Science Course Descriptions

Contents

Grade 8

Science 8

Science 8 introduces students to foundational scientific concepts that explain life at the cellular level, the behaviour of matter, energy transfer, and Earth's dynamic systems. Key areas of study include:

- **Life Processes at the Cellular Level:** Explore the characteristics of living things, cell theory, and the structure and function of plant and animal cells. Learn about photosynthesis, cellular respiration, and the role of micro-organisms in ecosystems and human health.
- **Matter and Atomic Theory:** Understand the kinetic molecular theory and atomic theory, including the structure of atoms, subatomic particles, and models that explain the behaviour of matter.
- **Energy as Particles and Waves:** Investigate electromagnetic radiation and the properties and behaviours of light, including reflection, refraction, and transmission.
- **Plate Tectonics and Geological Processes:** Examine the theory of plate tectonics as the unifying explanation for Earth's geological activity. Study major geological events, layers of Earth, and local geological formations.

Science 8 Honours

Science 8 Honours is an accelerated and enriched course designed for students who demonstrate strong aptitude and interest in science. This course covers the full Science 8 curriculum while introducing advanced concepts from the Science 9 biology strand, providing a rigorous foundation for future honours-level science courses. Students will develop scientific literacy, critical thinking, and problem-solving skills through inquiry-based learning and hands-on laboratory investigations.

Key Areas of Study:

- **Science 8 Core Topics**
    - Cell theory and microscopic life
    - Optics and the behavior of light
    - Fluids and their properties

    - Introduction to plate tectonics and Earth systems
- **Science 9 Extensions**
    - Reproduction in living systems
    - Heredity and the principles of genetics

Students will engage in collaborative projects and experimental work that emphasize observation, data analysis, and scientific communication. The accelerated pace and expanded content prepare students for advanced science pathways.

Students who successfully complete Science 8 or Science 8 Honours may apply to enter Science 9 Honours.

Grade 9

Science 9

Science 9 builds on previous learning and focuses on the interconnected systems that sustain life and shape our planet. Students will study:

- **Cell Reproduction and Growth:** Learn how cells divide through mitosis and meiosis, and compare asexual and sexual reproduction. Explore human reproduction and its role in genetic diversity.
- **Atomic Structure and Chemical Properties:** Investigate how electron arrangement determines chemical behaviour. Study the periodic table, element properties, and the formation of compounds.
- **Electricity and Circuits:** Understand electric current as the flow of charge. Explore voltage, current, resistance, and circuit design, including series and parallel circuits.
- **Earth's Systems and Sustainability:** Examine how the biosphere, geosphere, hydrosphere, and atmosphere interact as matter cycles and energy flows through ecosystems. Consider the effects of solar radiation, sustainability, and First Peoples perspectives on interconnectedness.

Science 9 Honours

Science 9 Honours is an accelerated and enriched course designed for highly motivated students seeking a deeper and broader understanding of scientific concepts. This course covers the complete Science 9 curriculum while integrating advanced topics from Science 10, including physics, chemistry, and space science. Students will explore foundational principles of biology, chemistry, and physics, while developing critical thinking, problem-solving, and inquiry skills through hands-on investigations and collaborative projects.

Key Areas of Study:

- **Science 9 Core Topics**
    - Cell biology and reproduction

    - Atomic structure and chemical reactions
    - Electricity and energy transfer
    - Reproduction and genetics
- **Science 10 Extensions**
    - Physics: Motion, forces, and energy
    - Chemistry: Chemical bonding, reactions, and energy changes
- Space Science: The universe, astronomical phenomena, and Earth's place in space

The accelerated pace and expanded content prepare students for advanced science pathways.

Prerequisites: Strong academic performance in Science 8 and teacher recommendation.

Students who successfully complete Science 9 Honours may apply to enter the combined Science 10 Honours and Life Sciences 11 Honours course.

Grade 10

Science 10

Science 10 provides students with a comprehensive introduction to key scientific concepts that form the basis for advanced studies in Grades 11 and 12. The course emphasizes four major themes:

- **DNA and Biodiversity:** Students examine the structure and function of DNA, patterns of inheritance, mutations, and the role of natural and artificial selection in shaping life on Earth.
- **Chemical Processes:** The curriculum explores chemical reactions, energy changes, acid-base chemistry, and the law of conservation of mass, along with practical applications relevant to everyday life and environmental sustainability.
- **Energy and Its Transformations:** Learners study how energy is conserved and transformed, including nuclear energy, radiation, potential and kinetic energy, and the local and global impacts of energy technologies.
- **The Universe:** Students investigate the Big Bang Theory, the formation of matter and energy over time, and the methods scientists use to collect and analyze astronomical data.

Grade 11

Life Sciences 11

Life Sciences 11 focuses on the molecular and cellular foundations of life, evolutionary processes, and the diversity of organisms. Key topics include:

- **Cell Biology and Energy:** Study cell structure and function, levels of biological organization, and energy transformations through photosynthesis and cellular respiration.

- **Reproduction and Genetics:** Explore sexual and asexual reproduction, changes in DNA, and mechanisms of inheritance.
- **Evolution and Adaptation:** Examine microevolution and macroevolution, natural selection, speciation, and evidence for evolutionary change, including fossil records and molecular data.
- **Classification and Diversity:** Learn taxonomic principles, binomial nomenclature, and phylogenetic relationships among organisms. Investigate trends in complexity and the characteristics of major domains and kingdoms.
- **Viruses and Interrelationships:** Understand the role of viruses at the boundary of living and non-living, and explore ecological interactions and First Peoples perspectives on classification and interrelationships.

Life Sciences 11 / Science 10 Honours

Life Sciences 11 x Science 10 Honours is an advanced, college-preparatory course designed for students who wish to deepen their understanding of biological systems and prepare for AP Biology. This course covers the full Life Sciences 11 curriculum in greater depth while integrating key concepts from Science 10 and AP Biology to provide a rigorous foundation for future studies in life sciences.

Key Areas of Study:

- Core Life Sciences 11 Topics:
    - Cell biology and biochemistry
    - Plant and animal physiology
    - Classification and diversity of life
- Principles of heredity and molecular basis of inheritance
- AP Biology Concepts: Evolutionary processes, population genetics, and ecological interactions
- Advanced study of genetic variation and its role in adaptation and biodiversity

Prerequisites: Strong academic performance in Science 10, Science 10 Honours or Science 11 course..

Next Steps: Completion of Life Sciences 11 Honours is the prerequisite for AP Biology.

Chemistry 11

Chemistry 11 provides a comprehensive study of matter, its structure, and the chemical processes that impact our world. Students will explore:

- **Atomic Structure and Bonding:** Learn about the quantum mechanical model, electron configuration, valence electrons, and chemical bonding based on electronegativity. Examine molecular geometry and intermolecular forces.
- **Organic Chemistry:** Study the structure, properties, and applications of organic compounds, including their significance in medicine, industry, and environmental sustainability.
- **The Mole and Stoichiometry:** Understand the mole as a fundamental unit for measuring matter. Perform stoichiometric calculations involving mass, gas volumes, and solutions, applying concepts of accuracy and significant figures.

- **Chemical Reactions and Solubility:** Investigate types of chemical reactions, conservation of matter and energy, and factors affecting solubility. Explore solution chemistry and analysis techniques relevant to environmental and industrial contexts.
- **Green Chemistry and Applications:** Consider sustainable practices and technologies that reduce environmental impact, and examine traditional and modern chemical processes.

Chemistry 11 Honours

Chemistry 11 Honours is an advanced, preparatory course designed for students intending to pursue AP Chemistry. This course builds upon the standard Chemistry 11 curriculum while integrating key concepts from college-level chemistry to provide a rigorous foundation in chemical principles and scientific reasoning.

Students develop a deep understanding of matter and its transformations through conceptual learning, quantitative problem-solving, and inquiry-based laboratory investigations. The course emphasizes the ability to connect macroscopic observations with particulate-level representations and symbolic models, preparing students for advanced study in chemistry.

Key Areas of Study:

- **Core Chemistry 11 Topics**
    - Atomic structure, periodic trends, chemical reactions, stoichiometry, solutions, and introductory organic chemistry.
- **Extended Topics from AP Chemistry**
    - Thermodynamics: Energy changes in chemical processes, enthalpy..
    - Gas Laws: Ideal gas law, KMT and real gas behavior.
- Bonding and Molecular Geometry: Advanced treatment of chemical bonding, VSEPR theory, hybridization, and molecular polarity.

Prerequisites: Strong performance in Science 10.

Chemistry 11 Honours provides the conceptual and skill-based foundation necessary for success in AP Chemistry.

Physics 11

Physics 11 introduces students to the principles that govern motion, energy, and the transfer of forces in the physical world. Key areas of study include:

- **Motion and Forces:** Analyze and predict the motion of objects using concepts of uniform and accelerated motion, projectile motion, and Newton's laws. Explore contact forces, free-body diagrams, and the effects of balanced and unbalanced forces in systems.
- **Energy and Work:** Examine the conservation of energy, work-energy principles, power, and efficiency. Learn how simple machines provide mechanical advantage and study their applications, including examples from First Peoples technologies.

- **Electricity and Heat:** Investigate direct current (DC) circuits, Ohm's law, Kirchhoff's laws, and energy transfer in electrical systems. Explore thermal equilibrium and specific heat capacity as applications of energy conservation.
- **Waves and Sound:** Understand how mechanical waves transfer energy without transferring matter. Study wave properties and behaviours such as reflection, refraction, diffraction, and interference, as well as the characteristics of sound, resonance, and frequency.

AP Physics 1

AP Physics 1 is an introductory, algebra-based college-level physics course designed to develop a deep understanding of foundational principles in classical mechanics. Students engage in inquiry-based investigations and apply scientific reasoning to analyze physical phenomena.

Key areas of study include:

- **Kinematics:** Motion in one and two dimensions, including displacement, velocity, acceleration, and graphical representations.
- **Forces and Translational Dynamics:** Newton's laws, free-body diagrams, friction, and circular motion.
- **Work, Energy, and Power**: Energy transformations, conservation of energy, and power calculations.
- **Linear Momentum**: Impulse, conservation of momentum, and collisions.
- **Rotational Motion:** Torque, rotational dynamics, angular momentum, and energy of rotating systems.
- **Oscillations and Fluids:** Simple harmonic motion, properties of fluids, and fluid dynamics.

Laboratory Requirement: At least 25% of instructional time is devoted to hands-on, inquiry-based labs emphasizing experimental design, data analysis, and communication of findings.

Prerequisites: Students should have completed Pre-Calculus 10 and be concurrently enrolled in Pre-Calculus 11 or higher.

Earth Science 11

Earth Science 11 introduces students to the dynamic systems that shape our planet and its place in the solar system.

Key areas of study include:

- **Earth Materials and Resources:** Examine minerals and the formation of igneous, sedimentary, and metamorphic rocks. Explore geologic resources such as ores and fossil fuels, and consider their economic and environmental implications.
- **Plate Tectonics and Geological Processes**: Understand the evidence supporting plate tectonic theory, factors influencing plate motion, and the relationship between tectonic activity and earthquakes, volcanoes, and mountain building.

- **Atmosphere and Weather:** Investigate the interaction of air, water, and energy transfer in the atmosphere. Study weather systems, extreme weather events, and global phenomena such as El Niño and La Niña.
- **Water and Climate:** Explore the hydrologic cycle, properties of oceans, ocean currents, and the influence of large bodies of water on climate. Examine evidence of climate change and its effects on Earth's systems.
- **Earth in Space:** Learn about the formation of the solar system, Earth's unique characteristics, and the Earth–moon–sun system, including tides, eclipses, and seasonal variations.

STEM Leadership 11

This course is designed for students who are interested in developing leadership skills within the fields of science, technology, engineering, and mathematics. Students in STEM Leadership will take on active, hands-on responsibilities that support the school's science programming while gaining practical experience that will strengthen their readiness for future STEM pathways.

Students will be:

- Assisting with the preparation, setup, and takedown of labs and lab materials for a variety of science classes
- Maintaining lab organization, equipment, and safety practices under teacher supervision
- Planning and coordinating STEM outreach activities for the school and broader community
- Supporting the mentorship, planning, and execution of the school science fair.
- Modeling professionalism, reliability, and safe lab practices while working with younger students and staff

Through this course, students will gain valuable experience in laboratory procedures, technical problem-solving, event organization, communication, and supporting a vibrant school science culture. These practical and applied skills will serve students well in future scientific, technical, or engineering studies, and in related volunteer or work opportunities within the community.

Students wanting to take the STEM Leadership class need to complete and submit an application with Student Services.

Grade 12

Anatomy & Physiology 12

Anatomy and Physiology 12 provides an in-depth study of human biology, focusing on the structure and function of organ systems and the processes that maintain homeostasis. Key topics include:

- **Homeostasis and Regulation:** Examine feedback loops, physiological processes, and the mechanisms that maintain internal balance in response to environmental changes.

- **Cell Biology and Molecular Foundations:** Study biological molecules, metabolism, enzymes, and transport across cell membranes. Explore DNA replication, gene expression, and protein synthesis.
- **Organ Systems and Interdependence:** Investigate the structure, function, and interrelationships of major organ systems, including nervous, endocrine, cardiovascular, respiratory, digestive, immune, and reproductive systems.
- **Genomics and Biotechnology:** Learn about advances in genomics, genetic engineering, and biotechnology, and their implications for health and society.
- **Health and Disease:** Explore lifestyle factors affecting health, holistic approaches to wellness, and diseases resulting from imbalances in homeostasis.

Successful completion of Anatomy and Physiology 12 prepares students for post-secondary studies in health sciences, medicine, and related fields**.**

AP Biology

AP Biology is a college-level course that emphasizes the core principles and processes underlying living systems. Students develop conceptual understanding through inquiry-based investigations and data analysis. The course focuses on applying biological principles to explain phenomena and solve problems.

Key Areas of Study:

- **Chemistry of Life:** Structure of water, macromolecules, and their roles in biological systems.
- **Cells:** Cell structure and function, membrane transport, and compartmentalization.
- **Cellular Energetics:** Enzyme activity, photosynthesis, and cellular respiration.
- **Cell Communication and Cell Cycle:** Signal transduction and regulation of cell division.
- **Heredity:** Meiosis, Mendelian and non-Mendelian genetics.
- **Gene Expression and Regulation:** DNA replication, transcription, translation, and biotechnology.
- **Natural Selection:** Evolutionary processes, population genetics, and speciation.
- **Ecology:** Energy flow, population dynamics, and ecosystem interactions.

Laboratory Requirement: At least 25% of instructional time devoted to hands-on, inquiry-based laboratory work.

Chemistry 12

Chemistry 12 focuses on the dynamic nature of chemical systems and the factors that influence chemical reactions. Students will study:

- **Reaction Rates and Collision Theory**: Explore how molecular collisions, energy changes, and catalysts affect reaction rates. Learn to interpret potential energy diagrams and kinetic energy distributions.

- **Chemical Equilibrium:** Understand the dynamic nature of equilibrium, Le Châtelier's principle, and the equilibrium constant (K_{eq}). Examine factors that shift equilibrium and apply these concepts to industrial and biological systems.
- **Solubility and Saturated Solutions:** Investigate solubility product (K_{sp}), precipitation reactions, and applications in environmental and industrial contexts.
- **Acid-Base Chemistry:** Study the strength of acids and bases, titration techniques, buffer systems, and hydrolysis of salts. Explore applications in environmental science and biochemistry.
- **Oxidation-Reduction and Electrochemistry**: Learn about redox reactions, electrochemical and electrolytic cells, and their practical applications, including energy storage and metal refining.

Successful completion of Chemistry 12 is essential for students pursuing science, health, or engineering programs at the post-secondary level.

AP Chemistry

AP Chemistry is a college-level course that provides a strong foundation in chemical principles and their applications.

Key Areas of Study:

- **Atomic Structure and Properties:** Electron configurations, periodic trends, and photoelectron spectroscopy.
- **Compound Structure and Properties:** Chemical bonding, Lewis structures, VSEPR theory, and hybridization.
- **Properties of Substances and Mixtures:** Intermolecular forces, states of matter, and solutions.
- **Chemical Reactions:** Stoichiometry, net ionic equations, and reaction types.
- **Kinetics:** Rate laws, reaction mechanisms, and factors affecting reaction rates.
- **Thermochemistry:** Heat transfer, enthalpy changes, and calorimetry.
- **Equilibrium**: Dynamic equilibrium, Le Châtelier's principle, and solubility equilibria.
- **Acids and Bases:** pH calculations, buffers, and titrations.
- **Thermodynamics and Electrochemistry:** Entropy, Gibbs free energy, and electrochemical cells.

Laboratory Requirement: At least 25% of instructional time devoted to hands-on, inquiry-based laboratory work.

Physics 12

Physics 12 builds on foundational concepts from Physics 11 and explores more complex principles of motion, forces, and energy. Key areas of study include:

- **Linear and Circular Motion:** Analyze static equilibrium, uniform circular motion, centripetal force, and changes to apparent weight in vertical and horizontal circles.
- **Fields and Forces:** Investigate gravitational, electric, and magnetic fields, including Newton's law of universal gravitation, Coulomb's law, and electromagnetic induction.
- **Momentum and Collisions:** Study impulse, conservation of momentum, and energy in elastic and inelastic collisions.

- **Relativity and Motion:** Understand frames of reference, relative motion, and the postulates of special relativity. Examine relativistic effects such as changes in time, length, and mass.
- **Graphical Analysis:** Apply graphical methods to interpret physical relationships, including linear, exponential, and inverse relationships, and calculate slopes and areas under curves for physical quantities.

Successful completion of Physics 12 prepares students for post-secondary studies in science, engineering, and technology.

AP Physics 2

AP Physics 2 is an introductory, algebra-based college-level physics course that builds on concepts from AP Physics 1 and expands into additional domains of physics. Students deepen their understanding through model development, problem-solving, and inquiry-based laboratory investigations.

Key areas of study include:

- **Thermodynamics**: Kinetic theory, ideal gas law, heat transfer, and laws of thermodynamics.
- **Electricity and Magnetism**: Electric force, fields, potential, circuits, and electromagnetic induction.
- **Optics and Waves:** Geometric optics, wave behavior, sound, interference, and diffraction.
- **Modern Physics:** Quantum theory, atomic models, nuclear processes, and applications of modern physics.

Laboratory Requirement: At least 25% of instructional time is devoted to hands-on, inquiry-based labs that reinforce conceptual understanding and scientific practices.

Prerequisites: Students should have completed AP Physics 1 or an equivalent introductory physics course and should have taken or be concurrently enrolled in Pre-Calculus 12.

Geology 12

Geology 12 offers an in-depth study of Earth's materials, processes, and history, with a focus on interpreting geological evidence and understanding resource development.

Key areas of study include:

- **Minerals and Rock Formation:** Classify minerals and study the formation and properties of igneous, sedimentary, and metamorphic rocks. Examine the rock cycle and its role in shaping Earth's crust.
- **Geologic Time and Fossil Record:** Learn methods of relative and absolute dating, interpret the fossil record, and reconstruct Earth's geological and biological history.
- **Plate Tectonics and Structural Geology:** Investigate the plate tectonic theory, volcanic and deformational features, faulting, folding, and the forces that shape Earth's crust.
- **Surface Processes and Landforms:** Understand weathering, erosion, glaciation, and mass wasting, and how these processes continually reshape landscapes.

- **Resources and Sustainability:** Explore British Columbia's resource deposits, including minerals, fossil fuels, and groundwater. Consider economic, environmental, and First Peoples perspectives on resource development and land use.

STEM Leadership 12

This course is designed for students who are interested in developing leadership skills within the fields of science, technology, engineering, and mathematics. Students in STEM Leadership will take on active, hands-on responsibilities that support the school's science programming while gaining practical experience that will strengthen their readiness for future STEM pathways.

Students will be:

- Assisting with the preparation, setup, and takedown of labs and lab materials for a variety of science classes
- Maintaining lab organization, equipment, and safety practices under teacher supervision
- Planning and coordinating STEM outreach activities for the school and broader community
- Supporting the mentorship, planning, and execution of the school science fair.
- Modeling professionalism, reliability, and safe lab practices while working with younger students and staff

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