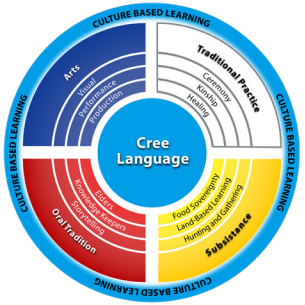
Science



Knowledge	Understanding	Skills & Procedures	ᓀᐦᐃᔭᐍ Nehiyaw Ways of Knowing	Other Suggestions
VIDEOS **Animate and Inanimate (Throughout Environment) (This video is recommended for viewing at the beginning of science units.)**				
ORGANIZING IDEA **Matter(M) : Understandings of the physical world are deepened through investigating matter and energy.**				
GUIDING QUESTION **How can states of matter and other physical properties be explained using the particle model of matter?**				
LEARNING OUTCOME **5M 1.1 Students investigate the particle model of matter to describe the physical properties of solids, liquids, and gasses.**				
Ideas represented by the particle model of matter include that: • **all matter is made up of small particles** • **particles of matter are always moving** • **particles of matter have spaces between them** **In solids, the particles are close together and vibrate in place.** **In liquids, the particles are separated by spaces and can slide past each other.** **In gasses, the particles are separated by large spaces and are constantly moving in all directions.** Attractive forces between particles are strongest in solids and weakest in gasses.	The particle model of matter explains the behaviour of particles in matter.	Represent solids, liquids, and gases using the particle model of matter. **Relate the movement and arrangement of particles to the state of matter.** Describe the impact that attractive forces have on the movement and arrangement of particles in solids, liquids, and gases.	**Fall Fire Making and Safety Series: Different Wood/ Trees and How They Burn** **Winter Fishing: Ice Fishing Series (3 videos)** **Creation Stories: Plant Features Legends**	**Ice fishing (ice density)**

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LEARNING OUTCOME **5M 1.2 Students investigate the particle model of matter to describe the physical properties of solids, liquids, and gasses.**				
Physical properties of matter include • **state** • **mass** • **volume** • **density** • **compressibility** Mass is the amount of matter in a solid, liquid, or gas. SI units of mass include grams and kilograms. Volume is the amount of space a solid, liquid, or gas takes up. SI units of volume of a liquid include millilitres and litres. SI units are abbreviated for convenience, including • g: grams • kg: kilograms • mL: millilitres • L: litres **Density is a comparison of the mass of a solid, liquid, or gas to its volume.** **The greater the mass of a solid, liquid, or gas as compared to its volume, the higher its density.** Density can be described comparatively using the phrases denser and less dense. **Density can be directly compared by determining** • **the relative mass of objects with the same volume** • **if a liquid sinks or floats when added to another liquid** **A solid, liquid, or gas that is less dense than the fluid in which it is placed will float.** Compressibility is the ability of a liquid or gas to reduce in volume when under pressure.	**The movement and arrangement of particles affect the physical properties of matter.**	Measure the mass of solids and liquids using a balance scale and SI units. Measure the volume of liquids using appropriate instruments and SI units. Directly compare the density of solid objects that have the same volume. Directly compare the density of liquids. Relate densities of solids, liquids, and gases using the particle model of matter. Compare the compressibility of air and water. Practise safe and appropriate use of materials, tools, and equipment.	**Mixing and Measuring Common Medicines (2 videos)** **Making Dry Meat Series (6 videos)** **How Medicines Came to Man** **Fall Whitefish Series (2 videos)**	**Explore different food security and storage methods for mobility, space, and safety.**

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ORGANIZING IDEA **Energy (E): Understandings of the physical world are deepened through investigating matter and energy.**				
GUIDING QUESTION **How are forces similar and different in water and air?**				
LEARNING OUTCOME **5E 1.1 Students investigate and compare how forces affect living things and objects in water and air.**				
Thrust and drag are opposing forces. **Lift and weight are opposing forces.** Thrust is a force that can act in the direction of movement. Drag is a force that can act in opposition to the direction of movement. Lift is an upward force that acts to overcome the weight of a living thing or object and hold it in the air. **Weight is a force caused by gravity that acts on a living thing or object in a downward direction.** **Forces can affect the flight of living things and objects in various ways, including** • **speed** • **horizontal and vertical movement** • **altitude** • **straight and level flight** Traditional technologies developed by diverse cultures that reflect understanding of forces that affect flight include the • bow and arrow • slingshot • fishing spear	**Flight of living things and objects is influenced by opposing forces.**	Diagram opposing forces that act on living things or objects in flight. Explain the effects of thrust and drag on the flight of living things and objects. Explain the effects of lift and weight on the flight of living things and objects. **Observe living things and objects in flight.** Describe traditional or modern technologies developed by diverse cultures that reflect understanding of forces that affect flight. Construct a device that can fly. Practise safe and appropriate use of tools, equipment, and materials while constructing a device.	**7 Sisters Legend (Girl That Climbed The Sky)** **Trickster and the Ducks**	

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LEARNING OUTCOME **5E 1.2 Students investigate and compare how forces affect living things and objects in water and air.**				
Buoyant force is an upward force exerted by a fluid that opposes the weight of anything placed in the fluid. When the buoyant force is greater than the weight of an object, the object will float. When the buoyant force is less than the weight of an object, the object will sink. **Fluids include liquids and gases.**	**The relationship between buoyant force and gravity can be used to explain the behaviour of an object in water.**	Relate buoyant force and weight to the tendency to float or sink in water. Conduct controlled experiments to determine if various objects and materials float in different fluids. Construct a device that can float. Practise safe and appropriate use of tools, equipment, and materials while constructing a device.	**Winter Fishing: Ice Fishing Series (3 videos)** **Trickster and the Ducks**	**Build a canoe from birch.**
GUIDING QUESTION **How are energy resources understood?**				
LEARNING OUTCOME **5E 2.1 Students investigate and analyze various energy resources.**				
Energy resources are renewable or non-renewable. **Renewable energy resources are not depleted over time as they can be naturally replenished if handled responsibly.** **Renewable energy resources include** • **solar** • **wind** • **biomass** • **geothermal** • **tidal** • **water and hydro** **Non-renewable energy resources are depleted over time because they will not be naturally replenished for thousands or millions of years.** [continued...]	Humans rely on energy resources to fulfill energy needs.	Compare renewable energy resources with non-renewable energy resources. Discuss advantages and disadvantages of using renewable and non-renewable energy resources. Examine how various provinces and territories throughout Canada fulfill energy needs.	**Fire Teachings** **Legend of Solstice**	

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[continued...] **Non-renewable energy resources include nuclear and fossil fuels.** **Alberta relies on both renewable and non-renewable energy resources to fulfill energy needs, including** • **fossil fuels** • **water and hydro** • **wind** • **biomass**				**Explore examples such as Métis Crossing and solar farms.**
ORGANIZING IDEA **Earth System (ES): Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions.**				
GUIDING QUESTION **How can climate and its effects be understood?**				
LEARNING OUTCOME **5 ES 1.1 Students analyze climate and connect it to weather conditions and agricultural practices.**				
Weather is the short-term conditions experienced in a region, including • **temperature** • **wind speed and direction** • **amount of sunlight** • **precipitation** • **humidity** • **cloud cover** **Climate is the long-term weather patterns of a region over a period of at least 30 years.** Data in maps, tables, or graphs can be used to represent key characteristics of climate, including • temperature • precipitation • humidity • wind [...continued]	The study of climates across regions helps identify historical patterns and make predictions.	Distinguish climate from weather. Discuss the characteristics of local, national, and global weather conditions to determine climate. Compare key characteristics of climate zones. Interpret data about climate. Relate factors that contribute to Alberta's climate. **Compare Alberta's climate to the climates of other Canadian provinces or territories.**	**Orienteering Series: Weather Indicators** **Climate Change and Effects on Hunting and Gathering**	**Use examples that include:** • **Adaptations of animals (i.e., rabbits changing colour due to climate)** • **Hornets building nests on ground for a dry season, nests built in trees or higher if season will be wet**

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[...continued] **Climates are dependent on factors that include** • **geographical location** • **landforms** • **altitude** • **proximity to bodies of water** Climate zones are defined areas with distinct climates and include • tropical • dry • temperate • polar • continental **First Nations, Métis, and Inuit can provide long-term observations of climate for local context.**				
LEARNING OUTCOME **5 ES 1.2 Students analyze climate and connect it to weather conditions and agricultural practices.**				
Tools to measure and track weather conditions include • **thermometers** • **wind vanes** • **windsocks** • **anemometers** • **barometers** • **rain or snow gauges** • **hygrometers** Websites, weather maps, and weather apps provide access to weather information. [...continued]	Weather conditions can be measured accurately using a variety of tools and methods.	Examine tools used to measure and track weather conditions. Construct simple tools to measure weather. Observe and record local weather for a given time interval. Represent local weather data. Construct a sample weather map of a local region for a given time. Explain the importance of weather forecasts. [...continued]	7 Year Cycle	**Observe trees for weather changes (i.e., poplar trees turning over leaves when it is going to rain).**

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[...continued] **First Nations, Métis, and Inuit communities rely on traditional knowledge, in addition to modern tools and methods, to interpret and predict weather patterns.** Methods used to predict weather include • computer modelling • historical data • satellite imaging • First Nations, Métis, and Inuit traditional knowledge		[...continued] **Investigate methods used to predict the weather.** Discuss First Nations, Métis, and Inuit methods of predicting weather.		**"Spirit Gifting: The Concept of Spiritual Exchange" by Elmer Ghostkeeper, 2007.**
LEARNING OUTCOME **5 ES 1.3 Students analyze climate and connect it to weather conditions and agricultural practices.**				
Climate affects various aspects of human activity, including • agriculture • infrastructure • clothing • transportation • recreation **Climate affects various aspects of animal activity, including** • migration patterns • accessing food • timing of reproduction	Climate affects human and other animal activity.	Explain how climate can affect human and other animal activity.	7 Year Cycle **Legend of Raven and Water**	**Make observations about:** • **Horses running when bad weather is approaching** • **Seagulls flying inland when a storm is approaching** • **Little birds hiding in trees and being still**

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LEARNING OUTCOME **5 ES 1.4 Students analyze climate and connect it to weather conditions and agricultural practices.**				
Climate and weather events may influence agricultural practices by affecting components such as • crop type • crop production • animal population • soil quality • water access **Conservation agriculture is a sustainable practice that responds to local climate and weather events.** Conservation agriculture practices are adapted to the requirements of plants and animals farmed. **Agricultural practices involve monitoring and responding to climate or weather events such as** • **drought** • **flooding** • **fires** • **windstorms** Conservation agriculture practices include • minimizing soil disturbance • maintaining soil cover • using water efficiently • using sustainable harvesting practices **Sustainable harvesting practices support the maintenance of stable plant or animal populations over time and include** • crop rotation • companion planting • limiting hunting and trapping • considering future harvests	Climate and weather events influence agricultural practices.	Describe how climate may affect plants and animals farmed in Alberta. **Discuss conservation agriculture practices and potential uses.** Describe local climate and weather events that affect agricultural practices. **Explain practices related to sustainable harvesting.**	7 Year Cycle **Legend of Corn**	

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LEARNING OUTCOME **5 ES 1.5 Students analyze climate and connect it to weather conditions and agricultural practices.**				
Observations of weather conditions and animal behaviour can be used to recognize patterns and cycles, such as seasonal migration.	**Intergenerational observations and accounts of place enable individuals and communities to recognize patterns and cycles related to weather and seasons.**	Examine how weather conditions and animal behaviour can be used to recognize weather patterns and cycles.	7 Year Cycle	
ORGANIZING IDEA **Living Systems (LS): Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions.**				
GUIDING QUESTION **How are organisms supported by vital biological processes and systems?**				
LEARNING OUTCOME **5 LS 1.1 Students investigate the internal systems of organisms and explain how they support biological processes.**				
Vital biological processes in complex organisms are carried out by biological systems that rely on each other. **Vital biological processes of complex organisms include** • **movement** • **nutrition** • **respiration** • **growth** • **reproduction** **Humans and many other animals have internal biological systems that include the** • **digestive system** • **respiratory system** • **circulatory system** • **musculoskeletal system** [...continued]	Humans are complex organisms with biological systems that carry out vital biological processes.	Relate vital biological processes to a human or other animal's internal biological systems. Examine the function of the human digestive, respiratory, circulatory, and musculoskeletal systems. **Identify the digestive, respiratory, circulatory, and musculoskeletal systems of the human body and the major body parts of each system.** **Investigate the relationships between body systems that are involved in moving oxygen and nutrients throughout the human body.**	**Animate and Inanimate (Throughout Environment)** Elk Harvest Series (5 videos) Moose Harvest Series (Field Harvest – 6 videos; Butchering and Cutting – 9 videos; Fire Preparation – 3 videos; Feast – 3 videos)	**Explore rocks, mountains and land as animate.**

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[...continued] **The digestive system breaks down food and absorbs nutrients, and includes the mouth, stomach, intestines, liver, and pancreas.** **The respiratory system exchanges oxygen and carbon dioxide, and includes the trachea, lungs, and diaphragm.** **The circulatory system moves blood around the body and includes the heart and blood vessels.** **The musculoskeletal system supports and moves the body, and includes muscles and bones.** The digestive, respiratory, and circulatory systems work together to supply oxygen and nutrients to the human body.				
LEARNING OUTCOME **5 LS 1.2 Students investigate the internal systems of organisms and explain how they support biological processes.**				
Plant transport systems include xylem and phloem. Xylem and phloem in plants perform similar functions to the circulatory system in animals. Xylem transports water and nutrients from the roots to the rest of the plant. Phloem transports sugars from the leaves to the rest of the plant.	Plants are complex organisms with transport systems that carry out specific functions for survival.	Examine the transport systems of plants and describe their functions.	**Plants and Trees – Animate/Inanimate (animate)** **Birch Tree Tapping Series: Tapping Birch Water (proper way to harvest without killing the tree)** **Common Tree Names: Northern Boreal Series (9 videos)**	

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ORGANIZING IDEA **Space: Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions.**				
GUIDING QUESTION **How are astronomical phenomena observed and interpreted?**				
LEARNING OUTCOME **5 S1 Students investigate interpretations and understandings of astronomical phenomena.**				
Astronomical phenomena are observable events that happen among objects in space. Astronomical phenomena include • seasons • Moon phases • lunar and solar eclipses • equinoxes and solstices • length of day and night • auroras **Astronomical phenomena, such as Moon phases, can have predictable patterns and cycles.** **Seasons are experienced during different times of the year in the northern and southern hemispheres of Earth because these regions are tilted toward the Sun at different times of the year.** **Longer and shorter days are experienced during different times of the year in the northern and southern hemispheres of Earth because these regions are tilted toward the Sun at different times of the year.** In the northern hemisphere, auroras are referred to as the northern lights (aurora borealis). **First Nations, Métis, and Inuit ways of living and significant events are connected to many astronomical phenomena, such as the association of seasons to ceremonies.** [...continued]	Observations and interpretations of astronomical phenomena can inform daily living.	Connect the direction of Earth's tilt in relation to the Sun to the length of day and night in each season. Describe personal observations related to cyclical changes in the Moon's appearance. Discuss observable features of lunar and solar eclipses and auroras. Identify astronomical phenomena that occur cyclically. **Explore First Nations, Métis, and Inuit understandings of phases and cycles within astronomical phenomena that inform ways of living and community activities.** **Explore Inuit, northern First Nations', or Métis' stories related to the midnight sun, the polar night, or the northern lights.** [...continued]	**Legend of Night and Day** **13 Moons** **Common Seasonal Activities – Seasonal Round** **Star Stories**	**Coyote Science website and TV show** **Lessons from the Earth and Beyond: Bringing Indigenous Knowledge Systems into the Classroom**

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[...continued] **Astronomical phenomena can be represented in various ways that connect to daily life, including** • **calendars** • **cycles** • **stories and legends** • **artifacts** • **models and digital simulations** Observations and interpretations of astronomical phenomena can be applied in various contexts, including • planting and harvesting crops • hunting		[...continued] **Represent astronomical phenomena in a variety of ways.** **Explore Indigenous representations of astronomical phenomena, past and present.** **Identify how observation of astronomical phenomena can determine agricultural and hunting practices.**		**Coyote Science website and TV show** **Lessons from the Earth and Beyond: Bringing Indigenous Knowledge Systems into the Classroom**
ORGANIZING IDEA **Computer Science (CS): Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.**				
GUIDING QUESTION **In what ways can design be used to help achieve desired outcomes or purposes?**				
LEARNING OUTCOME **5 CS 1.1 Students apply design processes when creating artifacts that can be used by a human or machine to address a need.**				
A computational artifact is anything created by a human using a computer, such as • **computer programs and code** • **images** • **audio** • **video** • **presentations** • **web pages** Design can be used to create algorithms and translate them into code. Code is any language that can be understood by and run on a computer. [...continued]	**Design can be used by humans or machines to meet needs.**	Engage in the design process to create computational artifacts. Relate a block of code to an outcome or a behaviour. Explain what will happen when single or multiple blocks of code are executed. [...continued]		

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[...continued] There are many ways to code, including using visual block-based languages. Visual block-based languages are a form of code in which prepared chunks of instructions are in drag-and-drop blocks that fit together like puzzle pieces to design a program. **A computer cannot think for itself and must rely on code for all that it does.** A loop is a repetition of instructions used in an algorithm.		[...continued] Translate a given algorithm to code using a visual block-based language. Design an algorithm that includes a loop and translate it into code.		
LEARNING OUTCOME **5 CS 1.2 Students apply design processes when creating artifacts that can be used by a human or machine to address a need.**				
Design process can be influenced by various factors, including • **safety** • **functionality** • **usability** • **reliability** • **efficiency** • **aesthetics** **Functionality is the quality of being useful to do the job for which something was designed.** Usability is the degree of ease with which something can be used to achieve an outcome. Design processes that support the development of multiple iterations include • enhancing • refining Design can be improved through collaboration.	Design can better meet needs through the development of multiple iterations.	Discuss examples of designs that have been enhanced or refined to better meet needs. Evaluate an artifact based on various factors. Design an artifact to meet a need. Propose enhancements and refinements to an artifact in collaboration with others. Develop multiple iterations of an artifact.	Trickster and the Tipi Legend of Tipi Trickster and the Tipi (Told in Cree)	

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ORGANIZING IDEA **Scientific Method (SM): Investigation of the physical world is enhanced through the use of scientific methods that attempt to remove human biases and increase objectivity.**				
GUIDING QUESTION **How does evidence lead to understanding?**				
LEARNING OUTCOME **5 SM 1.1 Students investigate how evidence is gathered and explain the importance of ethics in science.**				
Phenomena are facts or events that can be observed. **Some phenomena can be directly observed using the human senses.** Phenomena that cannot be directly observed using the human senses can be observed and measured using technologies such as telescopes, microscopes, and X-rays. **Natural phenomena occur without human input, such as lightning and auroras.**	Investigations can be conducted to better understand phenomena.	Discuss technologies that provide scientists with evidence that cannot be directly observed using the human senses.	**Legend of Death (Northern Lights)**	
LEARNING OUTCOME **5 SM 1.2 Students investigate how evidence is gathered and explain the importance of ethics in science.**				
Bias is any personal thoughts, feelings, or expectations that influence an investigation. Humans are not usually aware of their personal biases.	Evidence is more reliable and valid when investigations are conducted in a way that limits bias.	Identify biases that could influence an investigation.		

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LEARNING OUTCOME **5 SM 1.3 Students investigate how evidence is gathered and explain the importance of ethics in science.**				
A variable is a condition or factor that can influence the outcome of an experiment. A manipulated or independent variable is changed to determine what effect the change will have on the responding variable in a controlled experiment. A responding or dependent variable changes as a result of changes to the manipulated variable in a controlled experiment. A controlled variable is kept the same in a controlled experiment. A controlled experiment is an investigation in which one variable is changed and all other variables are kept the same.	Evidence from a controlled experiment can be used to make conclusions about cause-and-effect relationships between variables.	**Plan and conduct a controlled experiment.** **Identify the variables in a controlled experiment.** Apply vocabulary for variables correctly in science contexts. Evaluate the effect of the manipulated variable on the responding variable in a controlled experiment. Defend a conclusion about cause and effect based on evidence produced in a controlled experiment.		
LEARNING OUTCOME **5 SM 1.4 Students investigate how evidence is gathered and explain the importance of ethics in science.**				
Representations of data can include all or some of the data. Diverse representations of data can communicate evidence differently. **Evidence that is communicated clearly and accurately** • **uses correct vocabulary** • **includes all relevant data** • **is free from personal bias** • **can be understood by the intended audience** Evidence that is not communicated clearly and accurately can influence the validity and reliability of the investigation.	**Evidence must be communicated clearly and accurately.**	Discuss the use of diverse representations of data in communicating evidence. Compare the clarity and accuracy of evidence communicated by diverse representations of data. Discuss potential impacts of evidence that is not communicated clearly and accurately.		

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LEARNING OUTCOME **5 SM 1.5 Students investigate how evidence is gathered and explain the importance of ethics in science.**				
Scientific ethics are principles and rules that guide behaviour when conducting scientific investigations. Scientific ethics are demonstrated during investigations in ways such as • not changing data in an experiment • minimizing harm to environments, humans, and other animals • respecting the privacy of participants • limiting personal bias	**Evidence needs to be produced, handled, and shared ethically.**	Examine the importance of scientific ethics in investigations. Demonstrate scientific ethics during investigations.		