, industrial, and agricultural waste or run-off water; • Evaluate the importance of plant diversity both in maintaining natural ecosystems and in providing sources of medicines; • Analyse the risks and benefits to society of using various agricultural technologies (e.g., genetically altered plants or growth hormones), and propose actions that can be taken to minimize risks; **Environmental Science** • Assess the impact of agriculture on the natural environment; • Investigate and explain how a change in one population can affect the entire food web (e.g., explain how the killing off of species of fish by the lamprey eel affects fishing communities; explain the effects of the introduction of zebra mussels into the Great Lakes); • Investigate, independently or collaboratively, the effect that human population growth has on the environment and the quality of life (e.g., examine effects such as the movement or elimination of wildlife and plants, that are caused by the encroachment of human populations on ecosystems);

		• Independently or collaboratively synthesize and evaluate information from a variety of sources about an environmental and population-related issue, and propose a course of action (e.g., analyse a natural preserve as to its *raison d'être*, such as the species being conserved); • Evaluate the local use of natural and technologically engineered pesticides and herbicides; • Analyse, from a variety of perspectives, the risks and benefits to society and the environment of applying scientific knowledge of ecosystems or introducing a particular technology (e.g., examine the effects of recycling programs, or of introducing species into an environment);
11	**Chemistry SCH 3U**	**Matter and Chemical Bonding** • Identify chemical substances and reactions in everyday use or of environmental significance (e.g., fertilizers, greenhouse gases, photosynthesis); • Demonstrate an understanding of the need for the safe use of chemicals in everyday life (e.g., cleaners in the home, pesticides in the garden); **Solutions and Solubility** • Explain the origins of pollutants in natural waters (e.g., landfill leachates, agricultural run-off), and identify the allowable concentrations of metallic and organic pollutants in drinking water; • Describe the technology and the major steps involved in the purification of drinking water and treatment of waste water; **Gases and Atmospheric Chemistry** • Explain Canadian initiatives to improve air quality (e.g., the recycling of chlorofluorocarbons, the Montreal Protocol); **Hydrocarbons and Energy** • Demonstrate an understanding of the importance of hydrocarbons as fuels (e.g., propane for barbecues) and in other applications, such as the manufacture of polymers, and identify the risks and benefits of these uses to society and the environment;
11	**Physics SPH 3U**	**Forces and Motion** • Analyse and explain the relationship between an understanding of forces and motion and an understanding of political, economic, environmental, and safety issues in the development and use of transportation technologies (including terrestrial and space vehicles) and recreation and sports equipment; **Energy, Work and Power** • Analyse, using their own or given criteria, the economic, social, and environmental impact of various energy sources (e.g., wind, tidal flow, falling water, the sun, thermal energy and its transfer [heat]) and energy-transformation technologies (e.g., hydroelectric power plants and energy transformations produced by other renewable sources, fossil fuel, and nuclear power plants) used around the world;

11	**Science SNC 3M**	**Everyday Chemical and Safe Practice** • Explain the different chemical waste management strategies used in urban, rural, and industrial situations (e.g., strategies for managing septic tanks, grey water, sewer systems); • Analyse the costs and benefits to society of selected chemical products (e.g., corrosive products such as acids and bases), and assess the impact of their use in the community; • Assess the environmental impact of the increased use of chemicals in the manufacturing of new products used in the home, workplace, and industry; **Body Input and Body Function** • Assess the costs and benefits to society of certain eating behaviours (e.g., eating of highly processed foods, natural foods; adoption of a vegetarian diet); **Waste Management** • Explain the principles related to the management of solid waste; • Explain the principles related to the management of liquid waste; • Explain the principles related to the management of gaseous waste; • Explain how science and technology are used in the development of new waste management strategies; • Describe and explain through research and reporting, the use of bacteria as waste decomposers (e.g., write an essay on the use of bacteria in sewage treatment plants, septic-tank systems, and the clean-up of oil spills); • Evaluate the advantages and disadvantages of alternative waste management systems (e.g., assess the evidence for the assumed benefits of reclaiming sulphur from exhaust gases for selected industries); • Illustrate through research into a category of household waste, the effects of waste on the environment (e.g., the effects of solids, liquids, and gases resulting from the use of cleaning agents or paint strippers); • Analyse the impact of economic and political considerations on the choice of waste management strategies and ultimately on the environment (e.g., analyse and assess the policies of a local sewage treatment plant); • Evaluate the short- and long-term impact of a specific waste on the environment, and make recommendations for change (e.g., assess the possible effects of nuclear waste and its disposal, and suggest alternatives to nuclear energy); • Advocate for an improved waste management system at the local, regional, or national level of government (e.g., create a local action plan outlining suggested changes); **Technologies in Everyday Life** • Demonstrate, through their own research and its presentation, an understanding of ethical, environmental, and economic issues that involve various viewpoints on the use of technologies in everyday life (e.g., issues in forestry, agriculture, manufacturing, medicine, transportation); • Evaluate the design and function of an everyday technology using identified criteria (e.g., safety, cost, environmental impact, appearance); • Assess the costs and benefits to society of recent technologies (e.g., the impact of new technologies on human mortality, longevity, health care);

11	**Science SNC 3E**	**Materials and Safety** • Investigate and report on a topic related to the safe handling, storage, and disposal of hazardous materials, focusing on some specific examples (e.g., the hazards of disposing of chemicals and drugs in rural and urban water systems; local means of disposing of hazardous materials; hazardous materials in the home; application of WHMIS in the use of materials in a local workplace); **Electrical Circuits** • Identify and propose solutions to problems related to the environmental impact of the consumption of electrical energy and the disposal of used electrical appliances in Canada (e.g., alternatives to the wholesale discarding of old electrical devices; advantages and disadvantages of the recycling of outdated computer equipment or batteries); **Micro-Organisms** • Working cooperatively with team members, compile, display in an appropriate format, and report on information/evidence gathered concerning the benefits and/or costs to society of micro-organisms (e.g., industrial use of microbes, such as the making of yogurt and in the clean-up of oil spills; microbes and STDs; the potential for biological warfare; drug-resistant bacteria; microbes and the history of hygiene; mouldy-building syndrome; food-poisoning; microbes and forensic science; microbes and allergies; the role of microbes in soil and in home composting); • Describe some of the challenges of developing or modifying technologies to control or inhibit the reproduction and growth of micro-organisms (e.g., vaccines to fight viruses that are constantly mutating); **The Immune System and Human Health** • Identify the causes, effects, and treatments of common diseases associated with the immune system (e.g., AIDS); • Gather, integrate, and interpret information from print and electronic sources on a related health topic, and report the findings (e.g., use current, reliable information sources to find out about the spread of diseases such as AIDS, typhoid, and cholera); • Analyse ways in which human health has been improved over time as a result of a better understanding of pathogens and genetics and improved sanitary conditions and personal hygiene; **Human Impact on the Environment** • Analyse interactions between the environment and human activities (e.g., analyse the interdependence of biotic and abiotic factors in a municipal waste disposal site); • Evaluate the correlation between Earth's carrying capacity and the demands on natural resources made by human population growth; • Describe and explain the production, distribution, and use of food resources, using the concept of the energy pyramid; • Explain the importance of biodiversity with respect to the sustainability of life within the biosphere (e.g., the danger of extinction for species that have little genetic variability, or the concern about the diminishing number of species of wheat grown worldwide);

		• Formulate scientific questions about the effects of various conditions and pollutants on aquatic life (e.g., what are the effects of acidity, temperature, phosphate, oil, etc., on the growth rate of algae?), and plan procedures to investigate the effects; • Conduct and report on an investigation into the effects of pollutants on aquatic life; • Compare various points of view on an environmental issue (e.g., a proposal to dump garbage in a quarry that is adjacent to a residential area; the sustainability of current agricultural practices); • Explain the benefits of individual and societal participation in planning, problem solving, decision making, and task completion with respect to environmental issues; • Analyse the risks and benefits to society, the economy, and the environment of introducing a particular technology (e.g., nuclear power; genetically engineered micro-organisms for pollution clean-up; algae ponds to process sewage);
12	**Biology SBI 4U**	**Molecular Genetics** • Describe how mutagens such as radiation and chemicals can change the genetic material in cells by causing mutations (e.g., point mutations and frame-shifts); **Homeostasis** • Predict the impact of environmental factors such as allergens on homeostasis within an organism; **Population Dynamics** • Using the ecological hierarchy for living things, evaluate how a change in one population can affect the entire hierarchy both physically and economically (e.g., the effects of the killing off of species of fish by lamprey eels, or the results of the introduction of zebra mussels into the Great Lakes); • Investigate, individually or collaboratively the effects of human population growth on the environment and the quality of life (e.g., effects on ecosystems, such as the elimination of wildlife, plants, and farmland; causes and effects of ozone depletion or acid rain); • Analyse Canadian investments in human resources and agricultural technology in a developing country (e.g., investigate CIDA-funded projects in a developing country); • Describe examples of stable food-production technologies that nourish a dense and expanding population; • Outline the advances in medical care and technology that have contributed to an increase in life expectancy, and relate these developments to demographic issues;
12	**Chemistry SCH 4U**	**Organic Chemistry** • Analyse the risks and benefits of the development and application of synthetic products (e.g., polystyrene, aspartame, pesticides, solvents); • Provide examples of the use of organic chemistry to improve technical solutions to existing or newly identified health, safety, and environmental problems (e.g., leaded versus unleaded gasoline; hydrocarbon propellants versus chlorofluorocarbons [CFCs]);

		Energy Changes and Rates of Reaction • Compare conventional and alternative sources of energy with respect to efficiency and environmental impact (e.g., burning fossil fuels, solar energy, nuclear fission); **Electrochemistry** • Describe examples of common galvanic cells (e.g., lead-acid, nickel-cadmium) and evaluate their environmental and social impact (e.g., describe how advances in the hydrogen fuel cell have facilitated the introduction of electric cars); • Research and assess environmental, health, and safety issues involving electrochemistry (e.g., the corrosion of metal structures by oxidizing agents; industrial production of chlorine by electrolysis and its use in the purification of water);
12	**Chemistry SCH 4C**	**Organic Chemistry** • Identify issues connected to the growing use of plastics (e.g., the consumption of fossil fuels, waste disposal), and suggest alternative materials that could be used; **Electrochemistry** • Explain how electrolytic processes are used in the refining of metals and evaluate the impact of such processes on the environment (e.g., production of acid rain, high-energy consumption); **Chemistry in the Environment** • Identify substances in environmental water (including ions that contribute to hardness) whose concentration must be measured and controlled to ensure that the water is fit for human use; • Identify gases in the atmosphere that affect air quality (e.g., greenhouse gases, tropospheric and stratospheric zone, carbon monoxide, chlorofluorocarbons); • Demonstrate an awareness of how governmental regulations as well as the actions of individual people can improve air and water quality (e.g., discuss how individuals can contribute to the improvement of air quality through their choice of transportation); • Assess the environmental, economic, and societal implications of methods of use and disposal of common household products (e.g., analyse the issues involved in the use and disposal in everyday life of detergents containing phosphates, or of batteries and cleaners containing acids and bases); • Explain the importance of quantitative analysis of substances in air and water samples (e.g., explain how measuring levels of dissolved oxygen in samples of lake or river water is important in monitoring the health and use of the surrounding ecosystem);
12	**Earth and Space Science SES 4U**	**The Earth as a Planet** • Describe how observations and measurements of the Earth made from space are used to study and better understand natural physical elements of the Earth's environment (e.g. its crust, water, air) as well as human-made elements (e.g., crops, cities, air and water pollution);

		• Evaluate the negative effects of human activity on near-Earth space (e.g., space debris, pollution of the electromagnetic spectrum); **Introduction to Earth Sciences** • Describe and explain the effects of natural systems on the Earth's physical and human environments, and the increasing alteration of certain natural systems that has resulted from human activities; **Earth Materials** • Describe some of the technologies used to recover natural resources from the Earth, and evaluate economic, social, and environmental ramifications of their use (e.g., the need for fewer workers and the practice of site rehabilitation resulting from the use of improved technologies in the mining of nickel); **Internal and Surficial Earth Processes** • Demonstrate an understanding of the importance of aquifers and of their fragility in terms of contamination and depletion; • Demonstrate an understanding of how erosion and deposition by streams are affected by load, gradient, channel shape, sediment composition, and human activities;
12	**Physics SPH 4U**	**Energy and Momentum** • Identify and analyse social issues that relate to the development of vehicles (e.g., analyse, using their own or given criteria, the economic and social costs and benefits of the development of safety devices in automobiles); **Electric, Gravitational, and Magnetic Fields** • Evaluate, using their own criteria, the social and economic impact of new technologies based on a scientific understanding of electric, gravitational, and magnetic fields;
12	**Physics SPH 4C**	**Electricity and Electrons** • Investigate the use and historical development of an electrical or electronic appliance or device (e.g., dry-cell, rechargeable battery, toaster, refrigerator, computer), and describe its performance since its development with respect to safety, cost, availability, and environmental impact; **Hydraulic and Pneumatic Systems** • Identify and analyse some of the social and economic consequences of the use of robotic systems for many different kinds of operations; • Identify various applications of hydraulic and pneumatic systems in everyday life, and evaluate the impact of the use of these systems on the quality of life; **Communications Technology** • Assess, using their own criteria, the risks and benefits to society and the environment of introducing a particular technology from the communications industry (e.g., consider such factors as effects on personal privacy, control of the mass media, criminal activities, health concerns related to electric and magnetic fields, and the transfer of information); **Energy Transformations** • Evaluate the benefits and drawbacks, with respect to such factors as economic viability, use of energy resources,

		efficiency, safety, and general utility, of energy-transforming devices based on sources of renewable energy (e.g., photoelectric cells, solar cooker, hydrogen fuel cells, wind-up radios, Archimedes' pumps);
12	**Science SNC 4M**	**Organic Products in Everyday Life** • Analyse the costs and benefits of using organic products (e.g., most pesticides, phosphate detergents), and assess their global impact on the environment; • Identify and describe strategies for pest control other than the use of organic products (e.g., research alternatives to pesticide use in agriculture and the home); **Pathogens and Disease** • Describe the characteristics and reproductive cycles of representative pathogens (e.g., lysogenic cycle, lytic cycle, infectious cycle of malaria); • Describe the modes of transmission of diseases, including those that are insect-borne (e.g., malaria, encephalitis), airborne (e.g., influenza, TB); water-borne (e.g., cholera, poliomyelitis), sexually transmitted (STDs; e.g., AIDS), and food-borne (e.g., mad cow disease, trichinosis, food poisoning); • Describe the use of vaccines, antibiotics, antiseptics, and other drug therapies in the control of pathogenesis; • Describe non-medicinal ways to protect oneself from contracting pathogenic diseases (e.g., aseptic techniques, personal hygiene); • Describe some of the means used by agencies and governments to control the spread of disease, both locally and globally; • Research and explain the impact on disease control of technological advances in food preparation and preservation (e.g., the impact of freezing, pasteurization, radiation, and canning on food marketing); **Energy Alternatives and Global Impact** • Compare and contrast conventional and alternative energy sources with respect to criteria such as availability, renewability, cost, and environmental impact (e.g., draw a Venn diagram showing similarities and differences between the use of fossil fuels and geothermal energy); • Describe technologies created in response to dwindling non-renewable energy resources (e.g., windmills, solar panels, electric cars); • Gather and analyse data, experimentally or through research, to evaluate alternative and emerging technologies as examples of responsible energy use (e.g., technologies related to wind power, solar power, electric cars, ethanol fuel, or the fermentation of waste products); • Evaluate arguments for the use of nuclear technology, based on research into its advantages and disadvantages (e.g., production of greenhouse gases from fossil fuels is reduced by production of nuclear waste is increased); • Present an argument, based on research and science analysis, for the use of an alternative energy system (e.g., a solar cooker, or a solar collector); • Design a system that uses an alternative energy source (e.g., design, build, and test a working model of a wind generator, or as solar-powered car); • Identify, based on information integrated from print and electronic sources, short-and long-term environmental

		effects of by-products from nuclear generating stations; • Evaluate the environmental impact of a specific alternative source of energy (e.g., conduct an environmental impact survey that covers such issues as costs and waste production/management); • Analyse the costs and benefits to society of alternative energy systems, and asses the impact of their use on a global scale (e.g., wind generators, or tidal power plants); • Evaluate the suitability of alternative energy sources, using research into the regional availability of natural resources in Canada (e.g., draw a correlation map for Canada showing regional energy systems and the distribution of natural resources, including water, fossil fuels, heat sinks, and wind and tides); **Science and Contemporary Societal Issues** • Evaluate, through interview and research, differing cultural perspectives on a contemporary subject or issues to which science is also relevant (e.g., a First Nations' perspective on maintaining a natural balance through the use of alternative medicines); • Assess the possible positive and negative effects of a scientific discovery on society and the environment (e.g., positive and negative aspects of the Human Genome Project); • Analyse ways in which societal needs or demands influence scientific and technological endeavours (e.g., relate levels of funding for AIDS research over time to societal influences);
12	**SNC 4E**	**Chemistry at Home and Work** • Prepare, and present to classmates, a report on the social, environmental, and economic consequences of the use and discarding of organic products (e.g., common addition plastic, copolymer, thermosetting plastic, or vulcanized products; natural and synthetic fabrics); **Gardening, Horticulture, Landscaping, and Forestry** • Describe the diversity of environments that must be maintained in order to provide habitats for a wider variety of plants (e.g., make a list of the environmental conditions – soil composition, light conditions, landscaping – required for particular types of plants); • Demonstrate an understanding of the variety of ways in which human populations depend on healthy plant populations (e.g., for food, clothing fibres, fuel, structural materials); • Demonstrate an understanding of the role of forests as essential habitats for other plants and animals, including threatened and endangered species (e.g., describe the environmental, economic and social effects of various types of forestry practice, such as clear-cut forestry or sustainable forestry using selective cutting); • Analyse the social, economic, and environmental factors that determine the different approaches and methods required in gardening, horticulture, landscaping, and forestry (e.g., explain and evaluate the problems of monoculture and environmental need for biodiversity in horticulture; or participate in a group debate concerning the economic benefits and costs of sustainable forestry); **Alternative Environments** • Relate what they have learned about sustaining life in alternative environments to the processes through which our own natural environment sustains life (e.g., relate the mechanical processes of an air purification system to the

		natural process of air purification by trees); • Analyse the costs and benefits to society, the economy, and the environment of constructing and operating an alternative environment capable of supporting human life (e.g., write a brief essay on the potential economic benefits of maintaining an alternative life-sustaining environment such as the International Space Station);