Salesian International School 2025 Module Rubric

Year	9	Course	Science Year 9	Credits	
Module Title	Integrated Science: Science Skills Mastery (Grade 9) Physics				

Course Summary

This integrated science course is designed to explore natural phenomena through a mathematically grounded and interdisciplinary approach, with a major focus on physical science. Students will develop strong conceptual understanding, analytical thinking, and scientific reasoning skills by engaging with foundational content from the four major realms of physical science: mechanics, thermodynamics, electromagnetism, and wave or quantum physics. During Terms 1 and 2, students will investigate core topics such as motion, forces, energy systems, electricity, and wave behavior. These topics will be connected to modern physics concepts including quantum behavior and electromagnetic radiation. Chemistry is integrated meaningfully into the course to help students understand matter and energy at both macroscopic and microscopic levels, using simulation tools to examine atomic and molecular behavior, chemical reactions, energy changes, and particle-level interactions.

As science and technology continue to evolve rapidly, the course is designed to remain responsive to emerging developments in areas such as quantum computing, materials science, and artificial intelligence. However, the core scientific practices—modeling, data interpretation, coding and simulation, and mathematical reasoning—will remain central to student learning throughout the year. All laboratory investigations in Terms 1 and 2 will be conducted through virtual labs or student-generated Python simulations. Rather than relying on traditional physical lab equipment, students will construct, test, and analyze digital models of experimental systems to simulate data, visualize scientific processes, and explore cause-effect relationships. This simulation-based approach applies across all units, including both physics and chemistry, allowing students to carry out flexible and personalized investigations that reflect modern scientific practice.

In Term 3, students will expand their scientific literacy by exploring interdisciplinary themes in biology, psychology, ecology, and earth science. These modules are designed to build on the conceptual foundation established in physical science and support integrative scientific thinking. Topics will include body coordination, sensory systems, cognitive processing, energy flow in ecosystems, plate tectonics, seismic activity, and environmental energy systems.

The course culminates in a final digital portfolio completed during Term 3. This portfolio combines a student-designed project with further investigation or research on a scientific question or phenomenon of their choice. Students will apply simulation-based modeling and cross-disciplinary analysis to synthesize knowledge gained across the year in areas including physics, chemistry, biology, psychology, earth science, and ecology. The portfolio may include lab reports from multiple simulations, summaries of research articles, digital diagrams or models, reflection essays, and documentation of project work. Ultimately, this portfolio provides a comprehensive demonstration of each student's scientific understanding, analytical reasoning, and creativity across integrated science.

Required Materials

- Pearson Science 9, 2nd Edition (eBook)
The core digital textbook for content reference and foundational learning across science topics.
- iPad or digital device with internet access
Required for accessing simulations, assignments, research tools, and virtual lab platforms.
- Digital tools and virtual simulation platforms
All labs and scientific investigations in this course will be conducted using virtual platforms. Students are free to choose whichever simulation or modeling tools they prefer, as long as the tools are entirely digital. The following platforms are commonly used and recommended, but not required:
•PhET Interactive Simulations:
Free, interactive simulations ideal for exploring foundational ideas in motion, energy, waves, atomic structure, and other core science topics across physics, chemistry, and biology.
•Pivot Interactives:
Video-based simulations that present real-world science scenarios and measurable data, guiding students through meaningful analysis using structured questions.
•Labster:
3D virtual labs offering immersive environments for chemistry, physics, and biology. These labs help students visualize particle interactions, chemical systems, and complex physics concepts.
•Student-created simulations:
Students may build their own simulations or models using programming languages of their choice. Python is preferred due to its accessibility and versatility, and Visual Studio is suggested as a suitable integrated development environment (IDE). However, students are free to use any programming language or IDE that supports their creative and investigative goals.

Assessment Basis

	Basics (Knowledge)	Development/Communication (Application)	Judgment (Inquiry)
Creative Thinking	A3 Students will demonstrate foundational understanding of classical, modern, and quantum physical principles, including mechanics, energy systems, electromagnetism, and quantum structure. They will identify and define relationships between observed phenomena and digital simulations. Students will describe key trends in scientific and technological advancement, such as quantum computing and AI, and begin to relate them to everyday examples.	B3 Students will apply their understanding of major physical science concepts through simulations, experiments, and modeling tasks. This includes using Python or simulation tools to visualize forces, waves, and atomic behavior. Students will demonstrate creativity in how they apply models, analyze visual data, and propose solutions to real-world systems.	C3 Students will creatively synthesize learning from across disciplines by designing and completing an original digital portfolio project that reflects integration of physics with other sciences (chemistry, biology, earth science). They will demonstrate originality and initiative by exploring real-world challenges or emerging scientific ideas.
Critical Thinking	A2 Students will explain relationships between key physical science principles and natural systems. They will identify the cause-and-effect nature of forces, fields, and particle behavior using evidence-based reasoning.	B2 Students will evaluate observations and simulation results to justify patterns, claims, or conclusions. They will demonstrate accuracy in analyzing trends using code-based modeling and data collection tools.	C2 Students will critically assess scientific claims or emerging technologies (e.g., AI, quantum applications, sustainability) through research, simulation, and digital modeling. They will evaluate multiple sources, test hypotheses, and reflect on evidence gathered in the digital portfolio project
Logical Thinking	A1 Students will demonstrate strong logic-based thinking when applying physics laws to everyday contexts. This includes mastering Newton's laws, conservation principles, and energy transformations. Students will show proficiency in circuit logic, mechanical reasoning, and fundamental chemistry simulations (e.g., atomic models, reactivity).	B1 Students will apply logical thinking to real-world modeling and lab-based investigations. They will justify simulation outcomes using basic data structures and computation. Students will show problem-solving progression using Python, formulas, and visual representation tools (e.g., charts, models).	C1 Students will evaluate the logical consistency of their models and conclusions. They will revise hypotheses based on simulation feedback, connect physical laws across multiple systems, and apply integrated reasoning across interdisciplinary contexts, including ecosystem modeling, energy cycles, and electromagnetism.

Course Contents/Topics

Term 1 – Scientific Foundations in Motion, Energy, and Electricity

Core Scientific Inquiry Skills
- Understand and apply the stages of scientific inquiry (question, hypothesis, variables, method, data collection, analysis, conclusion).
- Design lab setups, simulations, and execute investigations using digital or Python-coded simulations.
- Explore models and cause-effect reasoning using digital platforms (PhET, Pivot, Labster, custom-coded models).
- Communicate findings through simulation-based data presentation and iterative testing.
- Use visualization tools and physics-based digital models to analyze real-world systems and evaluate variables.

Mechanics and Energy Concepts
- Newton's laws, motion, forces, energy conservation, friction, ramps, collisions, simple and compound machines.
- Simulate mechanical systems using interactive or Python-coded tools.

Thermodynamics
- Particle motion and temperature, heat transfer through conduction, convection, radiation.
- Explore thermal systems, insulation, and energy transformations.

Electricity and Circuit Fundamentals
- Build understanding of electric current, voltage, resistance, simple circuit systems.
- Simulate and measure electric systems using virtual platforms.

Term 2 – Fields, Waves, and Quantum Foundations

Electromagnetism
- Magnetic and electric field interactions, electromagnetism, motors, generators, and practical applications.
- Explore real-life examples (e.g., speakers, sensors, energy transfer devices).

Waves and Radiation
- Study of sound and light waves, reflection, refraction, the electromagnetic spectrum.
- Analyze wave properties and apply them to communication and technology.

Quantum Physics Foundations
- Atomic transitions, discrete energy levels, photon emission/absorption, energy quantization.
- Model subatomic behaviors with Python-based or platform-based tools (Labster, custom code)

Chemistry Integrated
- Atomic and molecular structure, electron configurations, chemical bonding.
- Simulations on chemical reactions, conservation of mass, and energy changes.
- Chemistry is incorporated through physical principles and is essential to the overall understanding.

Term 3 – Life, Earth, and Cognitive Systems

Interdisciplinary Applications
- Biology: Body systems, neural coordination, molecular signaling, sensory integration.
- Psychology: Cognitive processing, stimulus-response systems, behavior and brain functions.
- Ecology: Ecosystem dynamics, food webs, environmental modeling and sustainability.
- Earth Science: Plate tectonics, seismic activity, planetary heat systems and Earth's energy flows.

Digital Final Portfolio
- Students complete a comprehensive final digital portfolio by choosing a research topic or scientific phenomenon of interest.
- The project synthesizes learning from physics, chemistry, biology, psychology, earth science, and coding.
- Portfolio components may include lab reports, visual models, simulation results, reflections, and documentation of inquiry and findings.

Modes of Assessment

Formative & Summative Assessments

Formative Assessments
Categories:
Problem-solving Test (Pass/Fail — prerequisite for all other assessments)
Project Submission/Presentation
Mini Research Paper
Portfolio Progress Check

Content:
Chapter-based concepts and content (varies depending on class focus)
Early development of the final digital portfolio, including topic proposal, research planning, and simulation/modeling drafts

Submission Method:
All submissions must be digital (via Google Classroom)

Summative Assessments
Categories:
Problem-solving Test (Pass/Fail — prerequisite for all other assessments)
Project Submission/Presentation
Mini Research Paper
Portfolio Progress Check

Format:
Oral Testing (online — synchronous or video recording)
Final Digital Portfolio Submission and Presentation (can include lab simulations, models, code output, visual summaries, and written reflections)

Content:
Chapter-based concepts and content (topics may be adjusted based on current class emphasis and recent scientific trends)
Culmination of learning through the Digital Final Portfolio: a student-designed investigation or research-based project integrating physics, chemistry, biology, psychology, earth science, and coding