

SENIOR 1 CLUSTERS

Cluster 1: Reproduction

S1-1-01 Illustrate and explain the process of mitotic cell division in plants and animals. Include: chromosomes, mitosis, cytoplasmic division, cell cycle. GLO: D1, E1, E2	S1-1-11 Observe, collect, and analyze class data of single trait inheritance. <i>Examples: hand clasping, earlobe attachment, tongue rolling...</i> GLO: C2, D1
S1-1-02 Observe and explain the dynamic nature of cell division. GLO: C2, D1, E3	S1-1-12 Differentiate between dominant and recessive genes. Include: genotype, phenotype. GLO: D1, E1, E2
S1-1-03 Describe various types of asexual reproduction that occur in plant and animal species. <i>Examples: fission, budding, sporulation, vegetative propagation, regeneration...</i> GLO: D1, E1	S1-1-13 Describe the relationships among DNA, chromosomes, genes, and the expression of traits. Include: genetic similarity among all humans. GLO: A2, D1, E1, E2
S1-1-04 Investigate and describe agricultural applications of asexual reproduction. <i>Examples: cloning, cuttings, grafting, bulbs...</i> GLO: A5, B1, B2, D1	S1-1-14 Explain the inheritance of sex-linked traits in humans and use a pedigree to track the inheritance of a single trait. <i>Examples: colour blindness, hemophilia...</i> GLO: D1, E1, E2
S1-1-05 Illustrate and explain the production of male and female gametes by meiosis. GLO: D1, E1, E2	S1-1-15 Investigate and describe environmental factors and personal choices that may lead to a genetic mutation or changes in an organism's development. <i>Examples: fetal exposure to alcohol, overexposure to sunlight, toxins, hormone mimics, food additives, radiation...</i> GLO: B1, B3, D1, D2
S1-1-06 Compare and contrast the function of mitosis to that of meiosis. Include: diploid cells, haploid cells. GLO: D1, E1	S1-1-16 Investigate Canadian and international contributions to research and technological development in the field of genetics and reproduction. <i>Example: Human Genome Project...</i> GLO: A3, A4, B1, B2
S1-1-07 Compare sexual and asexual reproduction in terms of their advantages and disadvantages for plant and animal species. GLO: D1, E1	S1-1-17 Discuss current and potential applications and implications of biotechnologies including their effects upon personal and public decision making. Include: genetic engineering, genetic screening, cloning, DNA fingerprinting. GLO: B1, B2, C4, C8
S1-1-08 Investigate and explain adaptations of plant and animal species which enhance reproductive success. <i>Examples: appearance, behaviour, number of gametes or offspring, chemical cues...</i> GLO: D2, E1, E2	S1-1-18 Use the decision-making process to address a current biotechnology issue. GLO: C4, C6, C7, C8
S1-1-09 Describe the structure and function of the male and female human reproductive systems. Include: role of hormones. GLO: D1, E1, E2	
S1-1-10 Outline human development from conception through birth. Include: X and Y chromosomes, zygote, embryo, fetus. GLO: D1, E1, E2, E3	

Cluster 2: Atoms and Elements

S1-2-01 Describe how historical ideas and models furthered our understanding of the nature of matter. Include: Greek ideas, alchemy, Lavoisier. GLO: A1, A2, A4	S1-2-10 Interpret chemical formulas of elements and compounds in terms of the number of atoms of each element. <i>Examples: He, H₂, O₂, H₂O, CO₂, NH₃...</i> GLO: C2, D3
S1-2-02 Investigate the historical progression of the atomic model. Include: Dalton, Thompson, Rutherford, Bohr, quantum model. GLO: A1, A2, A4, D3	S1-2-11 Investigate properties of substances and explain the importance of knowing these properties. <i>Examples: usefulness, durability, safety...</i> GLO: A5, B2, D3, E1
S1-2-03 Define element and identify symbols of some common elements. Include: the first 18 elements and K, Ca, Fe, Ni, Cu, Zn, I, Ag, Sn, Au, W, Hg, Pb, U. GLO: C2, D3	S1-2-12 Differentiate between physical and chemical changes. GLO: D3, E1, E3
S1-2-04 Explain the atomic structure of an atom in terms of the number of protons, electrons, and neutrons and explain how these numbers define atomic number and atomic mass. GLO: D3, E2	S1-2-13 Experiment to determine indicators of chemical change. <i>Examples: colour change, production of heat and/or light, production of a gas or precipitate or new substance...</i> GLO: C2, D3, E3
S1-2-05 Assemble or draw Bohr atomic models for the first 18 elements and group them according to the number of outer shell electrons. GLO: A2, C2, D3	S1-2-14 Investigate technologies and natural phenomena that demonstrate chemical change in everyday situations. <i>Examples: photography, rusting, photosynthesis, combustion, baking...</i> GLO: A3, A5, B1, B2
S1-2-06 Investigate the development of the periodic table as a method of organizing elements. Include: periods, families (groups). GLO: A2, A4, B2, E1	
S1-2-07 Investigate the characteristic properties of metals, non-metals, and metalloids and classify elements according to these properties. <i>Examples: ductility, conductivity of heat and electricity, lustre, reactivity...</i> GLO: D3, E1	
S1-2-08 Relate the reactivity and stability of different families of elements to their atomic structure. Include: alkali metals, alkaline earths, chalcogens, halogens, noble gases. GLO: D3, D4, E1, E3	
S1-2-09 Compare elements to compounds. Include: atoms, molecules. GLO: D3, E1, E2	

Cluster 3: Nature of Electricity

S1-3-01 Demonstrate evidence for the existence of two types of charge. GLO: A1, C2, C5	S1-3-13 Construct electric circuits using schematic diagrams. Include: series, parallel. GLO: C3, D4, E4
S1-3-02 Discuss early models of electricity to support the premise that models in science change. Include: one-fluid model, two-fluid model, particle model. GLO: A1, A2, A5, C8	S1-3-14 Use appropriate instruments and units to measure voltage (electric potential difference), current, and resistance. GLO: C2, C3, D4
S1-3-03 Explain how a discrepant event can be used to evaluate the particle model of electricity. Include: the attraction of neutral objects to charged objects. GLO: A1, A2, A3, C8	S1-3-15 Compare and contrast voltage (electric potential difference) and current in series and parallel circuits. Include: cells, resistance. GLO: C3, D4
S1-3-04 Relate the particle model of electricity to atomic structure. GLO: A1, A2, D3	S1-3-16 Investigate and describe qualitatively the relationship among current, voltage (electric potential difference), and resistance in a simple electric circuit. GLO: C2, D4, E4
S1-3-05 Investigate and explain electrostatic phenomena using the particle model of electricity. Include: conservation of charge, conduction, grounding, attraction of a neutral insulator, induction. GLO: A2, D3, D4, E4	S1-3-17 Relate the energy dissipated in a circuit to the resistance, current, and brightness of bulbs. GLO: D4
S1-3-06 Investigate common electrostatic technologies and phenomena and describe measures which reduce dangers associated with electrostatics. <i>Examples: photocopying, static straps to reduce charge buildup, lightning, electrostatic spray-painting, electrostatic precipitator...</i> GLO: A5, B1, C1, D4	S1-3-18 Explain the parallel circuits, the components, and the safety aspects of household wiring. Include: switches, fuses, circuit breakers, outlets. GLO: A5, B1, B2, C1
S1-3-07 Construct one or more electrostatic apparatus and explain how they function using the particle model of electricity. Include: pie-plate electrophorus. GLO: A2, C3, D3, D4	S1-3-19 Explain safety considerations of some common household electrical appliances. <i>Examples: kettle, heater, toaster...</i> GLO: A5, B1, C1, D4
S1-3-08 Demonstrate and explain the like nature of electrostatics and current electricity. Include: discharge an electrophorus through a neon bulb. GLO: C3, D4, E4	S1-3-20 Define electrical power as energy per unit time, and solve related problems. Include: $P = \frac{E}{t}$. GLO: C2, C3, D4
S1-3-09 Define electric current as charge per unit time and solve related problems. Include: $I = \frac{Q}{t}$. GLO: C2, C3, D4	S1-3-21 Develop a formula for domestic power consumption costs, and solve related problems. Include: $\text{Cost} = \frac{\text{Power} \times \text{time} \times \text{unit price}}{\text{kWh}}$. GLO: B2, C2, C3, D4
S1-3-10 Define voltage (electric potential difference) as the energy per unit charge between two points along a conductor and solve related problems. Include: $V = \frac{E}{Q}$. GLO: C2, C3, D4	S1-3-22 Analyze the electrical energy consumption of a household appliance. Include: calculate consumption using Energuide labels, read hydro meter, interpret monthly hydro bill. GLO: B5, C4, C5, C8
S1-3-11 Identify the five sources of electrical energy and some associated technologies. Include: chemical, photo, thermo, electromagnetic, piezo. GLO: B1, D4, E4	S1-3-23 Recognize and explain the importance of incorporating principles of electrical energy conservation into the decision-making process. GLO: B2, B5, C4, C8
S1-3-12 Describe resistance in terms of the particle model of electricity. GLO: A2, D3, E2	S1-3-24 Use the decision-making process to address an issue associated with the generation and transmission of electricity in Manitoba. Include: hydroelectric power, sustainability. GLO: B2, B5, C4, C8

Cluster 4: Exploring the Universe

S1-4-01 Use a coordinate system to locate visible celestial objects, and construct an astrolabe to determine the position of these objects. Include: altitude, azimuth. GLO: C2, C3, D6	S1-4-07 Compare and contrast scientific and cultural perspectives on the origin and evolution of the universe. GLO: A1, A2, A4, D6
S1-4-02 Observe the motion of visible celestial objects and organize collected data. <i>Examples: graph sunrise and sunset data, track the position of the Moon and planets over time, maintain a log of changes in the night sky...</i> GLO: C2, C5, C6, D6	S1-4-08 Differentiate between the major components of the universe. Include: planets, moons, comets and asteroids, nebulae, stars, galaxies, black holes. GLO: D6, E1, E2
S1-4-03 Investigate how various cultures used knowledge of the position and motion of visible celestial objects for navigation. GLO: A4, B1, B2, D6	S1-4-09 Explain how various technologies have extended our ability to explore and understand space. <i>Examples: robotics, Canadarm, Hubble telescope, Lunar Rover, shuttle, space station, Sojourner Rover, Pathfinder and Galileo space probes...</i> GLO: A5, B1, B2, D6
S1-4-04 Compare and contrast historical perspectives on the relationship between Earth and space. Include: geocentric model, heliocentric model. GLO: A2, A4, B2, E2	S1-4-10 Investigate ways in which Canada participates in space research and in international space programs, and then use the decision-making process to address a related issue. <i>Examples: International Space Station, Canadarm...</i> GLO: A3, A4, B2, C4
S1-4-05 Explain the apparent motion of the Sun, stars, planets, and the Moon as seen from Earth. Include: daily rising and setting, seasonal constellations, retrograde motion. GLO: D4, D6, E2	S1-4-11 Evaluate the impact of space science and technologies in terms of their benefits and risks to humans. <i>Examples: search for extraterrestrial life and habitat, remote sensing, predictions of potentially catastrophic impacts, colonization of space by only a few countries...</i> GLO: A3, B1, B2, B5
S1-4-06 Differentiate between units of measure used for astronomical distances, and perform simple calculations using these units. Include: astronomical unit, light year. GLO: C2, D6	

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Scientific Inquiry	STSE Issues	Scientific Inquiry	STSE Issues	Scientific Inquiry	STSE Issues	Scientific Inquiry	STSE Issues
<p>S1-0-1a Propose questions that could be tested experimentally. GLO: C2 (ELA: S1: 3.1.2)</p> <p>S1-0-1b Select and justify various methods for finding the answers to specific questions. GLO: C2 (Math: S1: A-1)</p>	<p>S1-0-1c Identify STSE issues which could be addressed. GLO: C4</p> <p>S1-0-1d Identify stakeholders and initiate research related to an STSE issue. GLO: C4 (ELA: S1: 3.1.4, 4.4.1)</p>	<p>S1-0-2a Select and integrate information obtained from a variety of sources. Include: print, electronic, specialists, other resource people. GLO: C2, C4, C6 TFS: 1.3.2, 4.3.4 (ELA: S1: 3.1.4, 3.2.3; Math: S1-B-1, 2; TFS 2.2.1)</p> <p>S1-0-2b Evaluate the reliability, bias, and usefulness of information. GLO: C2, C4, C5, C8 TFS: 2.2.2, 4.3.4 (ELA: S1: 3.2.3, 3.3.3)</p> <p>S1-0-2c Summarize and record information in a variety of forms. Include: paraphrasing, quoting relevant facts and opinions, proper referencing of sources. GLO: C2, C4, C6 TFS: 2.3.1, 4.3.4 (ELA: S1: 3.3.2)</p>	<p>S1-0-2d Review effects of past decisions and various perspectives related to an STSE issue. Examples: government's, public, environmentalists', and First Nations' positions on hydroelectric development; religious, social, and medical views on genetic screening... GLO: B1, C4 TFS: 1.3.2, 4.3.4 (ELA: S1: 3.2.2)</p>	<p>S1-0-3a State a testable hypothesis or prediction based on background data or on observed events. GLO: C2</p> <p>S1-0-3b Identify probable mathematical relationships between variables. Examples: relationship between current and resistance... GLO: C2</p> <p>S1-0-3c Plan an investigation to answer a specific scientific question. Include: materials, variables, controls, methods, safety considerations. GLO: C1, C2</p>	<p>S1-0-3d Summarize relevant data and consolidate existing arguments and positions related to an STSE issue. GLO: C4 TFS: 2.3.1, 4.3.4 (ELA: S1: 1.2.1, 3.3.1, 3.3.2)</p> <p>S1-0-3e Determine criteria for the evaluation of an STSE decision. Examples: scientific merit; technological feasibility; social, cultural, economic, and political factors; safety; cost; sustainability... GLO: B5, C1, C3, C4</p> <p>S1-0-3f Formulate and develop options which could lead to an STSE decision. GLO: C4</p>	<p>S1-0-4a Carry out procedures that comprise a fair test. Include: controlling variables, repeating experiments to increase accuracy and reliability of results. GLO: C1, C2 TFS: 1.3.1</p> <p>S1-0-4b Demonstrate work habits that ensure personal safety, the safety of others, as well as consideration for the environment. Include: knowledge and use of relevant safety precautions, WHMIS regulations, emergency equipment. GLO: B3, B5, C1, C2</p> <p>S1-0-4c Interpret relevant WHMIS regulations. Include: symbols, labels, Material Safety Data Sheets (MSDS). GLO: C1, C2</p> <p>S1-0-4e Work cooperatively with group members to carry out a plan, and troubleshoot problems as they arise. GLO: C2, C4, C7 (ELA: S1: 3.1.3, 5.2.2)</p> <p>S1-0-4f Assume the responsibilities of various roles within a group and evaluate which roles are most appropriate for given tasks. GLO: C2, C4, C7 (ELA: S1: 5.2.2)</p>	<p>S1-0-4d Use various methods for anticipating the impacts of different options. Examples: test run, partial implementation, simulation, debate... GLO: C4, C5, C6, C7</p>

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Scientific Inquiry	STSE Issues	Scientific Inquiry	STSE Issues	Scientific Inquiry	STSE Issues
<p>S1-0-5a Select and use appropriate methods and tools for collecting data or information. GLO: C2 TFS: 1.3.1</p> <p>S1-0-5b Estimate and measure accurately using Système International (SI) and other standard units. Include: SI conversions. GLO: C2</p> <p>S1-0-5c Record, organize, and display data using an appropriate format. Include: labelled diagrams, graphs, multimedia. GLO: C2, C5 TFS: 1.3.1, 3.2.2 (ELA: S1: 4.1.1, 4.1.2)</p>	<p>S1-0-5d Evaluate, using pre-determined criteria, different STSE options leading to a possible decision. Include: scientific merit; technological feasibility; social, cultural, economic, and political factors; safety; cost; sustainability. GLO: B5, C1, C3, C4 TFS: 1.3.2, 3.2.3 (ELA: S1: 3.3.3)</p>	<p>S1-0-6a Interpret patterns and trends in data, and infer and explain relationships. GLO: C2, C5 TFS: 1.3.1, 3.3.1 (ELA: S1: 3.3.1)</p> <p>S1-0-6b Identify and suggest explanations for discrepancies in data. Examples: sources of error... GLO: C2 (ELA: S1: 3.3.3)</p> <p>S1-0-6c Evaluate the original plan for an investigation and suggest improvements. Examples: identify strengths and weaknesses of data collection methods used... GLO: C2, C5</p>	<p>S1-0-6d Adjust STSE options as required once their potential effects become evident. GLO: C3, C4, C5, C8</p>	<p>S1-0-7a Draw a conclusion that explains the results of an investigation. Include: cause and effect relationships, alternative explanations, supporting or rejecting the hypothesis or prediction. GLO: C2, C5, C8 (ELA: S1: 3.3.4)</p> <p>S1-0-7e Reflect on prior knowledge and experiences to develop new understanding. GLO: C2, C3, C4 (ELA: S1: 4.2.1)</p>	<p>S1-0-7b Select the best option and determine a course of action to implement an STSE decision. GLO: B5, C4</p> <p>S1-0-7c Implement an STSE decision and evaluate its effects. GLO: B5, C4, C5, C8</p> <p>S1-0-7d Reflect on the process used to arrive at or to implement an STSE decision, and suggest improvements. GLO: C4, C5 (ELA: S1: 5.2.4)</p>

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Scientific Inquiry	STSE Issues	Scientific Inquiry	STSE Issues
<p>S1-0-8a Distinguish between science and technology. Include: purpose, procedures, products. GLO: A3</p> <p>S1-0-8b Explain the importance of using precise language in science and technology. GLO: A2, A3, C2, C3 (ELA: S1: 4.4.2)</p> <p>S1-0-8c Describe examples of how scientific knowledge has evolved in light of new evidence, and the role of technology in this evolution. GLO: A2, A5</p> <p>S1-0-8d Describe examples of how technologies have evolved in response to changing needs and scientific advances. GLO: A5</p> <p>S1-0-8e Discuss how peoples of various cultures have contributed to the development of science and technology. GLO: A4, A5</p> <p>S1-0-8f Relate personal activities and possible career choices to specific science disciplines. GLO: B4</p> <p>S1-0-8g Discuss social and environmental effects of past scientific and technological endeavours. Include: major shifts in scientific world views, unintended consequences. GLO: B1</p>		<p>S1-0-9a Appreciate and respect that science and technology have evolved from different views held by women and men from a variety of societies and cultural backgrounds. GLO: A4</p> <p>S1-0-9b Express interest in a broad scope of science- and technology-related fields and issues. GLO: B4</p> <p>S1-0-9c Demonstrate confidence in their ability to carry out investigations in science and to address STSE issues. GLO: C2, C4, C5</p> <p>S1-0-9d Value skepticism, honesty, accuracy, precision, perseverance, and open-mindedness as scientific and technological habits of mind. GLO: C2, C3, C4, C5</p> <p>S1-0-9e Be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment. GLO: B5, C4</p> <p>S1-0-9f Demonstrate personal involvement and be proactive with respect to STSE issues. GLO: B5, C4</p>	