

## BIG IDEAS

**Measurement of motion** depends on our frame of reference.

Forces can cause **linear and circular motion**.

Forces and energy interactions occur within **fields**.

**Momentum** is conserved within a closed and isolated system.

## 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, local, or global interest</li> <li>• Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world</li> <li>• Formulate multiple hypotheses and predict multiple outcomes</li> </ul> <p><b>Planning and conducting</b></p> <ul style="list-style-type: none"> <li>• Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative)</li> <li>• Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods</li> <li>• Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data</li> <li>• Apply the concepts of accuracy and precision to experimental procedures and data:               <ul style="list-style-type: none"> <li>– significant figures</li> <li>– uncertainty</li> <li>– scientific notation</li> </ul> </li> </ul>	<p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• frames of reference</li> <li>• relative motion within a stationary reference frame</li> <li>• postulates of special relativity</li> <li>• <b>relativistic effects</b> within a moving reference frame</li> <li>• <b>static equilibrium</b></li> <li>• <b>uniform circular motion:</b> <ul style="list-style-type: none"> <li>– centripetal force and acceleration</li> <li>– <b>changes to apparent weight</b></li> </ul> </li> <li>• <b>First Peoples knowledge and applications of forces in traditional technologies</b></li> <li>• <b>gravitational field</b> and Newton’s law of universal gravitation</li> <li>• gravitational potential energy</li> <li>• <b>gravitational dynamics and energy relationships</b></li> <li>• <b>electric field</b> and Coulomb’s law</li> <li>• electric potential energy, electric potential, and electric potential difference</li> <li>• <b>electrostatic dynamics and energy relationships</b></li> <li>• <b>magnetic field</b> and <b>magnetic force</b></li> <li>• <b>electromagnetic induction</b></li> <li>• <b>applications of electromagnetic induction</b></li> <li>• <b>impulse</b> and momentum</li> <li>• conservation of momentum and energy in <b>collisions</b></li> <li>• <b>graphical methods</b> in physics</li> </ul>

Learning Standards (continued)

Curricular Competencies	Content
<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 ways of knowing, and local knowledge as sources of information</li> <li>• Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies</li> <li>• Construct, analyze, and interpret graphs, models, and/or diagrams</li> <li>• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence</li> <li>• Analyze cause-and-effect relationships</li> </ul> <p><b>Evaluating</b></p> <ul style="list-style-type: none"> <li>• Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions</li> <li>• Describe specific ways to improve their investigation methods and the quality of their data</li> <li>• Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled</li> <li>• Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources</li> <li>• Consider the changes in knowledge over time as tools and technologies have developed</li> <li>• Connect scientific explorations to careers in science</li> <li>• Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources</li> <li>• Consider social, ethical, and environmental implications of the findings from their own and others' investigations</li> <li>• Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems</li> <li>• Assess risks in the context of personal safety and social responsibility</li> </ul>	

Learning Standards (continued)

Curricular Competencies	Content
<p><b>Applying and innovating</b></p> <ul style="list-style-type: none"> <li>• Contribute to care for self, others, community, and world through individual or collaborative approaches</li> <li>• Co-operatively design projects with local and/or global connections and applications</li> <li>• Contribute to finding solutions to problems at a local and/or global level through inquiry</li> <li>• Implement multiple strategies to solve problems in real-life, applied, and conceptual situations</li> <li>• Consider the role of scientists in innovation</li> </ul> <p><b>Communicating</b></p> <ul style="list-style-type: none"> <li>• Formulate physical or mental theoretical models to describe a phenomenon</li> <li>• Communicate scientific ideas and information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations</li> <li>• Express and reflect on a variety of experiences, perspectives, and worldviews through <b>place</b></li> </ul>	