



# PRESCRIBED LEARNING OUTCOMES

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*Grade 8*

## GRADE 8

## KEY ELEMENTS: PROCESSES OF SCIENCE

**Estimated Time: integrate with other curriculum organizers**

The prescribed learning outcomes related to Processes of Science support the development of attitudes, skills, and knowledge essential for an understanding of science. These learning outcomes should not be taught in isolation, but should be integrated with activities related to the other three curriculum organizers.

*Vocabulary*

accuracy, compound light microscope, conclusion, control, dependent variables, experiment, hypothesis, independent variables, observation, precision, prediction, principle, procedure, scientific literacy, validity, variable

*Knowledge*

- metric system (SI units)
- angle measured in degrees
- elements of a valid experiment
- dependent and independent variables
- appropriate scale
- application of scientific principles in the development of technologies

*Skills and Attitudes*

- recognize dangers
- demonstrate emergency response procedures
- use personal protective equipment
- use proper techniques for handling and disposing of lab materials
- use safe dissection techniques
- use microscopes, triple-beam and electronic balances, thermometers, ray boxes, lenses, mirrors
- make accurate measurements using a variety of instruments (e.g., rulers, balances, graduated cylinders)
- use the Internet as a research tool
- communicate results
- use the appropriate type of graph to represent a given type of data
- use bar graphs, line graphs, pie charts, tables, and diagrams to extract and convey information
- deduce relationships between variables given a graph
- use models to demonstrate how systems operate
- apply given criteria for evaluating evidence and sources of information
- identify main points, supporting or refuting information, and bias in a science-related article or illustration
- demonstrate ethical, responsible, cooperative behaviour
- acquire and apply scientific and technological knowledge to the benefit of self, society, and the environment

## GRADE 8 PROCESSES OF SCIENCE

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<p>A1 demonstrate safe procedures</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify a variety of dangers in procedures (e.g., cuts from sharp objects; burns from heating devices; shocks from misuse of electrical equipment)</li> <li><input type="checkbox"/> identify appropriate equipment for an lab activity (e.g., Bunsen burner vs. hotplate)</li> <li><input type="checkbox"/> identify and use appropriate personal protective equipment (e.g., hand and eye protection) and procedures (e.g., hair tied back, clear work area, no loose clothing, no horseplay)</li> <li><input type="checkbox"/> use proper techniques for handling and disposing of lab materials (e.g., using tongs, waste receptacles to handle and dispose of chemical or biological materials)</li> <li><input type="checkbox"/> with teacher support, describe appropriate emergency response procedures (e.g., how to use a fire extinguisher/blanket, eye wash station, first aid for cuts, knowing who to contact and how)</li> <li><input type="checkbox"/> describe safe dissection techniques involved in an actual (or virtual) dissection</li> </ul>
<p>A2 perform experiments using the scientific method</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the elements of a valid experiment: <ul style="list-style-type: none"> <li>- formulate an hypothesis</li> <li>- make a prediction</li> <li>- identify controlled versus experimental variables</li> <li>- observe, measure, and record using appropriate units</li> <li>- interpret data</li> <li>- draw conclusions</li> </ul> </li> <li><input type="checkbox"/> use information and conclusions as a basis for further comparisons, investigations, or analyses</li> <li><input type="checkbox"/> communicate results using a variety of methods</li> </ul>

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
A3 represent and interpret information in graphic form	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify the most appropriate type of graph to represent a given type of data (e.g., pie, bar, table, line graph)</li> <li><input type="checkbox"/> convey information, using appropriate units as applicable, in               <ul style="list-style-type: none"> <li>- bar graphs (e.g., variables in aquatic environments)</li> <li>- line graphs (e.g., mass versus volume)</li> <li>- pie charts (e.g., percentages of water distribution)</li> <li>- tables</li> <li>- diagrams (e.g., of a cell, of systems)</li> </ul> </li> <li><input type="checkbox"/> distinguish between dependent and independent variables in a graph</li> <li><input type="checkbox"/> draw a best fit line or curve given a set of data points on a graph</li> <li><input type="checkbox"/> extrapolate and interpolate points on a graph</li> <li><input type="checkbox"/> use appropriate scale and axis to create a graph</li> <li><input type="checkbox"/> extract relevant information from pie charts, bar graphs, line graphs, and tables</li> </ul>
A4 use models to explain how systems operate	<ul style="list-style-type: none"> <li><input type="checkbox"/> give examples of how various processes could be modelled (e.g., diagrams or demonstrations of energy transfer, refraction, wave action, phase change)</li> <li><input type="checkbox"/> construct a variety of models (e.g., a cell, the eye, wave components)</li> <li><input type="checkbox"/> describe the relationships between components of the model and what it represents</li> </ul>
A5 demonstrate scientific literacy	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify the main points in a science-related article or illustration</li> <li><input type="checkbox"/> describe the qualities of the scientifically literate person, such as               <ul style="list-style-type: none"> <li>- awareness of assumptions (their own and authors')</li> <li>- respect for precision</li> <li>- ability to separate fundamental concepts from the irrelevant or unimportant</li> <li>- recognizing that scientific knowledge is continually developing and often builds upon previous theories</li> </ul> </li> <li><input type="checkbox"/> use given criteria for evaluating evidence and sources of information (e.g., identify supporting or refuting information and bias)</li> <li><input type="checkbox"/> explain how science and technology affect individuals, society, and the environment</li> </ul>

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
A6 demonstrate ethical, responsible, cooperative behaviour	<input type="checkbox"/> describe and demonstrate <ul style="list-style-type: none"> <li>- ethical behaviour (e.g., honesty, fairness, reliability)</li> <li>- open-mindedness (e.g., ongoing examination and reassessment of own beliefs)</li> <li>- willingness to question and promote discussion</li> <li>- skills of collaboration and co-operation</li> <li>- respect for the contributions of others</li> </ul>
A7 describe the relationship between scientific principles and technology	<input type="checkbox"/> give examples of scientific principles that have resulted in the development of technologies (e.g., pressure—diving equipment, pumps, vacuum cleaners; optics—lasers, eyeglasses, headlights, mirrors) <input type="checkbox"/> identify a variety of technologies and explain how they have advanced our understanding of science (e.g. microscopes for observing cell structure)
A8 demonstrate competence in the use of technologies specific to investigative procedures and research	<input type="checkbox"/> select and carefully use appropriate technologies, including <ul style="list-style-type: none"> <li>- microscope</li> <li>- balances and other measurement tools (e.g., thermometers)</li> <li>- ray boxes, lenses, mirrors</li> </ul> <input type="checkbox"/> proficiently use the Internet as a research tool

**GRADE 8****KEY ELEMENTS: LIFE SCIENCE****Estimated Time: 20-25 hours**

By the end of the grade, students will have a basic understanding of the characteristics, needs, and interdependence of cells, tissues, organs, and organ systems.

***Vocabulary***

antibody, antigen, bacteria, cell wall, cell membrane, cells, circulatory system, chloroplast, cytoplasm, diffusion, digestive system, excretion, gas exchange, gastric juice, immune, metabolism, mitochondrion, mucus, nucleus, nutrients, organ, organ system, organelles, organisms, osmosis, pathogen, phagocytic white blood cells, reproduction, respiratory system, ribosome, tertiary defence system, tissue, toxins, vacuole, viruses, white blood cells

***Knowledge***

- characteristics of living things
- cell theory
- structure and function of cell organelles
- osmosis and diffusion
- relationship between cells, tissues, organs, and organ systems
- basics of various systems of the human body (i.e., respiratory, circulatory, digestive, and excretory)
- how organ systems work together to obtain and transport nutrients, remove wastes, and exchange gases
- pathogens and toxins
- immune system: primary, secondary, and tertiary defence systems

***Skills and Attitudes***

- use scalpels safely
- use a microscope
- demonstrate safe dissection techniques by doing an actual (or virtual) dissection
- create diagrams or models of cells and organ systems
- show respect for living things

## GRADE 8 LIFE SCIENCE: CELLS AND SYSTEMS

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<p>B1 demonstrate knowledge of the characteristics of living things</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify various characteristics of living things (e.g., require energy, respond to the environment, perform gas exchange, excrete waste, reproduce)</li> <li><input type="checkbox"/> relate characteristics of living things to viruses, bacteria, plants, and animals</li> </ul>
<p>B2 relate the main features and properties of cells to their functions</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> summarize cell theory (e.g., recognize that all living things are composed of cells, and all cells come from pre-existing cells)</li> <li><input type="checkbox"/> accurately list similarities and differences between cell types (plant, animal, and bacteria)</li> <li><input type="checkbox"/> describe the structure and function of cell organelles (e.g., cell membrane, nucleus, cytoplasm, mitochondrion, cell wall, chloroplast, vacuole, ribosome)</li> <li><input type="checkbox"/> recognize and name parts of a cell using a microscope</li> <li><input type="checkbox"/> relate the concepts of osmosis and diffusion to transport of materials across cell membranes</li> </ul>
<p>B3 explain the relationship between cells, tissues, organs, and organ systems</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> define the terms <i>tissue</i>, <i>organ</i>, and <i>organ system</i></li> <li><input type="checkbox"/> distinguish between cells, tissues, organs, and organ systems, based on structure and function</li> <li><input type="checkbox"/> identify the main components of the human organ systems (e.g., respiratory, circulatory, digestive, and excretory systems)</li> <li><input type="checkbox"/> describe how organ systems work together to obtain and transport nutrients, remove wastes, and exchange gases</li> </ul>
<p>B4 explain the functioning of the immune system, and the roles of the primary, secondary, and tertiary defence systems</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify components of the primary defence systems, including skin, tears, ear wax, saliva, gastric juice, cilia, mucus</li> <li><input type="checkbox"/> identify phagocytic white blood cells as the major component of the secondary defence system</li> <li><input type="checkbox"/> identify white blood cells that produce antibodies as the major component of the tertiary defence system</li> <li><input type="checkbox"/> describe how each of the defence system components works (e.g., skin prevents bacteria from entering the body, phagocytic white blood cells engulf and destroy viruses and bacteria, and white blood cells produce antibodies that combine with antigens)</li> <li><input type="checkbox"/> describe factors that can have a negative effect on body systems, including pathogens (e.g., <i>E. coli</i>, influenza viruses, HIV) and toxins (e.g., botulism)</li> </ul>

## GRADE 8

## KEY ELEMENTS: PHYSICAL SCIENCE

Estimated Time: 40-48 hours

By the end of the grade, students will have a basic understanding of forces and the properties of waves, light, and fluids.

*Optics* (estimated time: 20-24 hours)

*Vocabulary*

amplitude, angle of incidence, angle of reflection, angle of refraction, blind spot, concave, converging, convex, cornea, crest, diverging, electromagnetic radiation, energy, focal point, frequency, gamma rays, infrared, iris, lens, microwaves, normal, opaque, optic nerve, pupil, radio waves, refraction, retina, sclera, spectrum, translucent, transparent, trough, visible light, ultraviolet, wave, wavelength, X-rays

*Knowledge*

- waves: reflection, refraction, and energy transfer
- light: properties, transmission, reflection, absorption, refraction
- electromagnetic spectrum
- types and applications of electromagnetic radiation
- parts of the eye
- cornea-lens-retina system
- human vision and optical systems

*Skills and Attitudes*

- use dissection equipment safely
- use a ray box
- use a microscope
- use mirrors and lenses
- show respect for living things

**KEY ELEMENTS: PHYSICAL SCIENCE**

*Fluids and Dynamics* (estimated time: 20-24 hours)

***Vocabulary***

area, compression, condensation, convection, density, evaporation, expansion, force, friction, gravitation, hydraulic, magnetic, mass, melting, pneumatic, pressure, solidification, sublimation, volume, weight

***Knowledge***

- types of forces
- pairs of objects that apply forces on each other
- relationship between mass and weight
- balanced and unbalanced forces on a single object
- kinetic molecular theory
- solids, liquids, and gases
- changes of state
- mass, volume, and density
- relationship between pressure, temperature, heat (energy transferred due to a temperature difference), force, and area in fluids
- nature of fluids
- natural and constructed fluid systems (hydraulic and pneumatic)

***Skills and Attitudes***

- use balances, graduated cylinders, thermometers, spring scales
- demonstrate appropriate behaviour with syringes
- calculate density

## GRADE 8 PHYSICAL SCIENCE: OPTICS

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<p>C1 demonstrate knowledge of the behaviour of waves</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> define <i>waves</i> and describe their characteristics, using examples and sketches</li> <li><input type="checkbox"/> demonstrate wavelength, frequency, and amplitude, with corresponding explanations</li> <li><input type="checkbox"/> describe how waves are reflected off a barrier and refracted when passing from one medium to another</li> </ul>
<p>C2 explain the properties of visible light</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> connect the behaviour of waves to visible light (e.g., both waves and light reflect and refract)</li> <li><input type="checkbox"/> identify and describe properties of visible light (e.g., prism to demonstrate spectrum of colour, pinhole camera to demonstrate how light travels in a straight line)</li> <li><input type="checkbox"/> show how light is transmitted and absorbed by different materials (e.g., opaque, translucent, transparent; creation of shadows)</li> <li><input type="checkbox"/> demonstrate how visible light is reflected (e.g., relate angle of incidence and angle of reflection for curved and plane mirrors)</li> <li><input type="checkbox"/> demonstrate how visible light is refracted (e.g., bending of rays, changes of speed, diverging and converging lenses)</li> </ul>
<p>C3 compare visible light to other types of electromagnetic radiation</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> differentiate radio waves, microwaves, infrared, visible light, ultraviolet, X-rays, and gamma rays in terms of wavelength, frequency, and energy transferred</li> <li><input type="checkbox"/> relate different types of electromagnetic radiation to their daily lives</li> </ul>
<p>C4 explain how human vision works</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> illustrate the parts of the eye, including sclera, cornea, retina, lens, optic nerve and blind spot, iris, and pupil</li> <li><input type="checkbox"/> describe the cornea-lens-retina system</li> <li><input type="checkbox"/> describe common defects in human vision (e.g., near-sighted, far-sighted)</li> <li><input type="checkbox"/> describe several ways of correcting or extending human vision (e.g., contact lenses, laser surgery, binoculars)</li> <li><input type="checkbox"/> identify similarities and differences between the eye and another optical system (e.g., microscopes, telescopes)</li> </ul>

## GRADE 8 PHYSICAL SCIENCE: FLUIDS AND DYNAMICS

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<p>C5 explain the concept of force</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> define <i>force</i> (push or pull of one object on another)</li> <li><input type="checkbox"/> list different types of forces (e.g., magnetic, friction, gravitational, elastic, electrical)</li> <li><input type="checkbox"/> differentiate between mass and weight</li> <li><input type="checkbox"/> describe the movement of objects in terms of balanced and unbalanced forces</li> </ul>
<p>C6 describe the relationship between solids, liquids, and gases, using the kinetic molecular theory</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> outline the kinetic molecular theory</li> <li><input type="checkbox"/> distinguish between solids, liquids, and gases based on particle arrangement and motion</li> <li><input type="checkbox"/> define terms related to changes of state (e.g., temperature, heat, evaporation, condensation, solidification, melting, sublimation)</li> </ul>
<p>C7 determine the density of various substances</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> for a fixed mass and temperature, describe the differences between volume and density for each of the states of matter</li> <li><input type="checkbox"/> describe the effects of changes in temperature on the density of solids, liquids, and gases (e.g., compression and expansion)</li> <li><input type="checkbox"/> conduct experiments to calculate the density of regularly shaped objects [<math>D = m/V</math>] and irregularly shaped objects [<math>D = m/(V_2 - V_1)</math>]</li> </ul>
<p>C8 explain the relationship between pressure, temperature, area, and force in fluids</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> explain pressure with reference to force and area (i.e., compression and expansion)</li> <li><input type="checkbox"/> describe the relationship between temperature, area, and pressure, with reference to the kinetic molecular theory</li> </ul>
<p>C9 recognize similarities between natural and constructed fluid systems (e.g., hydraulic, pneumatic)</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> give examples of natural fluid systems (e.g., circulatory and respiratory system) and constructed fluid systems (e.g., hydraulic and air brakes)</li> <li><input type="checkbox"/> recognize the scientific principles involved in fluid systems (e.g., fluids can be compressed and flow; pressure differences can cause movement)</li> <li><input type="checkbox"/> identify possible problems in natural or constructed fluid systems (e.g., high/low blood pressure)</li> </ul>

**GRADE 8****KEY ELEMENTS: EARTH AND SPACE SCIENCE**

**Estimated Time: 20-22 hours**

By the end of this grade, students will have understood the properties of water and its effect on the biosphere and surface of the Earth.

*Vocabulary*

arêtes, climate, convection, crevasse, density, deposition, erosion, erratics, eskers, fiord, freezing point, glaciers, gravity, ground water, hanging valley, horns, hydrologist, iceberg, landslide, melting, moraines, ocean current, outwash, salinity, striations, tectonic processes, tsunami, turbidity currents, weathering (chemical, biological, physical)

*Knowledge*

- sources of fresh water
- properties of salt water and fresh water
- effect of ocean currents and winds on regional climates
- effect of water and ice on surface features
- weathering and erosion
- evidence and effects of glaciation
- impact of waves, tides, and water flow on surface features
- productivity and species distribution in aquatic environments
- diversity of aquatic life forms

*Skills and Attitudes*

- use the Internet for research
- use given criteria for evaluating evidence and sources of information (e.g., identify supporting or refuting information and bias)
- relate cause to effect
- assess human impact
- show respect and sensitivity for the environment

## GRADE 8 EARTH AND SPACE SCIENCE: WATER SYSTEMS ON EARTH

PRESCRIBED LEARNING OUTCOMES	SUGGESTED ACHIEVEMENT INDICATORS
<p><i>It is expected that students will:</i></p>	<p><i>The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.</i></p> <p><i>Students who have fully met the prescribed learning outcome are able to:</i></p>
<p>D1 explain the significance of salinity and temperature in the world's oceans</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> describe the world distribution of water (97.2% ocean, 2.8% fresh, 2.15% ice, 0.61% groundwater, 0.01 lakes and rivers, 0.001% atmosphere)</li> <li><input type="checkbox"/> identify similarities and differences between salt water and fresh water (e.g., freezing point, density)</li> <li><input type="checkbox"/> define <i>ocean currents</i></li> <li><input type="checkbox"/> describe how winds and ocean currents influence regional climates (e.g., moderating effects)</li> </ul>
<p>D2 describe how water and ice shape the landscape</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> define weathering and erosion</li> <li><input type="checkbox"/> describe how gravity directs the movement of water and ice and transports weathered materials through slow processes (rivers and glaciers) and fast processes (landslides)</li> <li><input type="checkbox"/> identify and illustrate various alpine and continental glacial features (e.g., cirques, arêtes, horns, hanging valleys, crevasses, moraines, eskers, outwash, fiords, icebergs, striations, erratics)</li> <li><input type="checkbox"/> describe how waves and tides are generated (e.g., waves: wind action; tsunamis: tectonic processes; tides: gravitational pull)</li> <li><input type="checkbox"/> describe the impact of water movement (e.g., waves, tides, river flow) on surface features (e.g., weathering, erosion, deposition)</li> </ul>
<p>D3 describe factors that affect productivity and species distribution in aquatic environments</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> identify various factors that affect productivity and species distribution in aquatic environments (e.g., temperature, nutrients in the water, turbidity, currents, sunlight, salinity, pollutants, water depth, resource extraction, dams)</li> <li><input type="checkbox"/> describe how changes in aquatic environments are monitored (e.g., through the use of satellite imagery)</li> <li><input type="checkbox"/> relate human activities to the distribution of aquatic species, with specific reference to First Nations peoples in BC (e.g., harvesting technologies, preservation techniques, use of resource)</li> </ul>