

**BIG IDEAS**

Life processes are performed at the cellular level.

The behaviour of matter can be explained by the kinetic molecular theory and atomic theory.

Energy can be transferred as both a particle and a wave.

The theory of plate tectonics is the unifying theory that explains Earth's geological processes.

**Learning Standards**

Curricular Competencies	Content
<p><i>Students are expected to be able to do the following:</i></p> <p><b>Questioning and predicting</b></p> <ul style="list-style-type: none"> <li>• Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest</li> <li>• Make observations aimed at identifying their own questions about the natural world</li> <li>• Identify a question to answer or a problem to solve through scientific inquiry</li> <li>• Formulate alternative “If...then...” hypotheses based on their questions</li> <li>• Make predictions about the findings of their inquiry</li> </ul> <p><b>Planning and conducting</b></p> <ul style="list-style-type: none"> <li>• Collaboratively plan a range of investigation types, including field work and experiments, to answer their questions or solve problems they have identified</li> <li>• Measure and control variables (dependent and independent) through fair tests</li> <li>• Observe, measure, and record data (<b>qualitative and quantitative</b>), using equipment, including digital technologies, with <b>accuracy</b> and <b>precision</b></li> <li>• Use appropriate SI units and perform simple unit conversions</li> <li>• Ensure that safety and ethical guidelines are followed in their investigations</li> </ul> <p><b>Processing and analyzing data and information</b></p> <ul style="list-style-type: none"> <li>• Experience and interpret the local environment</li> <li>• Apply First Peoples perspectives and knowledge, other <b>ways of knowing</b>, and local knowledge as sources of information</li> <li>• Construct and use a range of methods to represent patterns or relationships in data, including tables, graphs, keys, models, and digital technologies as appropriate</li> <li>• Seek patterns and connections in data from their own investigations and secondary sources</li> <li>• Use scientific understandings to identify relationships and draw conclusions</li> </ul>	<p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• <b>characteristics of life</b></li> <li>• <b>cell theory</b> and <b>types of cells</b></li> <li>• photosynthesis and cellular respiration</li> <li>• the relationship of <b>micro-organisms</b> with living things: <ul style="list-style-type: none"> <li>– basic functions of the <b>immune system</b></li> <li>– <b>vaccination</b> and <b>antibiotics</b></li> <li>– impacts of <b>epidemics</b> and <b>pandemics</b> on human populations</li> </ul> </li> <li>• <b>kinetic molecular theory (KMT)</b></li> <li>• <b>atomic theory</b> and <b>models</b></li> <li>• <b>protons, neutrons, and quarks</b></li> <li>• <b>electrons and leptons</b></li> <li>• <b>types</b> and <b>effects</b> of electromagnetic radiation</li> <li>• light: <ul style="list-style-type: none"> <li>– <b>properties</b></li> <li>– <b>behaviours</b></li> <li>– <b>ways of sensing</b></li> </ul> </li> <li>• <b>plate tectonic movement</b></li> <li>• major geological events of local significance</li> <li>• First Peoples knowledge of: <ul style="list-style-type: none"> <li>– local geological formations</li> <li>– significant local geological events</li> </ul> </li> <li>• layers of Earth</li> </ul>

Learning Standards (continued)

Curricular Competencies	Content
<p><b>Evaluating</b></p> <ul style="list-style-type: none"> <li>• Reflect on their investigation methods, including the adequacy of controls on variables (dependent and independent) and the quality of the data collected</li> <li>• Identify possible sources of error and suggest improvements to their investigation methods</li> <li>• Demonstrate an awareness of assumptions and bias in their own work and secondary sources</li> <li>• Demonstrate an understanding and appreciation of evidence (qualitative and quantitative)</li> <li>• Exercise a healthy, informed skepticism and use scientific knowledge and findings from their own investigations to evaluate claims in secondary sources</li> <li>• Consider social, ethical, and environmental implications of the findings from their own and others' investigations</li> </ul> <p><b>Applying and innovating</b></p> <ul style="list-style-type: none"> <li>• Contribute to care for self, others, community, and world through personal or collaborative approaches</li> <li>• Co-operatively design projects</li> <li>• Transfer and apply learning to new situations</li> <li>• Generate and introduce new or refined ideas when problem solving</li> </ul> <p><b>Communicating</b></p> <ul style="list-style-type: none"> <li>• Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate</li> <li>• Express and reflect on a variety of experiences and perspectives of <b>place</b></li> </ul>	

Big Ideas – Elaborations	SCIENCE Grade 8
<p><i>Sample questions to support inquiry with students:</i></p> <p><b>Life processes are performed at the cellular level.</b></p> <ul style="list-style-type: none"> <li>• How can you tell if something is living?</li> <li>• How do humans and micro-organisms interact?</li> </ul> <p><b>The behaviour of matter can be explained by the kinetic molecular theory and atomic theory.</b></p> <ul style="list-style-type: none"> <li>• What are some practical applications of the kinetic molecular theory?</li> <li>• What is the relationship between the atomic theory and kinetic molecular theory?</li> </ul>	

**Big Ideas – Elaborations****Energy can be transferred as both a particle and a wave.**

- How does electromagnetic energy behave like both a particle and a wave?
- What are the properties and behaviours of light?
- How do you sense light?

**The theory of plate tectonics is the unifying theory that explains Earth's geological processes.**

- How does the movement of Earth's tectonic plates cause observable changes and effects?
- How does tectonic plate movement affect you locally?
- What evidence of plate tectonic movement is shared by First Peoples?

**Curricular Competencies – Elaborations**

- **Questioning and predicting:** Matter is anything that has mass and takes up space. Energy is the ability to cause change or do work. The universe is made up of matter and energy.  
*Key questions about matter and energy:*
  - What is the relationship between matter and energy and the cell theory?
  - How do matter and energy connect to the kinetic molecular theory?
- **qualitative:** evidence expressed through words, descriptions, interviews, narratives
- **quantitative:** evidence expressed through numbers and measurement
- **accuracy:** how close a measured value is to the actual value
- **precision:** how close measurements of the same type are to each other
- **ways of knowing:** Ways of knowing refers to the various beliefs about the nature of knowledge that people have; they can include, but are not limited to, Aboriginal, gender-related, subject/discipline specific, cultural, embodied and intuitive beliefs about knowledge.
- **place:** Place is any environment, locality, or context with which people interact to learn, create memory, reflect on history, connect with culture, and establish identity. The connection between people and place is foundational to First Peoples perspectives of the world.

*Key questions about place:*

- How does place inform your questions and inquiries?
- How does place influence your ability to plan and conduct an inquiry and make predictions about outcomes?
- How does your understanding of place affect the ways in which you collect evidence and evaluate it?
- As you consider the significance, worth, or value of an outcome or finding, how can you show different **ways of knowing**?
- How can your understanding of place influence project designs?
- How do the place-based experiences and stories of others affect the ways in which you communicate and collaborate?

## Content – Elaborations

- **characteristics of life:** living things respire, grow, take in nutrients, produce waste, respond to stimuli, and reproduce; there is debate as to whether or not to classify viruses as living things
- **cell theory:**
  - living things are made of one or more cells
  - all cells come from pre-existing cells
  - the cell is a basic unit of life
- **types of cells:**
  - prokaryotic and eukaryotic cells
  - plant and animal cells
  - cells contain structures that carry out essential functions
- **micro-organisms:**
  - micro-organisms are key to nutrient recycling in ecosystems as they act as decomposers
  - viruses and bacteria can cause disease and can also be used in industry (e.g., production of cheese and salami) and agriculture (e.g., production of striped tulips)
- **immune system:**
  - the immune system provides a barrier to infections and a number of non-specific and specific responses to fight infection (e.g., fever, antibodies, phagocytes, inflammation)
  - different populations have greater immunity to certain infections than other populations (e.g., impact of smallpox epidemic on First Peoples)
- **vaccination:** vaccination can prevent the spread of infectious disease
- **antibiotics:** antibiotics are effective only against living organisms, such as bacteria, and not against viruses; overuse of antibiotics can lead to the development of antibiotic-resistant strains of bacteria (“superbugs”)
- **epidemics:** regional outbreaks (e.g., smallpox, measles)
- **pandemics:** global outbreaks (e.g., Spanish flu, SARS)
- **kinetic molecular theory (KMT):** explains how particles move in different states
- **atomic theory:** provides evidence for the existence of atoms and molecules
- **models:** models can be used to represent:
  - the arrangement and motion of particles in different phases
  - the arrangement of and forces that bind protons, neutrons, and electrons in an atom
  - the quarks and leptons in protons, neutrons, and electrons
- **protons, neutrons, and quarks:** protons and neutrons (made of quarks) are held together in the nucleus by a strong nuclear force
- **electrons and leptons:** electrons (a type of lepton) are held at a distance from the nucleus through electromagnetism
- **types:** types of electromagnetic radiation: the electromagnetic spectrum consists of radio, microwave, infrared, light, UV, X-ray, and gamma rays
- **effects:** effects of electromagnetic radiation: positive effects include cancer treatments; negative effects include sunburns

## Content – Elaborations

- **properties:** properties of light
  - acts like both a wave and a particle
  - wavelength, amplitude, frequency
- **behaviours:** behaviours of light:
  - reflection, refraction, absorption, transmission, scattering
  - images formed by lenses and mirrors
  - effects of translucent, transparent, and opaque objects
- **ways of sensing:** ways of sensing light: human vision, optical instruments, cameras
- **plate tectonic movement:**
  - types of plate movements
  - plate boundaries
  - earthquakes and volcanoes