CARSON GRAHAM
SECONDARY

COURSE OUTLINE – DP PHYSICS

Course Description:

The purpose of this two-year course is to provide students with an understanding of both the theoretical and practical nature of physics and to increase facility in the use of mathematics, which is the language of physics. This course will provide students with the opportunity to explore physics as it was developed historically from about Galileo's time to the present. A key objective is to challenge students to think about how physical principles have been applied to construct and alter the material world to suit our needs. This raises the issue of the impact of physics on society, the moral and ethical dilemmas, and the social, economic and environmental implications of the work of physicists. These concerns have become more prominent as our power over the environment has grown. Students will also explore the international context within which physics exists and examine issues from more than one side. **Laboratory work forms an integral part of the course.**

Nature of Science (NOS)

The Nature of science (NOS) is an overarching theme in IB biology, chemistry and physics courses. Students will investigate throughout the course the nature of science in the 21st century in connection to the curricular content.

1. What do we want to know in science?
2. What is the scientific endeavour?
3. What type of knowledge do we produce?
4. What is the impact of scientific knowledge?

Group 4 aims

Through studying biology, chemistry or physics, students should become aware of how scientists work and communicate with each other. While the scientific method may take on a wide variety of forms, it is the emphasis on a practical approach through experimental work that characterizes these subjects.

The aims enable students, through the overarching theme of the Nature of science, to:

1. develop conceptual understanding that allows connections to be made between different areas of the subject, and to other DP sciences subjects
2. acquire and apply a body of knowledge, methods, tools and techniques that characterize science
3. develop the ability to analyse, evaluate and synthesize scientific information and claims
4. develop the ability to approach unfamiliar situations with creativity and resilience
5. design and model solutions to local and global problems in a scientific context
6. develop an appreciation of the possibilities and limitations of science
7. develop technology skills in a scientific context
8. develop the ability to communicate and collaborate effectively
9. develop awareness of the ethical, environmental, economic, cultural and social impact of science.

IB Concepts and Considerations

- **THEORY OF KNOWLEDGE (TOK):** Students will reflect on the nature of knowledge in Physics, and on how we know what we claim to know throughout the course.
- **CREATIVITY, ACTIVITY, SERVICE (CAS):** Students will be encouraged to consider ways they can take meaningful action in their CAS activities connected to topics learned in Physics throughout the course.
- **APPROACHES TO LEARNING (ATL): Thinking, Social, Communication, Research**, and **Self-Management** skills will be developed and encouraged throughout the course.
- **LEARNER PROFILE ATTRIBUTES (LP):** Connections will be made to the IB Learner Profile Attributes (**Inquirer, Knowledgeable, Thinker, Communicator, Principled, Open-minded, Caring, Risk-taker, Balanced,** and **Reflective)** throughout the course. Students are encouraged to embody these traits as IB learners.

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Course Syllabus:

The syllabus content for the IB chemistry program consists of the core academic material and the Additional Higher Level material. Each topic will contain both core and AHL material. Students will develop and practice the tools and inquiry process throughout the course through experimentation and Internal Assessment tasks. The skills in the study of chemistry are assessed through internal and external assessment.

Year 1

Grade 11

Core (SL + HL)	HL

• **Tool 3 with Introduction to Tools 1 and 2:** Introduction to experiments. [Uncertainty and Data]
• **A.1-A.3:** Mechanics
  ○ Kinematics (Motion and Projectiles).
  ○ Newton's Laws/Dynamics.
  ○ Momentum.
  ○ Energy.
• **C.1 - C.5**: Waves
• **A.2 and D.1:** Circular Motion and Gravitation
• **A.2**: Fluids and fluid dynamics
	• **C.1, C.3, C.5:** Waves HL component
	• **A.4**: Rigid Body Mechanics

The Collaborative sciences project is an interdisciplinary sciences project, providing a worthwhile challenge to DP students, addressing real-world problems that can be explored through the sciences. Through identification and research of complex issues, students can develop and understanding of how interrelated systems, mechanisms, and processes impact a problem. Students will develop an understanding of the extent of global interconnectedness between regional, national, and local communities, which will empower them to become active and engaged citizens of the world.

Year 2

Core (SL + HL)	HL
• **B.1 – B.2**: Thermal Energy Transfers and the Greenhouse Effect • **B.3:** Gas Laws • **D.2, B.5, D.3**: Electricity and Magnetism • **E.1, E.3, E.4, E.5**: Atomic, Nuclear, and Particle Physics	• **A.5**: Galiean and Special Relativity • **B.4**: Thermodynamics • **D.1, D.2, D.4**: Fields and Electric Induction • **E.1 - E.3:** Atomic, Nuclear, and Quantum Physics

The scientific investigation is an open-ended task in which the student gathers and analyses data in order to answer their own formulated research question. The outcome of the scientific investigation will be assessed through the form of a written report. The maximum overall word count for the report is 3,000 words.

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Assessment Objectives:

The assessment objectives for biology, chemistry and physics reflect those parts of the aims that will be formally assessed either internally or externally. It is the intention of these courses that students are able to fulfill the following assessment objectives:

1. Demonstrate knowledge of:
    a. Terminology, facts and concepts
    b. Skills, techniques, and methodologies
2. Understand and apply knowledge of:
    a. Terminology and concepts
    b. Skills, techniques, and methodologies.
3. Analyze, evaluate, and synthesize:
    a. Experimental procedures
    b. primary and secondary data
    c. trends, patterns, and predictions.
4. Demonstrate the application of skills necessary to carry out insightful and ethical investigations.

Assessment Overview:

IB Assessment consists of two parts as specified by the International Baccalaureate Organization: External Assessments (Final Exams in May of Year 2) and Internal Assessment (labwork, the Collaborative Sciences Project, and the Scientific Investigation).

Students in this course will be assessed by:

- using the IB 7-point scale on formative and summative assessments relating to the syllabus
- using assessment criteria rubrics for formative and summative assessments relating to labwork

The course will be geared towards preparing the students for the IB exams that take place in May of Year 2. Teachers will use cumulative evaluation (quizzes, unit tests, etc) throughout the course that will give both the student and the teacher a snapshot of the student's progress in terms of their understanding of the curriculum. Teachers will report out each term on a student's current IB level which culminates to an IB predicted score at the end of the course.

SL Assessment Outline

Assessment component	Weighting
External assessment (3 hours)	**80%**
Paper 1 (1 hour and 30 minutes) Paper 1A—Multiple-choice questions Paper 1B—Data-based questions (Total 55 marks)	**36%**
Paper 2 (1 hour and 30 minutes) Short-answer and extended-response questions (Total 50 marks)	**44%**
Internal assessment (10 hours)	**20%**
The internal assessment consists of one task: the scientific investigation. This component is internally assessed by the teacher and externally moderated by the IB at the end of the course. (Total 24 marks)	

HL Assessment Outline

Assessment component	Weighting
External assessment (4 hours and 30 minutes)	**80%**
Paper 1 (2 hours) Paper 1A—Multiple-choice questions Paper 1B—Data-based questions (Total 75 marks)	**36%**
Paper 2 (2 hours and 30 minutes) Short-answer and extended-response questions (Total 90 marks)	**44%**
Internal assessment (10 hours)	**20%**
The internal assessment consists of one task: the scientific investigation. This component is internally assessed by the teacher and externally moderated by the IB at the end of the course. (Total 24 marks)	

Internal Assessment

The internal assessment consists of a mixture of short- and long-term investigations (such as practical lab work and projects), an interdisciplinary project called the Collaborative Sciences Project and the Scientific Investigation, which is assessed against the following four criteria; research design, data analysis, conclusion, evaluation.

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Assessment Timeline

Quizzes, Tests, Labwork, etc Ongoing throughout the course

Year 1		Year 2	
Collaborative Sciences Project	Spring	Scientific Investigation	Fall/Winter
Year Exam	June		

Grade Descriptors:

Grade 7

Displays comprehensive knowledge of factual information in the syllabus and a thorough command of concepts and principles. Selects and applies relevant information, concepts and principles in a wide variety of contexts. Analyses and evaluates quantitative and/or qualitative data thoroughly. Constructs detailed explanations of complex phenomena and makes appropriate predictions. Solves most quantitative and/or qualitative problems proficiently. Communicates logically and concisely using appropriate terminology and conventions. Shows insight or originality.
Demonstrates personal skills, perseverance and responsibility in a wide variety of investigative activities in a very consistent manner. Works very well within a team and approaches investigations in an ethical manner, paying full attention to environmental impact. Displays competence in a wide range of investigative techniques, pays considerable attention to safety, and is fully capable of working independently.

Grade 6

Displays very broad knowledge of factual information in the syllabus and a thorough understanding of concepts and principles. Selects and applies relevant information, concepts and principles in most contexts. Analyses and evaluates quantitative and/or qualitative data with a high level of competence. Constructs explanations of complex phenomena and makes appropriate predictions. Solves basic or familiar problems and most new or difficult quantitative and/or qualitative problems. Communicates effectively using appropriate terminology and conventions. Shows occasional insight or originality.
Demonstrates personal skills, perseverance and responsibility in a wide variety of investigative activities in a very consistent manner. Works well within a team and approaches investigations in an ethical manner, paying due attention to environmental impact. Displays competence in a wide range of investigative techniques, pays due attention to safety and is generally capable of working independently.

Grade 5

Displays broad knowledge of factual information in the syllabus. Shows sound understanding of most concepts and principles and applies them in some contexts. Analyses and evaluates quantitative and/or qualitative data competently. Constructs explanations of simple phenomena. Solves most basic or familiar problems and some new or difficult quantitative and/or qualitative problems. Communicates clearly with little or no irrelevant material.
Demonstrates personal skills, perseverance and responsibility in a variety of investigative activities in a fairly consistent manner. Generally works well within a team and approaches investigations in an ethical manner, paying attention to environmental impact. Displays competence in a range of investigative techniques, pays attention to safety and is sometimes capable of working independently.

Grade 4

Displays reasonable knowledge of factual information in the syllabus, though possibly with some gaps. Shows adequate comprehension of most basic concepts and principles but with limited ability to apply them. Demonstrates some analysis or evaluation of quantitative or qualitative data. Solves some basic or routine problems but shows limited ability to deal with new or difficult situations. Communicates adequately although responses may lack clarity and include some repetitive or irrelevant material.
Demonstrates personal skills, perseverance and responsibility in a variety of investigative activities, although displays some inconsistency. Works within a team and generally approaches investigations in an ethical manner, with some attention to environmental impact. Displays competence in a range of investigative techniques, pays some attention to safety although requires some close supervision.

Grade 3

Displays limited knowledge of factual information in the syllabus. Shows a partial comprehension of basic concepts and principles and a weak ability to apply them. Shows some ability to manipulate data and solve basic or routine problems. Communicates with a possible lack of clarity and uses some repetitive or irrelevant material.
Demonstrates personal skills, perseverance and responsibility in some investigative activities in an inconsistent manner. Works within a team and sometimes approaches investigations in an ethical manner, with some attention to environmental impact. Displays competence in some investigative techniques, occasionally pays attention to safety, and requires close supervision.

Grade 2

Displays little recall of factual information in the syllabus. Shows weak comprehension of basic concepts and principles with little evidence of application. Exhibits minimal ability to manipulate data and little or no ability to solve problems. Offers responses which are often incomplete or irrelevant.
Rarely demonstrates personal skills, perseverance or responsibility in investigative activities. Works within a team occasionally but makes little or no contribution. Occasionally approaches investigations in an ethical manner, but shows very little awareness of the environmental impact. Displays competence in a very limited range of investigative techniques, showing little awareness of safety factors and needing continual and close supervision.

Grade 1

Recalls fragments of factual information in the syllabus and shows very little understanding of any concepts or principles.
Rarely demonstrates personal skills, perseverance or responsibility in investigative activities. Does not work within a team. Rarely approaches investigations in an ethical manner, or shows an awareness of the environmental impact. Displays very little competence in investigative techniques, generally pays no attention to safety and requires constant supervision.

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BC Ministry Requirements:
In line with the philosophy of the IB Diploma Programme, students will be assessed against the course objectives at their current level of achievement on the 7-point scale throughout the course. As required by the Ministry of Education, students will also be given a percentage converted from the IB level that reflects their achievement in relation to the corresponding BC Curriculum course.

Academic Honesty and Personal Integrity

The faculty at Carson Graham expects our students to complete academic and nonacademic work that is authentic and respectful of intellectual property. As diploma candidates, you are expected to adhere to the school's Policy for Academic Integrity, and also to the principles and practices set out in the IB document, Diploma Programme: Academic Honesty, 2011. Ignorance of the standards related to academic honesty and student integrity is not an excuse for dishonesty, plagiarism and malpractice. You are expected to familiarize yourself with the policy.

In accordance with this policy, students can use advanced automated tools (artificial intelligence or machine learning tools such as ChatGPT or Dall-E 2) on assignments in this course if instructor permission is obtained in advance. Unless permission is given to use the aforementioned tools, each student is expected to complete each assignment without substantive assistance from others, including automated tools. Additionally, if students are allowed to use advanced automated tools on assignments in this course, that use must be properly documented and credited. For example, text generated using ChatGPT-3 should include a citation such as: "Chat-GPT-3. (YYYY, Month DD of query). "Text of your query." Generated using OpenAI. https://chat.openai.com/" Material generated using other tools should follow a similar citation convention.[1]

[1] Adapted from https://learninginnovation.duke.edu/ai-and-teaching-at-duke-2/artificial-intelligence-policies-in-syllabi-guidelines-and-considerations/

http://www.sd44.ca/school/carson/Documents/Carson%20Graham%20Policy%20for%20Academic%20Honesty%20June%202015.pdf