

NELSON

SCIENCE & TECHNOLOGY PERSPECTIVES



7

Curriculum Correlation

Pure Substances and Mixtures

CURRICULUM CORRELATION

1. Relating Science and Technology to Society and the Environment		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
1. evaluate the social and environmental impacts of the use and disposal of pure substances and mixtures	1.1 assess positive and negative environmental impacts related to the disposal of pure substances (e.g., uranium) and mixtures (e.g., paint, sewage)	1.4, 1.7, 2.1, 3.4
	1.2 assess the impact on society and the environment of different industrial methods of separating mixtures and solutions	3.4, 3.7

2. Developing Investigation and Communication Skills		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
2. investigate the properties and applications of pure substances and mixtures	2.1 follow established safety procedures for handling chemicals and apparatus (e.g., wash hands after handling chemicals, take note of universal warning symbols)	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8
	2.2 use scientific inquiry/experimentation skills to investigate factors (e.g., temperature, type of solute or solvent, particle size, stirring) that affect the solubility of a substance and the rate at which substances dissolve	1.4, 2.2, 2.4, 2.5
	2.3 investigate processes (e.g., filtration, distillation, settling, magnetism) used for separating different mixtures	1.4, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8
	2.4 use scientific inquiry/experimentation skills to investigate the properties of mixtures and solutions (e.g., the amount of solute required to form a saturated solution; differences between pure substances and mixtures)	1.5, 1.6, 2.2, 2.4
	2.5 use appropriate science and technology vocabulary, including "mechanical mixture," "solution," "solute," "insoluble," "saturated," "unsaturated," and "dilute," in oral and written communication	1.1, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
	2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., using appropriate mathematical conventions, make a scatter plot to show the relationship between solute, solvent, and temperature)	1.1, 1.3, 1.5, 1.6, 1.7, 2.1, 2.4, 2.5, 3.1, 3.3, 3.5, 3.6, 3.7, 3.8

3. Understanding Basic Concepts		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
3. demonstrate an understanding of the properties of pure substances and mixtures, and describe these characteristics using the particle theory	3.1 distinguish between pure substances (e.g., distilled water, salt, copper pipe) and mixtures (e.g., salad dressing, chocolate chip cookies)	1.4, 1.5, 1.7, 3.3
	3.2 state the postulates of the particle theory of matter (all matter is made up of particles; all particles are in constant motion; all particles of one substance are identical; temperature affects the speed at which particles move; in a gas, there are spaces between the particles; in liquids and solids, the particles are close together and have strong forces of attraction between them)	1.1, 1.2, 1.3
	3.3 use the particle theory to describe the difference between pure substances (which have identical particles) and mixtures (which have different particles)	1.4, 2.2
	3.4 distinguish between solutions and mechanical mixtures	1.6, 3.5, 3.7
	3.5 describe the processes (e.g., evaporation, sifting, filtration, distillation, magnetism) used to separate mixtures or solutions into their components, and identify some industrial applications of these processes (e.g., use of cheesecloth to separate seeds and skins from juice and pulp to make fruit jellies; use of evaporation in maple syrup production; use of different sizes of sieves to separate wheat grains in white bread production; use of strainers in industries to separate slurry into solids and liquids)	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
	3.6 identify the components of a solution (e.g., solvent, solute)	2.1, 2.2, 2.3, 2.4, 3.5
	3.7 identify solutes and solvents in various kinds of solutions (e.g., copper and tin in bronze; iodine and alcohol in iodine solution)	2.1
	3.8 describe the concentration of a solution in qualitative terms (e.g., dilute, concentrated) and in quantitative terms (e.g., 5 grams of salt in 1000 ml of water)	2.3, 2.4
	3.9 describe the difference between saturated and unsaturated solutions	2.3, 2.4
	3.10 explain why water is referred to as the universal solvent	2.1

Interactions in the Environment

CURRICULUM CORRELATION

1. Relating Science and Technology to Society and the Environment		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
1. assess the impacts of human activities and technologies on the environment, and evaluate ways of controlling these impacts	1.1 assess the impact of selected technologies on the environment	4.5, 4.6, 5.5, 6.2, 6.4, 6.6
	1.2 analyse the costs and benefits of selected strategies for protecting the environment	4.6, 5.6, 6.3, 6.4, 6.6, Unit Task

2. Developing Investigation and Communication Skills		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
2. investigate interactions within the environment, and identify factors that affect the balance between different components of an ecosystem	2.1 follow established safety procedures for investigating ecosystems (e.g., stay with a partner, wash hands after investigating an ecosystem)	4.3, 4.4, 5.5, Unit Task
	2.2 design and construct a model ecosystem (e.g., a composter, a classroom terrarium, a greenhouse), and use it to investigate interactions between the biotic and abiotic components in an ecosystem	4.3, 5.6
	2.3 use scientific inquiry/research skills (see page 15) to investigate occurrences (e.g., a forest fire, a drought, an infestation of invasive species such as zebra mussels in a local lake or purple loosestrife in a wetland habitat) that affect the balance within a local ecosystem	6.3, Unit Task
	2.4 use appropriate science and technology vocabulary, including sustainability, biotic, ecosystem, community, population, and producer, in oral and written communication	4.4, 4.5, 5.1, 5.2, 5.4, 5.5, 6.1, 6.2, 6.4, Unit Task
	2.5 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., design a multimedia presentation explaining the interrelationships between biotic and abiotic components in a specific ecosystem)	4.6, 5.6, 6.2, 6.3, 6.6, Unit Task

1. Understanding Basic Concepts		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
3. demonstrate an understanding of interactions between and among biotic	3.1 demonstrate an understanding of an ecosystem (e.g., a log, a pond, a forest) as a system of interactions between living organisms	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.2, 5.3, 5.5, Unit Task

and abiotic elements in the environment.	and their environment	
	3.2 identify biotic and abiotic elements in an ecosystem, and describe the interactions between them (e.g., between hours of sunlight and the growth of plants in a pond; between a termite colony and a decaying log; between the soil, plants, and animals in a forest)	4.1, 4.2, 4.3, 4.4, 4.5, 5.2, 5.3, 5.5, 5.6, Unit Task
	3.3 describe the roles and interactions of producers, consumers, and decomposers within an ecosystem (e.g., Plants are producers in ponds. They take energy from the sun and produce food, oxygen, and shelter for the other pond life. Black bears are consumers in forests. They eat fruits, berries, and other consumers. By eating other consumers, they help to keep a balance in the forest community. Bacteria and fungi are decomposers. They help to maintain healthy soil by breaking down organic materials such as manure, bone, spider silk, and bark. Earthworms then ingest the decaying matter, take needed nutrients from it, and return those nutrients to the soil through their castings.)	5.1, 5.3, 5.4, Unit Task
	3.4 describe the transfer of energy in a food chain and explain the effects of the elimination of any part of the chain	5.2, 5.3, 5.4
	3.5 describe how matter is cycled within the environment and explain how it promotes sustainability (e.g., bears carry salmon into the forest, where the remains decompose and add nutrients to the soil, thus supporting plant growth; through crop rotation, nutrients for future crops are created from the decomposition of the waste matter of previous crops)	5.5, 5.6
	3.6 distinguish between primary succession (e.g., the growth of native grasses on a sand dune) and secondary succession (e.g., the growth of grasses and shrubs in a ploughed field) within an ecosystem	6.1
	3.7 explain why an ecosystem is limited in the number of living things (e.g., plants and animals, including humans) that it can support	4.2, 4.4, 5.4, 6.4
	3.8 describe ways in which human activities and technologies alter balances and interactions in the environment (e.g., clear-cutting a forest, overusing motorized water vehicles, managing wolf-killings in Yukon)	4.6, 6.1, 6.2, 6.3, 6.4, 6.6, Unit Task
	3.9 describe Aboriginal perspectives on sustainability and describe ways in which they can be used in habitat and wildlife management (e.g., the partnership between the Anishinabek Nation and the Ministry of Natural Resources for managing natural resources in Ontario)	6.5

Heat in the Environment

CURRICULUM CORRELATION

1. Relating Science and Technology to Society and the Environment		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
1. assess the costs and benefits of technologies that reduce heat loss or heat-related impacts on the environment	1.1 assess the social and environmental benefits of technologies that reduce heat loss or transfer (e.g., insulated clothing, building insulation, green roofs, energy-efficient buildings)	7.1, 8.1, 8.8, 8.9, 8.10, 9.7, Unit Task
	1.2 assess the environmental and economic impacts of using conventional (e.g., fossil fuel, nuclear) and alternative forms of energy (e.g., geothermal, solar, wind, wave, biofuel)	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8

2. Developing Investigation and Communication Skills		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
2. investigate ways in which heat changes substances, and describe how heat is transferred	2.1 follow established safety procedures for using heating appliances and handling hot materials (e.g., use protective gloves when removing items from hot plates)	7.4, 7.5, 8.2, 8.5, 8.7, 8.10
	2.2 investigate the effects of heating and cooling on the volume of a solid, a liquid, and a gas	7.4, 7.5
	2.3 use technological problem-solving skills to identify ways to minimize heat loss	8.10, Unit Task
	2.4 use scientific inquiry/experimentation skills to investigate heat transfer through conduction, convection, and radiation	8.5, 8.7, Unit Task
	2.5 use appropriate science and technology vocabulary, including heat, temperature, conduction, convection, and radiation, in oral and written communication	7.2, 7.3, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 9.1, 9.2, Unit Task
	2.6 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., using the conventions of science, create a labelled diagram to illustrate convection in a liquid or a gas)	7.3, 7.4, 7.5, 8.1, 8.2, 8.4, 8.6, 8.7, 8.8, 8.9, 8.10, 9.8, Unit Task

3. Understanding Basic Concepts		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
3. demonstrate an understanding of heat as a form of energy that is associated with the movement of particles and is essential to many processes within Earth's systems	3.1 use the particle theory to compare how heat affects the motion of particles in a solid, a liquid, and a gas	7.2, 7.3, 8.2, 8.5, 8.6
	3.2 identify ways in which heat is produced (e.g., burning fossil fuels and renewable fuels, electrical resistance, physical activity)	7.1, 8.1, 8.4, 9.1, 9.2, 9.3, 9.5, 9.6, 9.7
	3.3 use the particle theory to explain the effects of heat on volume in solids (e.g., rails, sidewalks, and bridge segments expand in hot weather), liquids (e.g., sea levels are rising partly because global warming is making the oceans warmer and the water in them is expanding), and gases (e.g., the air in car tires expands on hot pavement)	7.3, 7.4, 7.5
	3.4 explain how heat is transmitted through conduction (e.g., the transmission of heat from a stove burner to a pot and from the pot to the pot handle), and describe natural processes that are affected by conduction (e.g., the formation of igneous and metamorphic rocks and diamonds)	8.3, 8.4, 9.6, Unit Task
	3.5 explain how heat is transmitted through convection, and describe natural processes that depend on convection (e.g., thunderstorms, land and sea breezes)	8.5, 8.6, 9.6, Unit Task
	3.6 explain how heat is transmitted through radiation, and describe the effects of radiation from the Sun on different kinds of surfaces (e.g., an ice-covered lake, a forest, an ocean, an asphalt road)	8.7, 9.1, Unit Task
	3.7 describe the role of radiation in heating and cooling Earth, and explain how greenhouse gases affect the transmission of radiated heat through the atmosphere. (e.g., Earth is warmed by absorbing radiation from the Sun. It cools by radiating thermal energy back to space. Greenhouse gases absorb some of the radiation that Earth emits to space and reradiate it back to Earth's surface. If the quantity of greenhouse gases in the atmosphere increases, they absorb more outgoing radiation, and Earth becomes warmer.)	9.1, 9.3
	3.8 identify common sources of greenhouse gases (e.g., carbon dioxide comes from plant and animal respiration and the burning of fossil fuels; methane comes from wetlands, grazing livestock, termites, fossil fuel extraction, and landfills; nitrous oxide comes from soils and nitrogen fertilizers), and describe ways of reducing emissions of these gases	9.2, 9.3, 9.7

Form and Function

CURRICULUM CORRELATION

1. Relating Science and Technology to Society and the Environment		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
1. analyse personal, social, economic, and environmental factors that need to be considered in designing and building structures and devices	1.1 evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs (e.g., function; efficiency; ease of use; user preferences; aesthetics; cost; intended lifespan; effect on the environment; safety, health, legal requirements)	10.1, 11.6, 12.1, 12.4, 12.5, 12.6, Unit Task
	1.2 evaluate the impact of ergonomic design on the safety and efficiency of workplaces, tools, and everyday objects (e.g., furniture, computer equipment, home tools and equipment), and describe changes that could be made in personal spaces and activities on the basis of this information (e.g., use computer keyboards and mice that are ergonomically designed; use kitchen tools such as knives with ergonomic handles; use equipment for household jobs that is designed to ease strain on the body, such as ergonomically designed snow shovels and garden tools)	12.4, 12.5, 12.6, Unit Task

2. Developing Investigation and Communication Skills		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
2. design and construct a variety of structures, and investigate the relationship between the design and function of these structures and the forces that act on them	2.1 follow established safety procedures for using tools and handling materials (e.g., wear safety glasses when cutting or drilling)	11.1, 11.3, 11.5, 11.6, 11.7, Unit Task
	2.2 design, construct, and use physical models to investigate the effects of various forces on structures (e.g., the struts of a roof experience compression forces from shingles; the support cables of a suspension bridge are in tension; a twisted ruler has torsion forces; the pin that holds the two parts of a pair of scissors together has shear forces acting on it)	10.5, 11.3, 11.5, 11.6, 11.7, Unit Task
	2.3 investigate the factors that determine the ability of a structure to support a load (e.g., the weight of the structure itself; the magnitude of the external loads it will need to support; the strength of the materials used to build it)	11.3, 11.4, 11.5, 11.7
	2.4 use technological problem-solving skills (see page 16) to determine the most efficient way for a structure (e.g., a chair, a shelf, a bridge) to	11.3, 11.5, 11.7

	support a given load	
	2.5 investigate methods used by engineers to ensure structural safety (e.g., incorporating sensors in structures to detect unusual stresses and give early warning of failure; designing structures to carry much heavier loads than they will actually have to bear)	11.5, 11.7
	2.6 use appropriate science and technology vocabulary, including truss, beam, ergonomics, shear, and torsion), in oral and written communication	10.4, 10.5, 11.2, 11.3, 11.4, 11.5, 11.7, 12.4, 12.5, 12.6, Unit Task
	2.7 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., use a graphic organizer to show the steps taken in designing and making a product)	10.3, 10.5, 11.4, 11.5, 11.7, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, Unit Task

1. Understanding Basic Concepts		Section(s)
OVERALL EXPECTATION	SPECIFIC EXPECTATIONS	
3. demonstrate an understanding of the relationship between structural forms and the forces that act on and within them	3.1 classify structures as solid structures (e.g., dams), frame structures (e.g., goal posts), or shell structures (e.g., airplane wings)	10.3
	3.2 describe ways in which the centre of gravity of a structure (e.g., a child's high chair, a tower) affects the structure's stability	11.1, 11.5, 11.7, 12.3, Unit Task
	3.3 identify the magnitude, direction, point of application, and plane of application of the forces applied to a structure	10.2, 11.3, 11.4, 11.5, 11.7
	3.4 distinguish between external forces (e.g., wind, gravity, earthquakes) and internal forces (tension, compression, shear, and torsion) acting on a structure	10.4, 10.5, 11.5, 11.6, 11.7, Unit Task
	3.5 describe the role of symmetry in structures (e.g., aesthetic appeal, structural stability)	12.3
	3.6 identify and describe factors that can cause a structure to fail (e.g., bad design, faulty construction, foundation failure, extraordinary loads)	10.2, 11.6, 11.7, Unit Task
	3.7 identify the factors (e.g., properties of the material as they relate to the product, availability, costs of shipping, aesthetic appeal, disposal) that determine the suitability of materials for use in manufacturing a product (e.g., a running shoe)	11.4, 11.5, 11.6, 11.7, 12.1, Unit Task