IB Physics

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LEARNING CENTER

Course Description

The IB Physics course provides students with a comprehensive understanding of key physics principles and their real-world applications through both theoretical and practical approaches. Covering topics like mechanics, electricity, waves, thermodynamics, and modern physics, the curriculum promotes critical thinking and problem-solving through laboratory work and projects. Available at standard level (SL) and higher level (HL), the course also addresses the philosophical aspects of scientific discoveries. Assessments include exams and projects, preparing students for further studies in physics and engineering while fostering informed citizenship in a technological society.

Course Objectives

Conceptual Understanding

Develop a deep understanding of fundamental physics concepts and principles, enabling students to apply their knowledge to solve complex problems and analyze real-world situations.

Practical Skills

Enhance practical and experimental skills through hands-on laboratory work, encouraging inquiry-based learning and fostering critical thinking, teamwork, and effective communication.

Scientific Literacy and Responsibility

Cultivate an appreciation for the role of physics in everyday life and technology, promoting ethical considerations and encouraging students to become informed and responsible citizens in a scientifically advanced society.

Syllabus Structure

1	**Space, Time, and Motion** Students learn the basics of motion, including kinematics, distance, time, and velocity, along with forces and momentum. Advanced students (HL) study rigid body mechanics and delve into Galilean and Special Relativity, which explain how motion varies in different frames of reference.
2	**The Particulate Nature of Matter** This section focuses on how heat transfers and the greenhouse effect relate to climate change. Students learn gas behaviors through gas laws. Advanced learners tackle complex thermodynamics and electrical principles regarding currents and circuits.
3	**Wave Behaviour** Students investigate oscillatory motion through simple harmonic motion and learn about wave properties. HL students explore advanced concepts like standing waves, resonance, and the Doppler effect, which has applications in fields like astronomy.
4	**Fields** Students study gravitational fields and how gravitational forces work. They also explore electric and magnetic fields, learning about interactions between charged particles. HL students focus on motion in electromagnetic fields and how electromagnetic induction is applied in technology.
5	**Nuclear and Quantum Physics** This section covers atomic structure and the significance of its components. HL learners study quantum physics and radioactive decay, along with safety concerns. Students also learn about nuclear fission and fusion, focusing on their roles in energy production and stellar processes.

External Assessment Criteria

External Assessment: HL

Paper 1

- **Duration:** 2 hours
- **Weighting:** 36%
- **Marks:** 60
- Contains multiple-choice and data-based questions.

Paper 2

- **Duration:** 2 hours 30 minutes
- **Weighting:** 44%
- **Marks:** 90
- Includes short-answer and extended-response questions.

Note: Calculators are permitted. Students must have a clean copy of the Physics data booklet.

External Assessment: SL

Paper 1

- **Duration:** 1 hour 30 minutes
- **Weighting:** 36%
- **Marks:** 45
- Contains multiple-choice and data-based questions.

Paper 2

- **Duration:** 1 hour 30 minutes
- **Weighting:** 44%
- **Marks:** 50
- Includes short-answer and extended-response questions.

Note: Calculators are permitted.

Internal Assessment Criteria

Internal Assessment: SL & HL

The Scientific Investigation

- **Duration:** 10 hours
- **Weighting:** 20%

The Internal Assessment (IA), worth 20% of the final assessment, consists of a single task—the scientific investigation. This open-ended task allows students to formulate their own research questions, gather and analyze data to answer them, and present their findings in a written report.

Report Specifications

Maximum Word Count: 3,000 words (charts, diagrams, data tables, equations, citations, and bibliography do not count toward this total)

Report Requirements

At the start of the report, include:

- Title of the investigation
- Candidate's personal code (e.g., xyz123)
- Group members' personal codes (if applicable)
- Total word count

Criteria Breakdown

1

Research Design

Assesses how well the student communicates the methodology to address the research question.

Clarifications:

- A strong research question includes dependent and independent variables and relevant background theory.
- Methodological considerations should cover measurement methods, data selection, control variables, and safety.

2

Data Analysis

Evaluates how well data is recorded, processed, and presented relevant to the research question.

Clarifications:

- Data includes quantitative and qualitative elements.
- Clear communication means the method can be easily understood.

3

Conclusion

Assesses how effectively the student answers their research question based on their analysis.

Clarifications:

- Conclusions should interpret processed data, including uncertainties, and reference accepted scientific context.

4

Evaluation

Evaluates the report's discussion of the investigation methodology and suggested improvements.

Clarifications:

- Methodological weaknesses may include variable control and measurement precision.
- Limitations might refer to data range or assumptions made during the investigation.

Learning Approaches

Affective Skills

Develop emotional awareness in students, helping them understand their feelings and attitudes towards learning, fostering a positive learning environment.

Metacognitive Skills

Cultivate self-awareness in learning by having students reflect on their own thought processes, assess their understanding, and adapt their study strategies based on experiences.

Cognitive Skills

Encourage critical thinking and problem-solving abilities by challenging students to ask questions, analyze information, and design experimental procedures.

Interdisciplinary Connections

Promote connections between physics and other subjects, encouraging students to apply principles learned in physics to real-world situations and other academic disciplines.

Teaching Approaches

Concept-Based Learning

Emphasize understanding over memorization by teaching key concepts that are interrelated, allowing students to connect new knowledge with prior experiences.

Contextualized Instruction

Relate physics concepts to real-world applications, helping students understand the relevance of their studies to current global issues and their personal lives.

Inquiry-Based Learning

Foster scientific inquiry by encouraging students to formulate research questions and engage in hands-on experiments, promoting active participation and discovery.

Collaborative Learning

Encourage group work and peer interaction, allowing students to share diverse perspectives, learn from one another, and develop social skills essential for teamwork.

Assessment Breakdown

External Assessment (80%)

Paper 1 (36%)

- **Duration:** 2 hours
- **Marks:** 60
- **Format:** Two booklets
  - Paper 1A: 40 Multiple-Choice Questions
  - Paper 1B: Data-Based Questions
- **Syllabus Coverage:** SL & HL Material
- **Assessment Objectives:** 1, 2, and 3

Paper 2 (44%)

- **Duration:** 2 hours 20 minutes
- **Marks:** 90
- **Format:** Short-Answer and Extended-Response Questions
- **Syllabus Coverage:** SL & HL Material
- **Assessment Objectives:** 1, 2, and 3

Internal Assessment (20%)

Scientific Investigation

- **Duration:** 10 hours
- **Marks:** 24
- **Assessment:** Teacher-assessed, externally moderated by the IB.

Standard Level (SL) Assessment Breakdown

External Assessment (80%)

Paper 1 (36%)

- **Duration:** 1 hour 30 minutes
- **Marks:** 45
- **Format:** Two booklets
  - Paper 1A: 25 Multiple-Choice Questions
  - Paper 1B: Data-Based Questions
- **Syllabus Coverage:** SL Material Only
- **Assessment Objectives:** 1, 2, and 3

Paper 2 (44%)

- **Duration:** 1 hour 30 minutes
- **Marks:** 50
- **Format:** Short-Answer and Extended-Response Questions
- **Syllabus Coverage:** SL Material Only
- **Assessment Objectives:** 1, 2, and 3

Internal Assessment (20%)

Scientific Investigation

- **Duration:** 10 hours
- **Marks:** 24
- **Assessment:** Teacher-assessed, externally moderated by the IB.

Learning Platform for Past Papers

To further support our students, we offer access to a specialized learning platform utilized by international schools. This platform allows students to:

Practice Past Papers

Drill past papers and practice exam-style questions, ensuring they are well-prepared for assessments.

Instant Feedback

Receive instant feedback on their performance and areas for improvement.

Access Resources

Access a wide bank of resources, including study guides and exam tips tailored for IB Mathematics.

Interactive Quizzes

Engage in interactive quizzes to reinforce learning and assess your understanding.