



St. Michaels
University School

Senior School Course Handbook 2021-22

Science

This is an excerpt from the St. Michaels University School Senior School Course Handbook 2021-22.
For the full handbook, please visit www.smus.ca/course-handbook.

Science

The science program promotes an understanding and appreciation of science and provides students with a variety of essential scientific skills. These include the ability to think critically and analytically, to apply the scientific method, to manipulate data in a scientific manner and to approach problems in a logical and reasoned way.

Science 9

This introductory course is designed to help you develop questioning, analytical and problem-solving skills for science at the Senior School level. We cover cell biology, foundational chemistry, elementary electricity, and introductory ecology, using a variety of inquiry-based laboratory experiences. You are expected to be self-motivated as our work consists of laboratory write-ups, practice problems and several group projects. You may be assessed on your laboratory skills, written quizzes and tests, or project work.

Marine Studies and Training 10 (term)

This course covers different aspects of the marine environment through hands-on, collaborative work, and numerous labs and projects. We will explore topics such as ocean geography, ocean geology, chemical oceanography, physical oceanography and marine biology. You will learn about the major environmental issues threatening the health of the marine environment and what you can do to help the oceans return to a healthy state. You will also develop practical and lab skills that will help you in your scientific endeavours. You should be passionate about science and the marine environment and be willing to step out of your comfort zone. The course includes an overnight field trip to the Vancouver Aquarium.

Science 10

This required course continues the development of analytical and problem-solving skills in preparation for the upper-level sciences. Using a variety of inquiry-based group activities and laboratory experiences, we cover the diversity of life, DNA structure, atomic theory, chemical processes, changes in energy, the Big Bang theory, and the impact and ethical considerations of recent scientific advancements. You are expected to be self-motivated and innovative, as homework consists of practice problems, group work, and formal reports for adapted and student-designed laboratory experiments. You may be assessed on your laboratory skills, written tests or project work.

Science Expansion Pack 10 (term)

In this elective course, we widen your experience with topics not typically covered in Science 9 and 10, such as thermodynamics, biomechanics and astronomy. Using a variety of inquiry-based group activities and laboratory experiences, our work enhances your laboratory, analytical and problem-solving skills. You are expected to be self-motivated and innovative, as you will design and carry out experiments, collect data and produce formal reports. You may be assessed on your laboratory skills, reports and a major project.

Life Sciences 11

This general biology course is guided by the themes of biological interactions, change over time, and evolutionary and taxonomic kinship, while providing a solid foundation for future studies in the biological sciences. We will examine cellular structure and function, microbiology, micro- and macroevolution, speciation, trends in complexity and ecology. You will engage in classroom and laboratory activities to provide you with opportunities to hone your critical thinking and technical writing. You will be self-motivated, engaging in pre- and post-reading, completing practice problems and conducting independent study. You will be assessed on your written assessments, assignments, project work, laboratory skills and formal summative assessments.

Life Sciences 11 (Pre-AP)

This is the first half of the AP Biology course and is taught at the university level. It is challenging, comprehensive, fast-paced and foundational for AP Biology 12. We examine topics such as cellular structure and function, Mendelian and post-Mendelian inheritance, and microbiology, and will introduce experimental design and some statistical analysis. You will develop communication and teamwork skills, as well as critical thinking through classroom discussion, collaborative activities and inquiry-based laboratory activities. A strong background in chemistry and mathematics is an asset but not required. You will be self-motivated, engaging in pre- and post-reading, completing practice problems and conducting independent study. You will be assessed on your written assessments, assignments, project work, laboratory skills and formal summative assessments.

Anatomy and Physiology 12

This course explores the mysteries of the human body. While having a background in biology is beneficial, a curiosity about life is preferred and all are welcome to take this course. In this fast-paced, content-rich course, we will investigate the human body from the cellular to the systemic level. You should be self-motivated and proactive, as you are expected to complete independent learning while engaging in inquiry-based class activities and labs, including dissections. Homework will consist of readings, review problems and laboratory write-ups. You may be assessed by tests, class work, laboratory tests and cumulative exams. By the end of the course, you will understand how the interconnection of the body's systems maintains the homeostasis needed to sustain life.

AP Biology

Comprehensive and fast-moving, this is the equivalent of a first-year university introductory biology course and builds on the work covered in Biology 11 (Pre-AP). We will engage in an in-depth examination of gene regulation, biotechnology, immunology, energetics, physiology and diversity. Inquiry-based activities will provide you with opportunities to apply your knowledge and understanding as well as hone your laboratory and statistical analysis skills. You will be self-motivated, engaging in pre- and post-reading, completing practice problems and conducting independent study. You will be assessed on assignments, project work, laboratory skills and formal summative assessments.

Chemistry 11

This conceptual and mathematical course requires you to use and develop your computational problem-solving skills; possessing strong mathematical skills is a definite asset. We cover data analysis and foundational skills, matter, gases, the mole concept, stoichiometry, atomic theory, the periodic table, chemical bonding, chemical solutions and organic chemistry. We will use a variety of instructional strategies, such as guided-inquiry activities, lab experiments, discussions, student-centred work sessions and direct teaching. Your learning will be assessed using quizzes, lab reports, post-lab assignments, tests and exams. Practical lab skills will be assessed on a continuous basis.

Chemistry 11 Pre-AP

This fast-paced, in-depth course is designed to enable you to hone your problem-solving skills; strong mathematical skills are a definite asset coming into this course. Some guided inquiry learning activities and experimental laboratory design opportunities will help you develop new lab skills. This is the first year of the two-year AP Chemistry course where, in addition to the provincial Chemistry 11 curriculum, we will cover thermochemistry, gas chemistry, the quantum model of the atom and chemical bonding. In addition to unit tests and laboratory assignments, you will write cumulative exams and be assessed on your practical lab skills.

Chemistry 12

This course builds on the content and skills of Chemistry 11. You develop your computational problem-solving skills while covering topics in reaction rates, equilibrium systems, acid/base chemistry and electrochemistry. Using lab activities, you will continue to develop your practical skills, especially through titration experiments. We will use a variety of guided-inquiry activities, class discussions, direct teaching, and student-centred work sessions. You will be self-motivated, practising mathematical and conceptual problems to gain a strong grasp of the concepts covered. Your learning will be assessed using quizzes, lab reports, post-lab assignments, unit tests and exams, and your lab skills will be assessed on an ongoing basis.

AP Chemistry

This challenging course continues from Chemistry 11 Pre-AP. We develop many of the skills introduced previously, while covering the Chemistry 12 curriculum and some additional topics. Our course expectations and assessment items are the same as in Chemistry 11 Pre-AP.

Physics 11

This introductory course focuses on the principles and theories of physics, encourages laboratory investigation of physical relationships, and illustrates the relationship between theory and application. We emphasize experimental design and data analysis skills and highlight the application of physics to everyday situations throughout the curriculum. We cover 2-D kinematics, Newton's laws of motion, work, energy and power, simple machines, electric circuits and wave behaviours. You will need to be self-motivated to complete the homework, consisting of laboratory write-ups, practice problems and a major project. You should feel comfortable with algebra, as it is used extensively. You may be assessed on your laboratory skills, written tests, exams or project work.

Physics 12

This course focuses on the principles and theories of physics, encourages laboratory investigation of physical relationships and illustrates the relationship between theory and application. We emphasize experimental design and data analysis skills, and highlight the application of physics to everyday situations. We cover momentum, static equilibrium, gravitation, electrostatics, electromagnetism and special relativity. You will need to be self-motivated to complete the homework, consisting of laboratory write-ups, practice problems and a major project. You should feel comfortable with algebra, as it is used extensively. You may be assessed on your laboratory skills, written tests or project work.

AP Physics 1

This is a challenging, fast-paced, university-level course, designed to help you develop analytical and problem-solving skills at a higher level than Physics 11. We cover linear and rotational mechanics, simple harmonic motion and waves, electric charge and force and simple DC electric circuits, using a variety of inquiry-based laboratory experiences. You will find the algebraic approach easier if you have completed Pre-Calculus 11, but this is not a requirement. You will need to be self-motivated to complete the homework, consisting of laboratory write-ups, practice problems and a major project. You may be assessed on your laboratory skills, written tests or project work.

AP Physics 2

This challenging, fast-paced, university-level course is designed to help you develop analytical and problem-solving skills at a higher level than Physics 12. We cover fluids, thermodynamics, electrostatics, DC circuits with resistors and capacitors, electromagnetism, waves and geometric optics, and topics in modern physics, using a variety of inquiry-based laboratory experiences. You will find the approach easier if you have completed AP Physics 1, but this is not a requirement. You are expected to be self-motivated, as homework consists of laboratory write-ups, practice problems and a major project. You may be assessed on your laboratory skills, written tests or project work.

AP Physics C

There are two courses, AP Physics C: Mechanics and AP Physics C: Electricity and Magnetism, each corresponding to approximately a semester of university work. Both courses use guided inquiry and student-centered learning to foster the development of critical thinking skills and use introductory differential and integral calculus. You will need to be self-motivated to complete the homework, consisting of laboratory write-ups, practice problems and a major project. You will find the calculus-based approach easier if you have already completed a calculus course. You may be assessed on your laboratory skills, written tests or project work.

AP Physics C: Mechanics covers kinematics, Newton's laws of motion, work, energy and power, systems of particles and linear momentum, circular motion and rotation, and oscillations and gravitation.

AP Physics C: Electricity and Magnetism covers electrostatics, conductors, capacitors and dielectrics, electric circuits, magnetic fields and electromagnetism.

Environmental Science 12

This course is designed to make you more aware of your world, the events affecting it and your role in mitigating and preventing environmental issues. We will be working closely with members of our community, focusing on local and global concerns centred around themes such as water quality, global climate change, sustainable land use and living sustainably. You will engage in hands-on, collaborative and Socratic-style classes. Your passion for the environment, readiness to engage in conversation about difficult problems with no clear answers, and willingness to step out of your comfort zone in search of solutions will be assets in your learning. You may be assessed on your laboratory skills, written quizzes and tests, projects and research skills. This course is not a prerequisite for AP Environmental Science.

AP Environmental Science

This fast-paced, in-depth course focuses on current environmental issues, the complexity of the problems and the roles played by the human population in these issues. We emphasize critical thinking skills and engage in discussions around the topics. You will be exposed to current environmental concerns, through lessons and required readings. We will design and carry out labs on the three spheres of our planet (soil, water and air) and interpret data from those labs and other sources of information. You will also be immersed in a university-style lab session with a four-day trip to the Bamfield Marine Science Station, completing 30 hours of lab work. You will be assessed by tests modelled after the AP exam.