

Student Name: _____		Course Name: Grade 9 Science		
R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 1 Student will:				
▶ demonstrate a knowledge of WHMIS standards by using proper techniques for handling and disposing of lab materials (209-7)				
▶ compare earlier conceptions of the structure of matter with current conceptions (110 1) <ul style="list-style-type: none"> ▪ define matter 				
▶ investigate materials and describe them in terms of their physical properties and chemical properties (307-12) <ul style="list-style-type: none"> ▪ distinguish between physical and chemical properties ▪ list examples of physical and chemical properties. Physical <ul style="list-style-type: none"> i. colour ii. malleability iii. electrical conductivity iv. magnetism v. luster vi. density vii. melting/boiling points viii. texture Chemical <ul style="list-style-type: none"> i. combustibility ii. reactivity 				

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UNIT 1 Student will:				
▶ investigate materials and describe them in terms of their physical properties and chemical properties. (307-12)				
▶ state a prediction and a hypothesis based on background information or an observed pattern of events. (208-5)				
▶ compile and display data collected during an investigation of the physical and chemical properties of materials. (210-2)				
▶ organize data using a format that is appropriate to the task or experiment. (209-4)				
▶ state a conclusion based on experimental data and explain how evidence supports or refutes an initial idea. (210-11)				
▶ explain the importance of using the terms law and theory in science. (109-14) <ul style="list-style-type: none"> ▪ distinguish between a theory and a law. 				
▶ identify major changes in atomic theory up to and including the Bohr model. (110-3) <ul style="list-style-type: none"> ▪ describe the contribution of various individuals (scientists) to the development of current atomic theory. Include: <ol style="list-style-type: none"> i. Early Greeks (Empedocles, Democritus, Aristotle) ii. Dalton iii. Thomson iv. Rutherford v. Bohr 				
▶ describe Rutherford's experiment to test Thomson's atomic model as an example of how technologies have enhanced, promoted, or made possible scientific research in chemistry. (111-4) <ul style="list-style-type: none"> ▪ recognize that the atomic theory continues to be refined. 				

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UNIT 1 Student will:				
<ul style="list-style-type: none"> ▶ use models in describing the structure and components of atoms. (307-14) <ul style="list-style-type: none"> ▪ define atom ▪ distinguish among protons, neutrons, and electrons in terms of their: <ul style="list-style-type: none"> i. charge ii. relative mass iii. location in the atom 				
▶ provide examples to illustrate that scientific and technological activities related to atomic structure take place in a variety of individual and group settings. (112-8)				
<ul style="list-style-type: none"> ▶ explain the importance of using words that are scientifically appropriate. (109-13) <ul style="list-style-type: none"> ▪ define element 				

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UNIT 1 Student will:				
<ul style="list-style-type: none"> ▶ identify and write chemical symbols for common elements. Include: (307-16) <ul style="list-style-type: none"> i. Hydrogen ii. Sodium iii. Potassium iv. Magnesium v. Calcium vi. Iron vii. Nickel viii. Copper ix. Zinc x. Carbon xi. Nitrogen xii. Oxygen xiii. Neon xiv. Helium xv. Chlorine xvi. Silicon xvii. Silver xviii. Gold xix. Mercury xx. Lead 				

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UNIT 1 Student will:				
<ul style="list-style-type: none"> ▶ identify and write chemical symbols for common elements (continued) (307-16) <ul style="list-style-type: none"> ▪ recognize that elements are represented by an internationally agreed upon system of symbols. ▪ identify each element symbol as either an upper-case symbol or an upper-case letter followed by a lower case letter 				
<ul style="list-style-type: none"> ▶ describe and explain the role of collecting evidence, finding relationships, and proposing explanations in the development of the periodic table. (109-2) <ul style="list-style-type: none"> ▪ identify the Periodic Table as a listing of all known elements ▪ describe Mendeleev's contribution to the development of the modern periodic table. 				
<ul style="list-style-type: none"> ▶ describe and explain the role of collecting evidence, finding relationships, and proposing explanations in the development of the periodic table. (109-2) <ul style="list-style-type: none"> ▪ distinguish between atomic number and atomic mass. ▪ using atomic mass and atomic number for an element, determine its number of protons, electrons, and neutrons. 				

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UNIT 1 Student will:				
<ul style="list-style-type: none"> ▶ using the Periodic Table, develop an understanding that the elements are grouped on the basis of similar characteristics. Include: (210-1, 307-15) <ul style="list-style-type: none"> i. metals ii. non-metals iii. metalloids iv. alkali metals v. alkaline earth metals vi. halogens vii. noble gases viii. transition metals ▪ list properties of metals. Include: <ul style="list-style-type: none"> i. shiny ii. ductile and malleable iii. conduct electricity iv. conduct heat ▪ list properties of non-metal elements. Include: <ul style="list-style-type: none"> i. dull ii. non-ductile and non-malleable iii. do not conduct electricity iv. do not conduct heat well 				

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UNIT 1 Student will:				
<ul style="list-style-type: none"> ▶ using the Periodic Table, develop an understanding that the elements are grouped on the basis of similar characteristics. (continued) (210-1, 307-15) <ul style="list-style-type: none"> ▪ define period ▪ define family ▪ provide examples of common properties which a family of elements share. Include: <ul style="list-style-type: none"> i. noble gases ii. alkali metals iii. halogens iv. alkaline earths 				
<ul style="list-style-type: none"> ▶ use the periodic table to identify new questions and problems that arise from what was learned (210-1, 210-16) 				
<ul style="list-style-type: none"> ▶ identify examples of common elements, and compare their characteristics and atomic structure. (307-15) <ul style="list-style-type: none"> ▪ define energy level ▪ define valence energy level ▪ define valence electron ▪ draw Bohr-Rutherford diagrams for elements 1 to 18 ▪ identify the maximum number of electrons which exist in the first three energy levels 				
<ul style="list-style-type: none"> ▶ interpret patterns and trends, and explain relationships among variables (210-6) <ul style="list-style-type: none"> ▪ make comparisons of energy level diagrams for elements from the same family (group) 				

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UNIT 1 Student will:				
<p>► identify and write chemical formula of common compounds (307-16)</p> <ul style="list-style-type: none"> ▪ define compound. ▪ identify whether a simple compound is ionic or molecular (covalent). ▪ identify that a compound is represented by a combination of element symbols known as a chemical formula, which indicates the proportion in which the elements are present. ▪ list chemical formulas for some common chemical ionic compounds. Include: <ul style="list-style-type: none"> i. table salt or sodium chloride (NaCl) ii. calcium carbonate (CaCO₃) iii. sodium sulfite (Na₂SO₄) iv. sodium hydroxide (NaOH) ▪ name simple ionic compounds ▪ list chemical formulas for some common chemical molecular (covalent) compounds. Include: <ul style="list-style-type: none"> i. sucrose or table sugar (C₁₂H₂₂O₁₁) ii. carbon dioxide (CO₂) iii. methane (CH₄) iv. water (H₂O) ▪ name simple molecular (covalent) compounds. 				

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UNIT 1 Student will:				
<p>► describe changes in the properties of materials that result from some common chemical reactions. (307-13)</p> <ul style="list-style-type: none"> ▪ distinguish between physical and chemical changes ▪ recognize that chemical changes produce new substances (elements or compounds), but physical changes do not. ▪ list examples of physical and chemical changes. Include: <ul style="list-style-type: none"> Physical <ul style="list-style-type: none"> i. change of state ii. cutting iii. dissolving Chemical <ul style="list-style-type: none"> i. corrosion ii. fruit ripening iii. combustion ▪ list evidence that a chemical change may have occurred. Include: <ul style="list-style-type: none"> i. heat is produced or absorbed ii. a new color appears iii. a precipitate is formed iv. a gas is produced v. process is difficult to reverse <p>recognize that during a chemical change, elements are conserved but compounds are not</p>				

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UNIT 1 Student will:				
▶ use tools and apparatus safely. (209-6)				
▶ identify new questions about physical and chemical changes that arise from investigations. (210-16)				
▶ organize data using a format that is appropriate to the task or experiment. (209-4)				
▶ determine, where possible, if the change in a material or object is physical or chemical based on experimental data. (210-11)				
▶ provide examples where knowledge of chemistry has resulted in the development of commercial materials. (111-1)				
▶ explain how society's needs can lead to developments in chemistry. (112-3)				
▶ analyze the design of a technology and the way it functions on the basis of its impact on their daily lives. (113-4)				
▶ make informed decisions about applications of science and technology, taking into account environmental and social advantages and disadvantages. (113-9)				
UNIT 2 Student will:				
▶ recognize that the nucleus of a cell contains genetic information and determines cellular processes. (305-1) <ul style="list-style-type: none"> ▪ define traits ▪ define heredity ▪ explain the role of the nucleus and its contents in determining traits and controlling cell division. 				
▶ explain the importance of using the terms gene and chromosome properly. (109-14) <ul style="list-style-type: none"> ▪ define gene ▪ describe chromosomes as being composed of numerous genes. 				
▶ provide examples of how the knowledge of cellular functions has resulted in the development of technologies. (111-1)				

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UNIT 2 Student will:				
<ul style="list-style-type: none"> ▶ discuss factors that may lead to changes in a cell's genetic information. (305-5) <ul style="list-style-type: none"> ▪ define mutation ▪ define mutagen ▪ give examples of mutations caused by: <ul style="list-style-type: none"> i. nature ii. human activity 				
<ul style="list-style-type: none"> ▶ determine and graph the theoretical population growth rate of cells and interpolate and extrapolate the cell population from the graph. (210-2, 210-4, 210-9) 				
<ul style="list-style-type: none"> ▶ illustrate and describe the basic processes of cell division, including what happens to the cell membrane and the contents of the nucleus. (304-11) <ul style="list-style-type: none"> ▪ define mitosis ▪ state and briefly describe the four phases of mitosis followed by cytokinesis. Include: <ul style="list-style-type: none"> i. Prophase ii. Metaphase iii. Anaphase iv. Telophase 				
<ul style="list-style-type: none"> ▶ select and integrate information from various print and electronic sources to examine chromosomes. (209-5) <ul style="list-style-type: none"> ▪ observe, identify, and describe a cell nucleus undergoing division. ▪ observe, identify, and describe chromosomes in each stage of mitosis. 				

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UNIT 2 Student will:				
<ul style="list-style-type: none"> ▶ distinguish between sexual and asexual reproduction in representative organisms. (305-2) <ul style="list-style-type: none"> ▪ explain methods of asexual reproduction using an example. Include: <ul style="list-style-type: none"> i. binary fission ii. fragmentation iii. budding iv. vegetative reproduction v. spore formation 				
▶ use tools and apparatus safely and accurately to investigate the growth of yeast cells under positive and negative environmental conditions. (209-3, 209-6)				
▶ interpret trends in data, and infer and explain relationships among the variables. (210-6)				
▶ communicate the results of an investigation into yeast population growth. (211-2)				
▶ compare sexual and asexual reproduction in terms of their advantages and disadvantages. (305-3)				
<ul style="list-style-type: none"> ▶ illustrate and describe the basic process of cell division, including what happens to the cell membrane and the content of the nucleus. (304-11) <ul style="list-style-type: none"> ▪ state and briefly describe the eight phases of meiosis ▪ define diploid ▪ define haploid ▪ compare and contrast mitosis and meiosis. Include: <ul style="list-style-type: none"> i. types of cells ii. number of daughter cells produced iii. amount of genetic material in each daughter cell iv. their respective roles in asexual and sexual reproduction. 				

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UNIT 2 Student will:				
▶ organize data using a format that is appropriate to the task or experiment. (209-4)				
▶ compile and display data, by hand or computer, in a variety of formats, including diagrams, flow charts, tables, bar graphs, line graphs, and scatter plots. (210-2)				
▶ receive, understand, and act on the ideas of others. (211-1)				
▶ work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise. (211-3)				
▶ distinguish between sexual and asexual reproduction in representative organisms. (305-2) <ul style="list-style-type: none"> ▪ explain how various organisms reproduce sexually. Include: <ul style="list-style-type: none"> i. moss ii. flowering plant iii. insect <ul style="list-style-type: none"> a. incomplete metamorphosis b. complete metamorphosis ▪ compare and contrast complete and incomplete metamorphosis. 				
▶ compare sexual and asexual reproduction in terms of their advantages and disadvantages. (305-3) <ul style="list-style-type: none"> ▪ compare and contrast asexual and sexual reproduction ▪ compare the advantages and disadvantages of sexual and asexual reproduction. Include: <ul style="list-style-type: none"> i. amount of energy required ii. parental care iii. genetic variety in offspring 				

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UNIT 2 Student will:				
<ul style="list-style-type: none"> ▶ compare the structure and function of the human reproductive systems. (305-4) <ul style="list-style-type: none"> ▪ identify the major parts of the male reproductive system. Include: <ul style="list-style-type: none"> i. testes ii. scrotum iii. penis iv. vas deferens v. urethra ▪ identify the major parts of the female reproductive system. Include: <ul style="list-style-type: none"> i. vagina ii. cervix iii. uterus iv. oviduct v. ovary 				
<ul style="list-style-type: none"> ▶ describe the major stages of human development from conception to early infancy. Include: (304-12B) <ul style="list-style-type: none"> i. fertilization ii. first trimester iii. second trimester iv. third trimester 				

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UNIT 2 Student will:				
<ul style="list-style-type: none"> ▶ identify visible signs of pregnancy. Include: (304-12A) <ul style="list-style-type: none"> i. cessation of menstrual flow ii. widening of the hips iii. enlargement of the breasts iv. morning sickness v. weight gain vi. cravings 				
<ul style="list-style-type: none"> ▶ identify major shifts in scientific understanding of genetics. Include: (110-3) <ul style="list-style-type: none"> i. Mendel's experiments ii. Watson and Crick's double helix model of DNA iii. Human Genome Project iv. genetic engineering 				
<ul style="list-style-type: none"> ▶ provide examples of genetic conditions that cannot be cured using scientific and technological knowledge at the present time. Include: (113-10) <ul style="list-style-type: none"> i. Down's syndrome ii. Cystic Fibrosis iii. Allderdice syndrome 				
<ul style="list-style-type: none"> ▶ provide examples of how the knowledge of cellular functions has resulted in the development of technologies. (111-1) 				
<ul style="list-style-type: none"> ▶ provide examples of Canadian contributions to science and technology related to heredity and genetic engineering. (112-12) 				
<ul style="list-style-type: none"> ▶ evaluate information and evidence gathered on the topic of genetics and genetic engineering. (209-5, 210-8) 				

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UNIT 3 Student will:				
<ul style="list-style-type: none"> ▶ explain the production of static electrical charges in some common materials. (308-13) <ul style="list-style-type: none"> ▪ recognize that electricity is an integral part of their lives ▪ define static electricity ▪ differentiate between static and current electricity using operational definitions ▪ describe the types of charges on objects. Include: <ul style="list-style-type: none"> i. positive charge ii. negative charge iii. neutral ▪ describe how the charges on objects can change. Include: <ul style="list-style-type: none"> i. neutral objects can develop a positive charge ii. neutral objects can develop a negative charge iii. positively charged objects can become neutral iv. negatively charged objects can become neutral ▪ define the coulomb 				
<ul style="list-style-type: none"> ▶ identify properties of static electrical charges. (308-14) <ul style="list-style-type: none"> ▪ define the Laws of Electric Charges. Include: <ul style="list-style-type: none"> i. like charges repel ii. unlike charges attract iii. charged objects attract some neutral ones 				

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UNIT 3 Student will:				
<ul style="list-style-type: none"> ▶ provide examples of how knowledge of static electricity has resulted in the development of technologies. Include: (111-1, 112-7) <ul style="list-style-type: none"> i. lightning rods ii. photocopiers iii. electrostatic air cleaners 				
<ul style="list-style-type: none"> ▶ provide examples of careers related to electricity in their community and province. (112-10) 				
<ul style="list-style-type: none"> ▶ use an ammeter and a voltmeter to measure current and voltage in a circuit. (209-3) <ul style="list-style-type: none"> ▪ define electric potential difference (voltage) ▪ identify the volt (V) as the SI unit for electric potential difference. 				
<ul style="list-style-type: none"> ▶ describe the flow of charge in an electric circuit (308-16) <ul style="list-style-type: none"> ▪ define electric circuit ▪ identify that electric potential is provided at the source and “used” by the circuit elements (a potential or voltage drop occurs) ▪ describe the parts of an electric circuit. Include: <ul style="list-style-type: none"> i. source of electrical energy ii. electrical load iii. control/switch iv. conductor 				
<ul style="list-style-type: none"> ▶ explain the importance of using precise language while studying the characteristics of electricity (109-14) <ul style="list-style-type: none"> ▪ define electric current ▪ identify the ampere (A) as the SI unit for current 				

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UNIT 3 Student will:				
▶ compare (qualitatively) static electricity and electric current. (308-15)				
▶ organize information using a format appropriate to studying and describing current electricity. (209-4) <ul style="list-style-type: none"> ▪ create circuit diagrams using appropriate circuit symbols. Include symbols for: <ol style="list-style-type: none"> i. bulb ii. cell iii. battery iv. wires v. resistors vi. ammeter vii. voltmeter viii. open switch ix. closed switch ▪ define electrical resistance. ▪ identify the ohm (Ω) as the SI unit for electrical resistance ▪ list the factors which affect the amount of resistance in a wire. Include: <ol style="list-style-type: none"> i. length ii. diameter iii. type iv. temperature 				

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UNIT 3 Student will:				
▶ state a prediction and a hypothesis based on background information or an observed pattern of events. (208-5)				
▶ identify new questions and problems that arise from what was learned concerning voltage, current and resistance. (210-16) <ul style="list-style-type: none"> ▪ state Ohm's Law ▪ given voltage drop and current through a resistor, calculate its resistance ▪ given voltage drop and resistance, calculate current through a resistor ▪ given current through a resistor and its resistance, calculate the voltage drop. 				
▶ identify potential sources of error in ammeter and voltmeter readings. (210-10)				
▶ identify and suggest explanations for discrepancies in data collected using an ammeter and a voltmeter. (210-7)				
▶ present graphically, using a line of best fit, the data from investigation of voltage, current and resistance. (210-5, 211-2)				
▶ give examples of situations where parallel and series connections of resistors are used. Include: (113-2B) <ol style="list-style-type: none"> i. Christmas lights connected in series versus parallel ii. household lights connected in parallel. <ul style="list-style-type: none"> ▪ distinguish between series and parallel connections of resistors (or bulbs). 				

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UNIT 3 Student will:				
<ul style="list-style-type: none"> ▶ describe positive and negative effects of parallel and series connections of resistors (or bulbs). Include: (113-2A) <ul style="list-style-type: none"> i. if bulbs are connected in series, when one light extinguishes so must all others. ii. if bulbs are connected in parallel, when one light extinguishes, the remaining can continue to function ▪ describe the effect on the total resistance of the circuit as resistors are added: <ul style="list-style-type: none"> i. in series ii. in parallel 				
▶ carry out procedures controlling the major variables (209-1)				
▶ use instruments effectively and accurately for collecting data (209-3)				
▶ use tools and apparatus safely (209-6)				
▶ work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise (211-3)				
<ul style="list-style-type: none"> ▶ describe pros and cons of parallel and series connections of cells (113-2A) <ul style="list-style-type: none"> ▪ distinguish between series and parallel connections of cells ▪ indicate that series connections of cells increase the effective voltage, but the resulting battery life is shortened. ▪ indicate that parallel connections maintain the effective voltage, but the resulting battery life is lengthened ▪ determine the effective voltage for cells connected in series and parallel. 				

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UNIT 3 Student will:				
▶ rephrase questions in a testable form related to series and parallel connections of cells. (208-1)				
▶ give examples of situations where parallel and series connections of cells are used. Include: (113-2B) <ul style="list-style-type: none"> i. flashlights availing of series connections ii. powering a remote or hard to access device (e.g. lighthouse) might avail of parallel connections 				
▶ analyze the design of technologies, how they function, and how they impact our daily lives. Include: (113-4) <ul style="list-style-type: none"> i. fuses ii. circuit breakers iii. grounding terminals 				
▶ describe series and parallel circuits, with a maximum of two resistors, involving varying resistance, voltage and current. (308-17)				
▶ interpret patterns and trends in data, and infer and explain relationships among the variables. (210-6)				
▶ relate electrical energy to domestic power consumption costs. (308-18) <ul style="list-style-type: none"> ▪ define electrical energy ▪ identify the Joule (J) as the unit to measure energy ▪ define electrical power ▪ identify the Watt (W) as the unit to measure electrical power. ▪ recognize that electrical energy cost depends on three factors. Include: <ul style="list-style-type: none"> i. voltage drop ii. electrical current iii. time 				
▶ relate electrical energy to domestic power consumption costs (308-18) <ul style="list-style-type: none"> iv. 				

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UNIT 3 Student will:				
<ul style="list-style-type: none"> ▶ explain the importance of using precise language in evaluating electrical energy costs. (109-14) <ul style="list-style-type: none"> ▪ given power rating and time, determine electrical energy used ▪ identify the kWh as a more convenient unit to express electrical energy consumption ▪ given electrical energy used and cost of electrical energy, determine cost to consumer 				
<ul style="list-style-type: none"> ▶ provide examples of careers related to electricity in their community and province. Include: (112-10) <ul style="list-style-type: none"> i. electrician ii. photocopier technician 				
<ul style="list-style-type: none"> ▶ identify and evaluate potential applications of findings (210-12) <ul style="list-style-type: none"> ▪ recognize that electrical energy is converted to many other forms. Include: <ul style="list-style-type: none"> i. light ii. heat iii. sound 				
<ul style="list-style-type: none"> ▶ determine quantitatively the efficiency of an electrical appliance that converts electrical energy to heat energy. (308-19) <ul style="list-style-type: none"> ▪ given useful output energy and input energy, calculate efficiency of an electrical device 				
<ul style="list-style-type: none"> ▶ evaluate the design of electrical devices in terms of their efficiency. This should include incandescent lighting versus fluorescent lighting: (113-6) 				
<ul style="list-style-type: none"> ▶ compare examples of past and current technologies that used current electricity to meet similar needs. (110-9) <ul style="list-style-type: none"> ▪ recognize that Energulde labels are used to aid customers. 				

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UNIT 3 Student will:				
<ul style="list-style-type: none"> ▶ propose a course of action that reduces the consumption of electrical energy. Include: (113-13) <ul style="list-style-type: none"> i. for homes heated by electricity, improve insulating factors ii. turn off lights when not required iii. use energy-efficient light bulbs iv. air dry clothes when possible 				
▶ identify different approaches taken to answer questions, solve problems, and make decisions. (109-7)				
▶ analyze the design of a technology and the way it functions on the basis of identified criteria such as cost and impact on daily life and the community. (113-5)				
▶ make informed decisions about applications of science and technology, taking into account environmental and social advantages and disadvantages (113-9)				
<ul style="list-style-type: none"> ▶ describe the transfer and conversion of energy from a generating station to the home. (308-20) <ul style="list-style-type: none"> ▪ identify the components of an electrical generator. Include: <ul style="list-style-type: none"> i. coil of wire ii. magnets ▪ describe different types of electrical generating stations. Include: <ul style="list-style-type: none"> i. hydroelectric ii. thermal iii. nuclear 				

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<ul style="list-style-type: none"> ▶ describe the transfer and conversion of energy from a generating station to the home. (308-20) (continued) <ul style="list-style-type: none"> ▪ explain that electrical energy is transmitted over large distances at high voltage and low current ▪ define transformer ▪ recognize that voltage is provided at 120 V and 240 V for domestic use. 				
<ul style="list-style-type: none"> ▶ apply criteria for evaluating environmental problems associated with electrical energy production. Include: (210-8) <ul style="list-style-type: none"> i. safety ii. cost of production iii. degree of environmental input. 				
<ul style="list-style-type: none"> ▶ give examples of alternative sources of electrical energy. Include: (109-6A) <ul style="list-style-type: none"> i. wind generator ii. solar energy iii. fuel cell 				
<ul style="list-style-type: none"> ▶ explain the development of alternative sources of energy as constrained by several factors. Include: (109-6B) <ul style="list-style-type: none"> i. cost ii. availability of materials iii. properties of materials. 				

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UNIT 4 Student will:				
<ul style="list-style-type: none"> ▶ describe and explain the apparent motion of celestial bodies. Include: (312-4) <ul style="list-style-type: none"> i. moon ii. sun iii. planets iv. comets v. asteroids ▪ define celestial body ▪ list examples of constellations and recognize them on a sky chart. Include: <ul style="list-style-type: none"> i. Ursa Major, the Great Bear (including the Big Dipper) ii. Ursa Minor, the Little Bear (including the Little Dipper) iii. Orion iv. Cassiopeia v. Leo ▪ identify that celestial bodies move in cyclic paths called orbits and that these orbits result from gravitational forces. ▪ identify that planets, suns, and moons revolve on a central axis. 				

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UNIT 4 Student will:				
<ul style="list-style-type: none"> ▶ describe theories on the formation of the solar system. (312-1) <ul style="list-style-type: none"> ▪ describe the contributions made by various individuals to our knowledge and understanding of celestial bodies and their motions. Include: <ul style="list-style-type: none"> i. Aristotle ii. Ptolemy iii. Copernicus iv. Galileo v. Kepler vi. Newton ▪ identify early technologies that advanced scientific observations about the solar system. Include: <ul style="list-style-type: none"> i. stone circles ii. astrolabe iii. telescope 				
▶ select appropriate methods and tools for collecting data and information and for solving problems. (208-8)				
▶ use instruments effectively and accurately for collecting data (209-3)				
▶ organize data using a format that is appropriate to the task or experiment (209-4)				
▶ evaluate designs and prototypes in terms of function, reliability, and use of materials (210-15)				
▶ work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise. (211-3)				

Student Name: _____		Course Name: Grade 9 Science		
R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 4 Student will:				
▶ relate personal activities and various scientific and technological endeavours to specific. (109-11)				
▶ describe the science underlying particular technologies designed to explore natural phenomena, extend human capabilities, or solve practical problems (111-5)				
▶ describe the effects of solar phenomena on Earth (312-6) <ul style="list-style-type: none"> ▪ define and describe how the following phenomena affect life on Earth <ol style="list-style-type: none"> i. sun-spots ii. solar flares iii. solar radiation 				
▶ describe the composition and characteristics of the following components of the solar system. Include: (312-5) <ol style="list-style-type: none"> i. the sun ii. terrestrial and gas planets iii. dwarf planets (Pluto) iv. periodicity of comets v. asteroids/meteors <ul style="list-style-type: none"> ▪ compare and contrast the composition of the four inner rocky (terrestrial) planets with the four outer gaseous (Jovian) planets ▪ explain why Pluto is now called a Dwarf Planet ▪ describe how Pluto differs from the other eight planets ▪ describe the composition of comets ▪ define periodicity as it relates to comets ▪ compare and contrast asteroid, meteor and meteorite ▪ define impact sites. 				

Student Name: _____		Course Name: Grade 9 Science		
R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 4 Student will:				
<ul style="list-style-type: none"> ▶ provide examples of how the Canadian Government and/or Canadian Space Agency are involved in research projects about space. (112-6) <ul style="list-style-type: none"> ▪ list Canadian contributions and partnerships to space research and exploration. Include: <ul style="list-style-type: none"> i. the Canadarm 1 ii. the International Space Station iii. Canadian Space Station Remote Manipulator system (SSRMS) or Canadarm 2 iv. Special Purpose Dexterous Manipulator (SPDM) or Canadahand ▪ give examples of Canadian Astronauts. Include: <ul style="list-style-type: none"> i. Roberta Bondar ii. Marc Garneau iii. Chris Hadfield 				

Student Name: _____		Course Name: Grade 9 Science		
R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 4 Student will:				
<ul style="list-style-type: none"> ▶ describe the science underlying some technologies designed to explore space. (109-11, 111-5) Include: <ul style="list-style-type: none"> i. rocket propulsion ii. space suits iii. satellite orbiting iv. probes v. rovers vi. optical telescopes vii. radio telescopes ▪ relate how various technologies have increased our knowledge of the universe. Include: <ul style="list-style-type: none"> i. the Hubble space telescope ii. the Canada-France-Hawaii Telescope iii. The Very Large Array Radio Telescope. 				
<ul style="list-style-type: none"> ▶ explain how data provided by technologies contribute to our knowledge of the universe. (109-3) <ul style="list-style-type: none"> ▪ describe current technologies used to explore space. Include: <ul style="list-style-type: none"> i. spectroscopy ii. reflecting telescopes iii. adaptive optics iv. radio telescopes v. Hubble Space Telescope. vi. space probes 				

Student Name: _____		Course Name: Grade 9 Science		
R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 4 Student will:				
▶ propose alternative solutions to a given practical problem, select one, and develop a plan (208-4)				
▶ test the design of a constructed device or system (210-13)				
▶ work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise. (211-3)				
▶ evaluate individual and group processes used in planning, problem solving, decision making, and completing a task. (211-4)				
▶ explain the need for new evidence in order to continually test existing theories about the composition and origin of our solar system and galaxies (110-6, 210-3) <ul style="list-style-type: none"> ▪ recognize that astronomical theories are based on data collected remotely. ▪ define galaxy, solar system, universe ▪ describe how Edwin Hubble used red shift analysis to explain how our universe is expanding 				
▶ describe theories on the origin and evolution of the universe. (312-3) Include: <ul style="list-style-type: none"> i. Big Bang Theory ii. Oscillating Theory. 				
▶ identify new questions and problems that arise from the study of the universe. (210-16)				
▶ describe past and present theories related to the formation of our solar system. Include: <ul style="list-style-type: none"> i. Stellar Collision Theory ii. Nebular hypothesis 				

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R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 4 Student will:				
<ul style="list-style-type: none"> ▶ define and explain a light year (210-9) <ul style="list-style-type: none"> ▪ calculate the travel time to a distant star at a given speed. ▪ using the concept of a light year, calculate the time required for light to travel from the various points in the universe to Earth, including but not limited to: <ul style="list-style-type: none"> i. Mars ii. The Sun iii. Polaris (The North Star) 				

Student Name: _____		Course Name: Grade 9 Science		
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UNIT 4 Student will:				
<p>► describe and classify the major components of the universe. (312-2) Include:</p> <ul style="list-style-type: none"> i. nebula ii. spiral and elliptical galaxies iii. giant stars iv. dwarf stars v. quasars vi. black holes <ul style="list-style-type: none"> ▪ describe the formation of stars ▪ describe the life cycle of a star ▪ compare some well know stars relative to our solar system. Include: <ul style="list-style-type: none"> i. Vega ii. Canopus iii. Sun iv. Arcturus v. Betelgeuse vi. Rigel vii. Delta Orionis 				

Student Name: _____		Course Name: Grade 9 Science		
R - retain, D - delete, C - changed Outcomes	R	D	C	Changed outcomes
UNIT 4 Student will:				
<ul style="list-style-type: none"> ▶ describe examples of science and technology-based careers in Canada that are associated with space exploration. (112-11) Include: <ul style="list-style-type: none"> i. astronauts ii. scientists iii. engineers iv. doctors v. pilots vi. technicians 				
<ul style="list-style-type: none"> ▶ defend a position regarding societal support for space exploration. (113-3, 211-5) <ul style="list-style-type: none"> ▪ identify potential scientific and social benefits and negative consequences of Canadian partnerships in space exploration. Include: <ul style="list-style-type: none"> i. medical ii. industrial iii. agricultural iv. meteorological v. military ▪ identify the risks associated with space exploration and travel. 				

