Grade **8**

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 the nature of the particles that make up matter influence the properties of materials?*
- *How does solar energy travel to Earth, and what effects does it have on the planet?*
- *How are living things organized at the cellular level?*

Strand A. Indigenous Peoples within the Natural World

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

SCI.8.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.8.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.

Strand C. Practical Science

STSE CONTEXTS

How do science and our world interact?

SCI.8.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: phase changes in everyday contexts (refrigeration technology, food science); phase change and weather (precipitation, cloud formation); solar energy harvesting; various electromagnetic (EM) radiation technologies (radio, cellphone, microwave); sun safety; effects of tectonics on daily life, including natural disasters and hazards; Indigenous uses of rocks and minerals; human-caused climate change and sustainable alternatives; conservation and protection of land, water, and ecosystems; Indigenous teachings related to water and land; cellular level technologies; lifestyle and cardiovascular health

SCIENTIFIC MEASUREMENT

How do we measure scientifically?

SCI.8.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, pan balance, balance, volumetric vessels, **barometer, spectrometer**
- Attributes: length, mass, volume, time, temperature, speed, force, direction, energy, **density, pressure**
- Units: length (km, m, cm, mm), mass (kg, g), volume (L, mL), time (h, min, s), temperature (°C), speed (km/h, m/s), force (N), energy (J), **density (kg/m³, g/cm³), 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)**

ACTION AND PRACTICE

How can we do science?

SCI.8.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.
- Conduct a fair test to identify which factors determine whether a given object will float or sink, and discuss reasons why scientists control some variables when conducting a fair test.
- Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- Analyze the design and function of a technology that incorporates electromagnetic radiation (e.g., microwave oven, solar cooker, sun tanning lamp, infrared heat lamp, radio, medical imaging X-ray, blacklight, ultraviolet [UV] fire detector, night vision goggles, infrared thermography, and radar) on the basis of learner-identified criteria such as cost, usefulness, and impact on self, society, and the environment.
- Design and carry out an experiment to demonstrate the function of selectively permeable membranes in cells.
- Identify Workplace Hazardous Materials Information System (WHMIS) symbols that provide information on the safety of substances.

SCIENTIFIC INSTRUMENTS

How do we use tools in science?

SCI.8.C.4
Demonstrate an understanding of the purpose and function of various scientific instruments and materials (considering availability and appropriateness), as well as competence in using them safely.

Examples: microscope, prism, glassware, hot plate, chemical substances, craft and recycled materials, classroom materials, materials from nature, logbook, diagrams, charts, graphs, spreadsheets, safety procedures

CAREERS, HOBBIES, AND ACTIVITIES

Where is science found in our lives?

SCI.8.C.5
Demonstrate an understanding of the connections between the scientific ideas studied and a range of careers, hobbies, and activities.

Examples: painter, solar energy technician, materials scientist, mechanic, electric vehicle (EV) specialist, medical doctor, gardening, artist, photography, ethnobotany and medicinal use of plants, cooking and baking, hiking, swimming, rowing, rock climbing, hockey

Manitoba

Strand D.
Nature of Science

PURPOSE	METHOD	APPLICATION	IMPLICATION
Science is about finding the cause or causes of phenomena in the natural world.	Scientific explanations, theories, and models are those that best fit the evidence available at a particular time.	The knowledge produced by science is used in engineering and technologies to create products and processes.	Applications of science often have ethical, environmental, social, economic, and political implications.
What is science for?	*How is science done?*	*How is science used?*	*What are the impacts of using science?*
SCI.8.D.1 Demonstrate the understanding that empirical data must be systematically collected, and conclusions reviewed, to detect potential errors and minimize bias. Include the following: peer review, types of bias.	**SCI.8.D.3** Demonstrate the understanding that models are metaphorical representations of phenomena used to aid understanding or better explain what is happening. Examples: physical model, mathematical model, simulation	**SCI.8.D.5** Demonstrate the understanding that many factors play a role in finding optimal solutions to problems. Examples: available materials; effects on humans and other animals; environmental effects; costs	**SCI.8.D.7** Demonstrate the understanding that technologies that improve human life can have predictable as well as unforeseen detrimental consequences. Examples: medicine; improved agriculture and overpopulation; overproduction and pollution; resources and space depletion; and extinction
SCI.8.D.2 Demonstrate an understanding of the nature of scientific predictions, and how they are tested. Include the following: hypothesis, experiment, variables.	**SCI.8.D.4** Demonstrate the understanding that scientific models may be well established (e.g., Solar System model) while others are more tentative (e.g., black hole model).	**SCI.8.D.6** Demonstrate the understanding that seeking solutions to problems often involves employing a variety of strategies before an actual solution is determined. Example: drawings, models, mathematical modelling, computer simulations	**SCI.8.D.8** Demonstrate the understanding that sometimes, when detrimental effects of a technology are revealed, the trade-off between the advantages and consequences of continued use must be carefully considered. Include the following: fossil fuels and climate change; paper usage and biodiversity; cell phones and social health.

Strand E.
Scientific Knowledge

MATTER

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

How does density of matter change with temperature?

SCI.8.E.1 Demonstrate an understanding of the nature of density as a physical property of matter.
Include the following: mass, volume, density, d=m/v.

SCI.8.E.2 Demonstrate an understanding of the effect of temperature on density using the particle theory of matter.
Include the following: solids, liquids, gases.

SCI.8.E.3 Demonstrate an understanding of the nature of viscosity as a physical property of a fluid.
Example: viscosity-temperature relationship

SCI.8.E.4 Demonstrate an understanding of the relationship between temperature, volume, and pressure using the particle theory of matter.
Include the following: water, steam, vapor, ice, compressibility.

SCI.8.E.5 Demonstrate an understanding of how the nature of attractions between particles in a substance dictate how much energy is required to cause their temperatures and phases to change.

SCI.8.E.6 Demonstrate the understanding that water has properties caused by the nature of its particles, which make it important to climate and vital to living things.
Include the following: heat capacity, boiling and melting point, liquid and solid density difference, universal solvent, transport, humidity, precipitation.

FIELDS

Objects can affect other objects at a distance.

How does sunlight work?

SCI.8.E.7 Demonstrate the understanding that energy from the Sun travels through empty space to Earth, where it is absorbed or reflected by the atmosphere, hydrosphere, and lithosphere.
Include the following: radiation, electromagnetic waves, solar spectrum, albedo.

ENERGY

The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event.

What can we learn about solar energy?

SCI.8.E.8 Demonstrate an understanding of the nature of solar radiation.
Include the following: electromagnetic waves, visible light, solar spectrum.

SCI.8.E.9 Demonstrate an understanding of various types of electromagnetic radiation with respect to relative energy, frequency, wavelength, and applications.
Examples: photosynthesis, visible light, x-rays, microwaves, radio waves, infrared ultraviolet (UV), sun safety, mutation

EARTH SCIENCE

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

How does Earth's internal and external heat affect life?

SCI.8.E.10 Demonstrate an understanding of the physical structure and physical properties of Earth.
Include the following: crust, mantle, outer core, inner core.

SCI.8.E.11 Demonstrate an understanding of the factors contributing to Earth's internal heat.
Examples: residual heat during Earth's formation (accretional heat), nuclear heat, frictional heat)

SCI.8.E.12 Demonstrate the understanding that tectonic activity due to Earth's internal heat leads to various types of geological activity.
Include the following: tectonic plates, continental drift, faults, mountain ranges, earthquakes, volcanoes, geysers, hot springs.

SCI.8.E.13 Demonstrate the understanding that solar energy heats the surface of Earth.
Examples: Sun's radiation energy, transparent atmosphere, albedo, soil thermal properties

SCI.8.E.14 Demonstrate an understanding of the role of water in shaping the features of Earth's surface.
Examples: erosion, deposition, precipitation, flooding, glaciers, ice age, watersheds

SCI.8.E.15 Demonstrate a basic understanding that all energy arriving at Earth from the Sun eventually radiates back into space.
Include the following: energy budget.

SCI.8.E.16 Demonstrate an understanding of how the Sun's radiation provides energy to plants through the process of photosynthesis.
Include the following: chlorophyll, glucose, food chain, food pyramid.

SCI.8.E.17 Demonstrate an understanding of the mechanisms of the greenhouse effect in raising temperatures on Earth.
Include: greenhouse gases, infrared radiation, energy budget, energy balance, atmosphere, natural versus human accelerated greenhouse effect.

LIFE SCIENCE

Organisms are organized on a cellular basis and have a finite life span.

How do cells work together to maintain a healthy body?

SCI.8.E.18 Demonstrate an understanding of cell theory.
Include the following: all living things are composed of one or more cells; cells are the basic unit of structure and function of any organism; all cells come from pre-existing cells; the activity of an organism depends on the total activity of all its cells.

SCI.8.E.19 Demonstrate the understanding that various types of cells have particular conditions that are ideal for their growth.

SCI.8.E.20 Demonstrate the understanding that cells have specialized structures for particular functions.
Include the following: organelle, cytoplasm, cell membrane, cell wall, nucleus, mitochondria, chloroplast, vacuole.

SCI.8.E.21 Demonstrate an understanding of the structural and functional relationships among cells, tissues, organs, and organ systems.
Include the following: stem cells, specialized cells.

SCI.8.E.22 Demonstrate the understanding that in living things, cells contribute to homeostasis to maintain conditions required for life.
Examples: cellular respiration, pH balance, osmosis, diffusion, selective permeability

SCI.8.E.23 Demonstrate an understanding of the structure and function of the human circulatory system in maintaining homeostasis.
Examples: heart, blood, blood components, blood vessels, oxygen, waste, water, temperature regulation