Physics SL/HL

Course Description

Physics is the most fundamental of the experimental sciences as it seeks to explain the universe itself, from the very smallest particles to the vast distances between galaxies. Despite the exciting and extraordinary development of ideas throughout the history of physics, observations remain essential to the very core of the subject. Models are developed to try to understand observations, and these themselves can become theories that attempt to explain the observations.

Besides helping us better understand the natural world, physics gives us the ability to alter our environments. 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.

By studying 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 the subject. Teachers provide students with opportunities to develop manipulative skills, design investigations, collect data, analyse results and evaluate and communicate their findings.

Implementation:

Physics is taught at standard level (SL), 4 classes per week or higher level (HL), 6 classes per week in the mixed class. Students at HL are required to study some topics in greater breath and depth.

Aims:

Through the overarching theme of the nature of science, the aims of the DP physics course are to enable students 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.

Curriculum overview

Topic/unit	Teaching hours (45min) Standard level	Teaching hours (45min) Higher level
Year 1	**128**	**192**
Measurements and uncertainties	6	8
Mechanics	29	33
Circular motion and gravitation	6	8
Thermal physics	15	20
Engineering physics	22	33
Oscillations and waves	20	23
Wave phenomena		23
Prescribed and other practical activities	17	31
Collaborative sciences project	13	13
Year 2	**92**	**138**
Electricity and magnetism	20	20
Fields	5	13
Electromagnetic Induction	10	20
Energy production	11	11
Atomic, particle and nuclear physics	19	19
Quantum and nuclear physics	4	20
Prescribed and other practical activities	10	22
Individual investigations	13	13

Assessment

It is the intention of this course that students are able to fulfill the following assessment objectives:

1. Demonstrate knowledge and understanding of:
   - facts, concepts, and terminology
   - methodologies and techniques
   - communicating scientific information.
2. Apply:
   - facts, concepts, and terminology
   - methodologies and techniques
   - methods of communicating scientific information.
3. Formulate, analyse and evaluate:
   - hypotheses, research questions and predictions
   - methodologies and techniques
   - primary and secondary data
   - scientific explanations.
4. Demonstrate the appropriate research, experimental, and personal skills necessary to carry out insightful and ethical investigations.

The final assessment is a combination of external and internal assessment.

Assessment at a glance

Type of assessment	Format of assessment	Standard level		Higher level	
		Time (60 min hours)	Weighting of final grade (%)	Time (60 min hours)	Weighting of final grade (%)
External		**3**	**80**	**4,5**	**80**
Paper 1	Multiple-choice questions	0,75	20	1	20
Paper 2	Short answer and extended response questions	1,25	40	1,25	20
Paper 3	Data- and practical-based questions plus, short answer and extended response questions on the option	1	20	2,25	36
Internal		**10**	**20**	**10**	**20**
Individual investigation	Investigation and write-up of 6 to 12 pages	10	20	10	20

Sample questions

- Some of the properties that can be demonstrated using waves are: I. Refraction, II. Polarization, III. Diffraction. Which properties can be demonstrated using sound waves? (Paper 1)
  A. I and II only
  B. I and III only
  C. II only
  D. III only

- There is a suggestion that the temperature of the Earth may increase if the use of fossil fuels is not reduced over the coming years. Explain, with reference to the enhanced greenhouse effect, why this temperature increase may occur. (Paper 2)

- In an experiment to measure the specific heat capacity of a metal, a piece of metal is placed inside a container of boiling water at 100°C. The metal is then transferred into a calorimeter containing water at a temperature of 10°C. The final equilibrium temperature of the water was measured. One source of error in this experiment is that the small mass of boiling water will be transferred to the calorimeter along with the metal.
  (a) Suggest the effect of the error on the measured value of the specific heat capacity of the metal
  (b) State one other source of error for this experiment (Paper 3)