

Grade 9 Science: Year at a Glance

Overview

Grade 9 Science Unit A builds on ideas from Grade 7 Science, Unit A: Interactions and Ecosystem and prepares students for Science 20, Unit B: Changes in Living Systems. The year opens with Biological Diversity, where students look at how species vary, how reproduction and genetics pass on characteristics, and how human activity affects the range of life in an environment. In Matter and Chemical Change, students investigate the properties of materials in the lab, learn WHMIS and safety practices, and are introduced to the periodic table, atoms and molecules, chemical nomenclature and how to represent chemical reactions. In Environmental Chemistry, students study the chemicals that make up local and global environments, learn about acids, bases, nutrients and toxicity, and investigate how the concentration and distribution of substances affect living things. In Electrical Principles and Technologies, students explore how scientific understanding and technology develop side by side, with students using a problem-solving approach to create and modify circuits and evaluate technologies by comparing alternative designs. In Space Exploration, students examine the technologies used to observe and travel in space, learn about satellites and orbits, the composition of bodies in space, and life-support and communication technologies, and see how space technologies bring benefits on Earth.

The year at a glance

Grade 9

Unit	General outcomes	Specific outcomes
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Unit A: Biological Diversity (Social and Environmental Emphasis) Overview: Biological diversity is reflected in the range of species found in local and global environments and by subtle variations in characteristics found within individual species.	Outcomes for Science, Technology and Society (STS) and Knowledge; Attitude Outcomes; Skill Outcomes	Students will: Investigate and describe the diversity of species in local and global environments - identify and describe the characteristics of a variety of organisms; and classify organisms on the basis of observable characteristics (see the curriculum); Students will: Investigate and describe the role of sexual and asexual reproduction and inheritance in passing on characteristics - identify and describe examples of sexual and asexual reproduction in plants and animals; and describe how characteristics are passed on from parents to offspring (see the curriculum); Students will: Investigate and describe the impact of human activity on biological diversity - identify and describe ways in which human activity affects the range of life in an environment; and propose ways to maintain or restore biological diversity (see the curriculum); Scientific Inquiry Students will be encouraged to: - Seek and apply evidence when evaluating alternative approaches to investigations, problems and issues *(e.g., consider observations and ideas from a number of sources during... (see the curriculum); Interest in Science Students will be encouraged to: - Show interest in science-related questions and issues, and confidently pursue personal interests and career possibilities within science-related fields *(e.g., actively participate in... (see the curriculum); Safety Students will be encouraged to: - Show concern for safety in planning, carrying out and reviewing activities *(e.g., take the time to organize their work area so that accidents can be prevented; read the labels on materials before... (see the curriculum); Collaboration Students will be encouraged to: - Work collaboratively in carrying out investigations and in generating and evaluating ideas *(e.g., assume responsibility for their share of work in preparing for investigations and in... (see the curriculum); Stewardship Students will be encouraged to: - Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment *(e.g., show respect for
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all forms of life; modify their behaviour... (see the curriculum); Mutual Respect Students will be encouraged to: - Appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds *(e.g., consider more than one perspective when... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Analyzing and Interpreting Students will: Analyze qualitative and quantitative data, and develop and assess possible explanations... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Initiating and Planning Students will: Ask questions about the relationships between and among observable variables, and plan... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Performing and Recording Students will: Conduct investigations into the relationships between and among observations, and gather... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Communication and Teamwork Students will: Work collaboratively on problems; and use appropriate language and formats to... (see the curriculum)

Unit B: Matter and Chemical Change (Nature of Science Emphasis) Overview: Different materials have different properties.	Skill Outcomes; Outcomes for Science, Technology and Society (STS) and Knowledge; Attitude Outcomes	Skill Outcomes (focus on scientific inquiry) Initiating and Planning Students will: Ask questions about the relationships between and among observable variables, and plan investigations to address those questions • identify questions to... (see the curriculum); Skill Outcomes (focus on scientific inquiry) Analyzing and Interpreting Students will: Analyze qualitative and quantitative data, and develop and assess possible explanations • compile and display data, by hand or computer, in a variety of... (see the curriculum); Skill Outcomes (focus on scientific inquiry) Communication and Teamwork Students will: Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results - receive, understand and... (see the curriculum); Skill Outcomes (focus on scientific inquiry) Performing and Recording Students will: Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data - carry out... (see the curriculum); Students will: Describe ideas used in interpreting the chemical nature of matter, both in the past and present, and identify example evidence that has contributed to the development of these ideas - demonstrate understanding of the... (see the curriculum); Students will: Investigate materials, and describe them in terms of their physical and chemical properties - investigate and describe properties of materials *(e.g., investigate and describe the melting point, solubility and conductivity... (see the curriculum); Students will: Apply simplified chemical nomenclature in describing elements, compounds and chemical reactions - read and interpret chemical formulas for compounds of two elements, and give the IUPAC (International Union of Pure and... (see the curriculum); Students will: Describe and interpret patterns in chemical reactions - identify and evaluate dangers of caustic materials and potentially explosive reactions - observe and describe evidence of chemical change in reactions between... (see the curriculum); Stewardship Students will be encouraged to: -
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Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment *(e.g., recognize that the materials people develop may have... (see the curriculum); Scientific Inquiry Students will be encouraged to: - Seek and apply evidence when evaluating alternative approaches to investigations, problems and issues *(e.g., seek data that is accurate and based on appropriate methods of... (see the curriculum); Interest in Science Students will be encouraged to: - Show interest in science-related questions and issues, and confidently pursue personal interests and career possibilities within science-related fields *(e.g., express a degree of... (see the curriculum); Collaboration Students will be encouraged to: - Work collaboratively in carrying out investigations and in generating and evaluating ideas *(e.g., demonstrate interest and become involved in decision making that requires full-group... (see the curriculum); Mutual Respect Students will be encouraged to: - Appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds *(e.g., show an interest in the contributions that... (see the curriculum); Safety Students will be encouraged to: - Show concern for safety in planning, carrying out and reviewing activities *(e.g., read the labels of materials before using them, and ask for help if safety symbols are not clear or understood;... (see the curriculum)

Unit C: Environmental Chemistry (Social and Environmental Emphasis) Overview: Environments are often viewed from a physical and biological perspective, but to fully understand how they function, it is important to view them from a chemical perspective as well.	Outcomes for Science, Technology and Society (STS) and Knowledge; Attitude Outcomes; Skill Outcomes	Students will: Analyze and evaluate mechanisms affecting the distribution of potentially harmful substances within an environment - describe mechanisms for the transfer of materials through air, water and soil; and identify factors that... (see the curriculum); Students will: Identify processes for measuring the quantity of different substances in the environment and for monitoring air and water quality - identify substrates and nutrient sources for living things within a variety of... (see the curriculum); Students will: Investigate and describe, in general terms, the role of different substances in the environment in supporting or harming humans and other living things - identify common organic and inorganic substances that are essential... (see the curriculum); Scientific Inquiry Students will be encouraged to: - Seek and apply evidence when evaluating alternative approaches to investigations, problems and issues *(e.g., consider observations and ideas from a number of sources during... (see the curriculum); Interest in Science Students will be encouraged to: - Show interest in science-related questions and issues, and confidently pursue personal interests and career possibilities within science-related fields *(e.g., actively participate in... (see the curriculum); Safety Students will be encouraged to: - Show concern for safety in planning, carrying out and reviewing activities *(e.g., take the time to organize their work area so that accidents can be prevented; read the labels on materials before... (see the curriculum); Collaboration Students will be encouraged to: - Work collaboratively in carrying out investigations and in generating and evaluating ideas *(e.g., assume responsibility for their share of work in preparing for investigations and in... (see the curriculum); Stewardship Students will be encouraged to: - Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment *(e.g., show respect for all forms of life; modify their behaviour... (see the curriculum); Mutual Respect Students will be
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encouraged to: - Appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds *(e.g., consider more than one perspective when... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Analyzing and Interpreting Students will: Analyze qualitative and quantitative data, and develop and assess possible explanations... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Initiating and Planning Students will: Ask questions about the relationships between and among observable variables, and plan... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Performing and Recording Students will: Conduct investigations into the relationships between and among observations, and gather... (see the curriculum); Skill Outcomes (focus on the use of research and inquiry skills to inform the decision-making process) Communication and Teamwork Students will: Work collaboratively on problems; and use appropriate language and formats to... (see the curriculum)

Unit D: Electrical Principles and Technologies (Science and Technology Emphasis) Overview: Electricity provides the means to energize many devices, systems and processes that are part of our technological environment.	Outcomes for Science, Technology and Society (STS) and Knowledge; Skill Outcomes; Attitude Outcomes	Students will: Identify and estimate energy inputs and outputs for example devices and systems, and evaluate the efficiency of energy conversions • identify the forms of energy inputs and outputs in a device or system • apply appropriate... (see the curriculum); Students will: Describe technologies for transfer and control of electrical energy - assess the potential danger of electrical devices, by referring to the voltage and current rating (amperage) of the devices; and distinguish between... (see the curriculum); Students will: Describe and discuss the societal and environmental implications of the use of electrical energy - identify and evaluate sources of electrical energy, including oil, gas, coal, biomass, wind and solar *(e.g., identify and... (see the curriculum); Students will: Investigate and interpret the use of devices to convert various forms of energy to electrical energy and electrical energy to other forms of energy - identify, describe and interpret examples of mechanical, chemical,... (see the curriculum); Skill Outcomes (focus on problem solving) Performing and Recording Students will: Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data - use tools and... (see the curriculum); Skill Outcomes (focus on problem solving) Communication and Teamwork Students will: Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results - work cooperatively with... (see the curriculum); Skill Outcomes (focus on problem solving) Initiating and Planning Students will: Ask questions about the relationships between and among observable variables, and plan investigations to address those questions • propose alternative... (see the curriculum); Skill Outcomes (focus on problem solving) Analyzing and Interpreting Students will: Analyze qualitative and quantitative data, and develop and assess possible explanations - test the design of a constructed device or system -... (see the curriculum); Scientific Inquiry Students will be encouraged to: - Seek and apply
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evidence when evaluating alternative approaches to investigations, problems and issues *(e.g., strive to assess a problem or situation accurately, by careful analysis of... (see the curriculum); Collaboration Students will be encouraged to: - Work collaboratively in carrying out investigations and in generating and evaluating ideas *(e.g., demonstrate interest and become involved in decision making that requires full-group... (see the curriculum); Safety Students will be encouraged to: Show concern for safety in planning, carrying out and reviewing activities (e.g., select safe methods in using electrical devices; readily alter a procedure to ensure the safety of members of the... (see the curriculum); Stewardship Students will be encouraged to: - Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment *(e.g., objectively identify potential conflicts between responding... (see the curriculum)

Unit E: Space Exploration (Science and Technology Emphasis) Overview: Technologies have played an essential role in the study of space and in the emerging use of space environments.	Outcomes for Science, Technology and Society (STS) and Knowledge; Attitude Outcomes; Skill Outcomes	Students will: Identify and describe technologies used to observe and study space - identify and describe examples of technologies used to observe and study space *(e.g., identify and describe the function of a telescope, space probe or satellite... (see the curriculum); Students will: Describe the composition and characteristics of bodies in space - identify and describe the characteristics of planets, moons, asteroids, comets and stars *(e.g., identify and describe the relative sizes, distances, temperatures and compositions... (see the curriculum); Students will: Investigate and describe technologies for life support and communication in space - identify and describe examples of technologies used to support human life in space *(e.g., identify and describe the function of space suits, life-support systems and communication technologies... (see the curriculum); Scientific Inquiry Students will be encouraged to: - Seek and apply evidence when evaluating alternative approaches to investigations, problems and issues *(e.g., consider how space exploration has contributed to scientific understanding and technological development... (see the curriculum); Collaboration Students will be encouraged to: - Work collaboratively in carrying out investigations and in generating and evaluating ideas *(e.g., work cooperatively with others to design and conduct investigations related to space exploration... (see the curriculum); Safety Students will be encouraged to: - Show concern for safety in planning, carrying out and reviewing activities *(e.g., follow safety procedures when using telescopes and other observation equipment... (see the curriculum); Stewardship Students will be encouraged to: - Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment *(e.g., consider the environmental and ethical implications of space exploration and resource use... (see the curriculum)
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Across the year

- Environmental Chemistry builds directly on the chemistry ideas introduced in Matter and Chemical Change, applying concepts such as acids, bases and chemical change to real environments and living things. [See the curriculum: 1, 2.](#)
- Data collection, graphing and rate-and-ratio work connect several units to Grade 8 and Grade 9 Mathematics, giving students a chance to use math skills inside science investigations. [See the curriculum: 1, 2, 3.](#)
- Matter and Chemical Change, Environmental Chemistry and Electrical Principles and Technologies each ask students to analyze data, look for discrepancies and explain their findings, building the same inquiry skills across different content. [See the curriculum: 1, 2, 3.](#)
- Electrical Principles and Technologies explores how scientific understanding and technology develop side by side, with students using a problem-solving approach to create and modify circuits and evaluate technologies by comparing alternative designs and considering their efficiency, effectiveness and environmental impact. [See the curriculum: 1, 2.](#)
- Stewardship shows up as a recurring attitude across units, asking students to weigh human needs against a sustainable environment whether they are studying chemical waste, electrical energy sources or environmental pollutants. [See the curriculum: 1, 2, 3.](#)