SCIENCE 12: Specialized Science (4 credits)

Description

The curriculum for Specialized Science 12 is designed to provide flexibility for teachers and students while ensuring that the rigorous provincial curriculum standards are met. Based on your students' interests, your strengths, and your department's course offerings, you may combine Big Ideas and Content, and add Elaborations to the Curricular Competencies to construct the curriculum for your course.

The following pages provide a description of how to construct a Specialized Science 12 curriculum for your classroom.

1. Review Tables A and B to combine Big Ideas, Curricular Competencies, and Content to tailor the Specialized Science 12 curriculum for you and your students.
2. You may want to use or adapt Example 1 or 2 below for your use as the curriculum for Specialized Science 12. Teachers on the curriculum development team created these examples to illustrate the flexibility of the curriculum.

Table A: Big Ideas

- Select the Big Ideas that best suit the course you are offering. Note that the Big Ideas below are adapted from Grades 11 and 12 courses and the course name is identified in parentheses after each Big Idea. (**Note:** You may want to refer to other Science curricula for other Big Ideas that reflect your intent.)
- Identify, adapt, or create Big Ideas, if desired, after you have reviewed and selected the Content topics for your course (see Table B).
- The course should integrate a minimum of three Big Ideas from at least two different areas of science – biology, chemistry, physics, and earth, space and environmental sciences – for specialized science learning.

Biodiversity is dependent on the complex interactions and processes between biotic and abiotic factors. (adapted from Environmental Science 11)	Climate change impacts biodiversity and ecosystem health. (adapted from Environmental Science 12)	All members of a species have common characteristics that evolve over time. (adapted from Life Sciences 11)	Our evolving understanding of genetics has implications for health, society, and environment. (adapted from Anatomy and Physiology 12)	Chemical reactions are due to energy changes that result from the breaking and re-formation of bonds. (adapted from Chemistry 11)
Changes in equilibrium drive chemical processes. (adapted from Chemistry 12)	Energy is always conserved. (adapted from Physics 11)	Forces interact within fields and cause linear and circular motions. (adapted from Physics 12)	Geologic materials can change as they cycle through the geosphere and can be used as resources. (adapted from Earth Sciences 11)	Rock layers and the fossil record reflect geologic changes through time. (adapted from Geology 12)

Table B: Curricular Competencies and Content

- Review the Curricular Competencies. Note that the Curricular Competencies remain the same regardless of the Content selected.
- Add Elaborations to link the Curricular Competencies to the Big Ideas that you selected for your curriculum. You may want to refer to Grade 11 or 12 Science curricula for Elaboration ideas.
- Select at least three topics from the Content column.

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following: **Questioning and predicting** • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest • Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world • Formulate multiple hypotheses and predict multiple outcomes **Planning and conducting** • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods • Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data • Apply the concepts of accuracy and precision to experimental procedures and data: – significant figures – uncertainty – scientific notation	*Students are expected to know:* • **at least three** of the following: – related Content from Anatomy and Physiology 12 – related Content from Chemistry 11 – related Content from Chemistry 12 – related Content from Earth Sciences 11 – related Content from Environmental Science 11 – related Content from Environmental Science 12 – related Content from Geology 12 – related Content from Life Sciences 11 – related Content from Physics 11 – related Content from Physics 12 – related Content from Science for Citizens 11 • any additional content not covered by the above

Learning Standards (continued)

Curricular Competencies	Content
Processing and analyzing data and information • Experience and interpret the local environment • Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies • Construct, analyze, and interpret graphs, models, and/or diagrams • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Analyze cause-and-effect relationships **Evaluating** • Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions • Describe specific ways to improve their investigation methods and the quality of their data • Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled • Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources • Consider the changes in knowledge over time as tools and technologies have developed • Connect scientific explorations to careers in science • Exercise a healthy, informed skepticism, and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources	

Learning Standards (continued)

Curricular Competencies	Content
• Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems • Assess risks in the context of personal safety and social responsibility **Applying and innovating** • Contribute to care for self, others, community, and world through individual or collaborative approaches • Co-operatively design projects with local and/or global connections and applications • Contribute to finding solutions to problems at a local and/or global level through inquiry • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations • Consider the role of scientists in innovation **Communicating** • Formulate physical or mental theoretical models to describe a phenomenon • 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 • Express and reflect on a variety of experiences, perspectives, and worldviews through place	

BIG IDEAS

Elements and compounds have specific properties.	An object's motion can be predicted, analyzed, and described.	Forces interact within fields and cause linear and circular motion.	Astronomy seeks to explain the origin of the universe and interactions of celestial bodies.

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following: **Questioning and predicting** • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest • Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world • Formulate multiple hypotheses and predict multiple outcomes **Planning and conducting** • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods • Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data • Apply the concepts of accuracy and precision to experimental procedures and data: – significant figures – uncertainty – scientific notation	*Students are expected to know the following:* • model of the atom • atomic spectra • periodic table • translational and rotational equilibrium • apparent weight • gravitational field and Newton's law of universal gravitation • gravitational potential energy • orbital and celestial mechanics: – uniform circular motion – gravitational dynamics and energy relationships – Newton's laws of motion – Kepler's laws of planetary motion • conservation of energy and momentum • applications of relativity • formation of the universe • astronomical objects – solar system (the sun, planets, moons, asteroids, comets) – outside the solar system (stars, stellar groups, planets, galaxies, nebulae) – interstellar medium, interstellar radiation field

Learning Standards (continued)

Curricular Competencies	Content
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Learning Standards (continued)

Curricular Competencies	Content
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Example 2: SCIENCE — Specialized Science (Fisheries) (Environmental Science, Chemistry, Anatomy and Physiology, Life Sciences, Topics in Fisheries) Grade 12

BIG IDEAS

Biodiversity is dependent on the complex interactions and processes between biotic and abiotic factors.	Human activities have implications in the local and global environments.	Elements and compounds have specific properties.	Organ systems work together to maintain homeostasis.	Health of aquatic ecosystems is critical to sustainable fisheries.

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following: **Questioning and predicting** • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest • Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world • Formulate multiple hypotheses and predict multiple outcomes **Planning and conducting** • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods • Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data • Apply the concepts of accuracy and precision to experimental procedures and data: – significant figures – uncertainty – scientific notation	*Students are expected to know the following:* • species and ecological roles • taxonomic principles for classifying organisms • aquatic ecosystem functions and services • organic compounds • chemical analysis techniques • shifts in equilibrium driving chemical processes • the body's internal regulation • organ systems of fish and other aquatic species • human impact on local and global ecosystems • First Peoples concepts of interconnectedness with land and place • Traditional Ecological Knowledge (TEK) • fisheries and aquatic resource management • sustainable resource practices • restoration and stewardship practices in local and global environments

Learning Standards (continued)

Curricular Competencies	Content
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Learning Standards (continued)

Curricular Competencies	Content
• Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems • Assess risks in the context of personal safety and social responsibility **Applying and innovating** • Contribute to care for self, others, community, and world through individual or collaborative approaches • Co-operatively design projects with local and/or global connections and applications • Contribute to finding solutions to problems at a local and/or global level through inquiry • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations • Consider the role of scientists in innovation **Communicating** • Formulate physical or mental theoretical models to describe a phenomenon • 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 • Express and reflect on a variety of experiences, perspectives, and worldviews through place	

