Grade
10

SCIENCE CURRICULUM at a Glance

This is a support document only. Please refer to the curriculum to fully understand the intent and context.

Global Competencies

Enduring Understandings

Explaining Phenomena · Collective Endeavour · Science & Technology · Implications · Empowering Agency

Potential Inquiry Questions

- *How do various types of matter interact?*
- *What do we know about Earth and its place in the universe?*
- *How are human activities affecting the environment?*

Strand A. Indigenous Peoples within the Natural World

What contributions do Indigenous ways of knowing, being, and doing make to science?

SCI.10.A.1 Demonstrate an understanding of different First Nations, Métis, and Inuit ways of knowing, being, and doing in relationship with the land and the natural world by exploring Indigenous methods of observing and interpreting the world, applying scientific principles, and creating technologies within local traditional and contemporary cultural contexts (e.g., wholistic, reciprocal, interconnected, and sustainable ways; land-based learning; outdoor learning; intersections with Western science).

Strand B. Science Identity

How do I engage in science?

SCI.10.B.1 Develop a sense of agency, identity, and belonging in science by cultivating natural curiosity about the world, acquiring scientific skills and fostering scientific attitudes, building a personal connection to nature, establishing links between science concepts and personal experience, and recognizing that everyone can contribute to science.

Manitoba

Strand C. **Practical Science**

STSE CONTEXTS	SCIENTIFIC MEASUREMENT	ACTION AND PRACTICE	SCIENTIFIC INSTRUMENTS	CAREERS, HOBBIES, AND ACTIVITIES
How do science and our world interact?	*How do we measure scientifically?*	*How can we do science?*	*How do we use tools in science?*	*Where is science found in our lives?*
SCI.10.C.1 Demonstrate an awareness of the dynamic interplay between science, technology, society, and the environment (STSE), thereby being empowered to critically evaluate the impacts of scientific and technological advancements on individuals, communities, and ecosystems, and to make informed decisions for a sustainable future. Examples: types of reactions seen in everyday life (combustion, oxidation, acid base chemistry); chemistry in health care; the importance of systematic organization in chemistry; transportation; physics safety and technology; atmospheric pressure and weather; pressure-based technologies (pneumatics, hydraulics); forces and Indigenous technologies; the development of and evidence for the Big Bang theory; cosmologies of various cultures, including intersection of science, religion, and philosophy; significance of celestial bodies (Earth, Sun, Moon, stars) in various cultures; causes and consequences of climate change; climate change mitigation strategies and sustainability; geological time scales and evidence of past and current extinction events; conservation and protection of land, water, and ecosystems; sustainable resource management; wildlife-human interactions and coexistence; the relationship between human culture and technological development	**SCI.10.C.2** Demonstrate an understanding of units, measuring tools, and the nature of measurement in science. (**Bold** indicates items introduced for the first time at this grade level.) Include the following: • Tools: thermometer, ruler, volumetric vessels, stopwatch, spring scale, caliper, digital scale, barometer, **telescope** • Attributes: temperature, length, mass, volume, time, speed, force, direction, energy, density, pressure • Units: length/distance (**parsec, light year, astronomical unit,** km, m, cm, mm, mm fractions), mass (kg, g, **cg, mg**), volume (L, mL), time (h, min, s), temperature (^{o}C), speed (km/h, m/s), force (N), energy (J), density (kg/m^3, g/cm^3), pressure (kPa, Pa) • Skills: measure and estimate using standard SI tools and units; select measurement tools; display quantitative data (charts, line graphs, tables, etc.); recognize importance of standard units; convert between SI length, time, and volume units; understand the meaning of SI prefixes and their symbols (micro, milli, centi, deci, deka, hecto, kilo, mega); describe the definition and relationship between SI units m and kg (historical and modern definitions); differentiate between base SI units (m, kg, s, A) and derived units (N, C, W, etc.); understand measurement precision, accuracy, and uncertainty **(+/- notation)**; use unit/dimensional analysis techniques to check computation; **use scientific notation and metric prefixes to represent large and small SI measurements**	**SCI.10.C.3** Demonstrate practical scientific skills through safely and actively participating in a variety of scientific practices such as inquiry-based learning experiences, experimentation, scientific observation, data analysis, measurement, debate, communicating scientific information, and designing and building. Examples: • Participate in learning experiences that include an Indigenous community member (e.g., Elder, Knowledge Holder, Knowledge Keeper) to share knowledge, experience, or teachings related to the curriculum. • Investigate the potential impact of introducing invasive species to an ecosystem or removing a species from an ecosystem. • Design and perform an experiment to determine how various factors affect chemical reaction rates, including identifying and controlling major variables. • Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. • Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. • Demonstrate knowledge and use of relevant safety precautions, Workplace Hazardous Materials Information System (WHMIS) regulations, and emergency equipment.	**SCI.10.C.4** Demonstrate an understanding of the purpose and functioning of various scientific instruments and materials (considering availability and appropriateness), as well as competence in using them safely. Examples: glassware, hot plate, chemical substances, Bunsen burner, telescope, craft and recycled materials, classroom materials, materials from nature, logbook, diagrams, charts, graphs, spreadsheets, safety procedures	**SCI.10.C.5** Demonstrate an understanding of the connections between the scientific ideas studied and a range of careers, hobbies, and activities. Examples: chemist, firefighter, emergency medical technician (EMT), engineer, materials scientist, pharmacist, driver, astronomer, space scientist, rocket engineer, communications expert, roboticist, miner, ecologist, environmental scientist, waste management expert, gardening, ethnobotany, Indigenous teachings related to life interconnectedness, model building, skateboarding, biking, star gazing, nature walks, camping, nature photography, bowling, basketball, rock climbing, rock and mineral collecting

Strand D.
Nature of Science

PURPOSE

Science is about finding the cause or causes of phenomena in the natural world.

What is science for?

SCI.10.D.1 Demonstrate the understanding that scientific evidence is gathered through experimentation where possible, or systematic observations where it is not.

SCI.10.D.2 Demonstrate the understanding that patterns in data may reveal correlations among factors in phenomena.

SCI.10.D.3 Demonstrate the understanding that correlations in data suggest relations among factors but are not conclusive evidence that one factor is the cause of change in another because undiscovered factors could be causing both.

SCI.10.D.4 Demonstrate the understanding that in science, there is a difference between theories, models, hypotheses, and laws, including the fact that one does not become another, and all are important parts of the development of scientific understandings.

METHOD

Scientific explanations, theories, and models are those that best fit the evidence available at a particular time.

How is science done?

SCI.10.D.5 Demonstrate an understanding of how models are used in science. Examples: prediction, simplification, representation, testing

SCI.10.D.6 Demonstrate the understanding that theories and models are created by humans using intuition, reason, imagination, and consideration of evidence.

SCI.10.D.7 Demonstrate an understanding of the nature of scientific theories and models and how they may change as new evidence becomes available.
Examples: modify, replace, discard, paradigm shift

SCI.10.D.8 Demonstrate the understanding that theories are tested by experiment and observation and may be strengthened, modified, or discarded, but they cannot be proven correct. Include the following: problem of induction, black swan theory, falsifiability.

APPLICATION

The knowledge produced by science is used in engineering and technologies to create products and processes.

How is science used?

SCI.10.D.9 Demonstrate an understanding of how scientific knowledge and technological advancement enable and reinforce each other in a reciprocal fashion.

SCI.10.D.10 Demonstrate the understanding that while technologies may provide advantages, they may also have detrimental aspects.
Examples: climate change, environmental damage, disposal, mass consumption

SCI.10.D.11 Demonstrate the understanding that some technologies consume rare and finite resources, requiring collaboration among scientists, engineers, and others to find sustainable solutions.
Examples: sustainable development, environmental damage, non-renewable resource, rare metals, recycling, reuse

IMPLICATION

Applications of science often have ethical, environmental, social, economic, and political implications.

What are the impacts of using science?

SCI.10.D.12 Demonstrate the understanding that established science is not a matter of opinion; however, the application of scientific knowledge requires ethical and moral decisions that are outside the realm of science.

SCI.10.D.13 Demonstrate the understanding that all technologies consume or degrade resources, requiring considerations beyond what the technology or science itself can provide.
Examples: economical, social, health, ethical, political, environmental, sustainability

Strand E.
Scientific Knowledge

MATTER

All matter in the universe is made of very small particles.

What happens during chemical reactions?

SCI.10.E.1 Demonstrate the understanding that chemical reactions involve the joining or rearrangement of atoms in the reacting substances, resulting in the formation of new substances.
Include the following: conservation of mass, reaction equations, balancing equations, chemical bonds.

SCI.10.E.2 Demonstrate the understanding that the observable properties and behaviours of elements and compounds can be explained in terms of the arrangement of electrons, and the bonds between atoms or molecules.
Examples: metals, non-metals, Bohr models, ionic compounds, molecules, solids, liquids, gasses, boiling point, melting point, reactivity

SCI.10.E.3 Demonstrate an understanding of the nature of the formation and properties of binary ionic compounds.
Include the following: metal, non-metal, valence electron, ionic bond, crystal, melting point, boiling point, electrolyte.

SCI.10.E.4 Demonstrate an understanding of the nature of the formation and properties of simple molecular compounds.
Include the following: valence shell, covalent bond, single bond, double bond, triple bond, melting point, boiling point, states of matter.

SCI.10.E.5 Demonstrate the understanding that scientists name molecular and ionic compounds systematically, according to International Union of Pure and Applied Chemistry (IUPAC) rules.
Include the following: prefix, suffix, Stock system.

Note: All learners should demonstrate an awareness of the importance of systematically naming compounds. Those planning to enter Grade 11 Chemistry should learn basic naming.

FORCE

Changing the movement of an object requires a net force to be acting on it.

How do forces affect the motion of objects?

SCI.10.E.6 Demonstrate an understanding of the concepts of position, time, displacement, velocity, and constant acceleration.
Include the following: vector, scalar, distance, speed, and correct application of related SI units.

SCI.10.E.7 Demonstrate an understanding of the relationship among forces, masses, and changing velocities as described and understood through Newton's three laws of motion.
Include the following: mass, kilogram, inertia, definition of newton (N), vector, acceleration, friction.

SCI.10.E.8 Demonstrate the understanding that pressure is a measure of force acting on a unit of area.
Include the following: pascal, kilopascal, m^2, N.

SCI.10.E.9 Demonstrate the understanding that liquids, gases, and solids exert pressures, and that the amount of pressure depends on various factors.
Include the following: density, gravity, volume, temperature, depth, height.

EARTH SCIENCE

The composition of Earth and its atmosphere and the processes occurring within them shape Earth's surface and its climate.

What causes climate to change?

SCI.10.E.10 Demonstrate an understanding of the nature and importance of the ozone layer.
Include the following: formation from oxygen, molecular composition, blocking ultraviolet (UV) rays, chlorofluorocarbon (CFC) damage.

SCI.10.E.11 Demonstrate an understanding of global efforts made to reverse ozone damage.
Include the following: ozone hole, Montreal protocol.

SCI.10.E.12 Demonstrate an understanding of factors that influence Earth's climate system.
Examples: latitude, Sun energy, landscape, prevailing wind, Coriolis effect, ocean currents

SCI.10.E.13 Demonstrate an understanding of the nature, importance, and extraction of natural resources contained within Earth.
Include the following: fossil fuels, ores, minerals, metals.

SCI.10.E.14 Demonstrate an understanding of the mechanism and consequences (e.g., severe weather events, ocean acidification, desertification, loss of polar ice, wildfires, flooding) of human-induced climate change.
Include the following: greenhouse gas emissions.

Strand E.
Scientific Knowledge

SPACE SCIENCE

Our Solar System is a very small part of one of billions of galaxies in the universe.

What can we learn about the universe?

SCI.10.E.15 Demonstrate an understanding of the vast size of the universe, its varied contents, and evidence for its formation in the Big Bang, and subsequent evolution.
Include the following: light year, parsec, astronomical unit, doppler shift, galaxies.

SCI.10.E.16 Demonstrate an understanding of the formation and evolution of our Solar System, and the Solar System's place and time in the larger universe.
Include the following: gravity, accretion, star, age of universe, age of Solar System, age of Earth.

SCI.10.E.17 Demonstrate an understanding of the varying nature of stars, including the formation, types, mechanism of energy production, and progression through a life cycle.
Include the following: types of stars, evolution of stars, star birth, main sequence, star death, nuclear fusion.

SCI.10.E.18 Demonstrate the understanding that celestial objects, and objects on Earth, all obey the same relatively simple laws of gravity and motion, which lead to mainly regular and predictable motions in the night sky, and occasionally to less predictable phenomena.
Example: meteor activity

SCI.10.E.19 Demonstrate the understanding that evidence of life has not been found anywhere beyond Earth.

LIFE SYSTEMS

Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.

What is the nature of a healthy ecosystem?

SCI.10.E.20 Demonstrate an understanding of the nature and functioning of resilient ecosystems.
Include the following: food web, ecological pyramids, biogeochemical cycles, biodiversity, carrying capacity.

SCI.10.E.21 Demonstrate the understanding that many human activities have a detrimental effect on natural, healthy ecosystems.
Examples: monoculture, farming, forestry, mining, lake eutrophication, invasive species, habitat destruction, bioaccumulation, climate change, urbanization, building dams, and dissemination of invasive species

SCI.10.E.22 Demonstrate the understanding that there are sustainable alternatives to most detrimental human activities.
Examples: sustainable agriculture practices, renewable energy resources

EVOLUTION

The diversity of organisms, living and extinct, is the result of evolution.

How are evolution and human activity related?

SCI.10.E.23 Demonstrate the understanding that the evolution of living things is an aspect of a larger process called cosmic evolution, which has led to conditions favorable to life on Earth.

SCI.10.E.24 Demonstrate the understanding that human activity changes environments more quickly than organisms can naturally evolve.
Include the following: climate change, pollution, monoculture, biodiversity, Anthropocene extinction, pesticides, fertilization, habitat destruction.

SCI.10.E.25 Demonstrate the understanding that humans can intentionally or unintentionally influence the evolution of species.
Examples: selective breeding, domestication, genetic modification, antibiotic resistance, peppered moth