Physics 11 / Advanced Physics 11

Outcomes

NOVA SCOTIA
NOUVELLE-ÉCOSSE

2015

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Physics 11 / Advanced Physics 11

Prepared by the Department of Education and Early Childhood Development

This is the most recent version of the current curriculum materials as used by teachers in Nova Scotia.

Physics 11 / Advanced Physics 11

General Curriculum Outcomes

STSE

1. Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology.

Skills

2. Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.

Knowledge

3. Students will construct knowledge and understandings of concepts in life science, physical science, and Earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.

Attitudes

4. Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society, and the environment.

Specific Curriculum Outcomes

Students in Advanced Physics 11 will be expected to achieve the outcomes for Physics 11 as well as those for Advanced Physics 11.

Students will be expected to

Kinematics (15%) (Advanced, 10%)

PRESENTING VECTORS

- identify the frame of reference for a given motion and to distinguish fixed and moving frames (325-7)
- identify and investigate questions that arise from practical problems/issues involving motion (212-1)

VECTOR ANALYSIS

- use vectors to represent position, displacement, velocity, and acceleration (325-5)
- analyze and describe vertical motion using the principles of kinematics (116-2)

ALGEBRAIC PROBLEM SOLVING

- analyze word problems, solve algebraically for unknowns, and interpret patterns in data (325-2)

Dynamics (22%) (Advanced, 18%)

DYNAMICS INTRODUCTION

- analyze the influence of society on scientific and technological endeavours in dynamics (117-2)
- describe and evaluate the design of technological solutions and the way they function, using scientific principles (116-6)
- analyze natural and technological systems to interpret and explain their structure and dynamics (116-7)
- use vectors to represent forces (325-5)

NEWTON'S LAWS

- apply Newton's laws of motion to explain inertia and the relationships among force, mass, and acceleration (325-8)
- design an experiment identifying and controlling major variables (212-3)
- evaluate and select appropriate instruments for collecting evidence and appropriate processes for problem solving, inquiring, and decision making (212-8)
- carry out procedures controlling the major variables and adapting or extending procedures where required (213-2)
- use instruments effectively and accurately for collecting data (213-3)
- compile and display evidence and information, by hand or computer, in a variety of formats, including diagrams, flow charts, tables, graphs, and scatter plots (214-3)
- interpret patterns and trends in data and infer or calculate linear and non-linear relationships among variables (214-5)
- analyze and describe examples where knowledge of the dynamics of bodies was enhanced or revised as a result of the invention of a technology (116-2)
- explain how a major scientific milestone revolutionized thinking in dynamics (115-3)

MOMENTUM INTRODUCTION

- describe the functioning of technology devices based on principles of momentum (116-5)

Momentum and Energy (35%) (Advanced, 30%)

CONSERVATION OF MOMENTUM

- apply quantitatively the law of conservation of momentum to one-dimensional collisions and explosions (326-3)

Work, Power, and Efficiency

- analyze quantitatively the relationships among force, distance, and work (325-9)
- analyze quantitatively the relationships among work, time, and power (325-10)
- design and carry out an experiment to determine the efficiency of various machines (212-3, 213-2, 213-3, 214-7)

Transformation, Total Energy, and Conservation

- analyze quantitatively the relationships among mass, speed, and thermal energy, using the law of conservation of energy (326-1)
- describe quantitatively mechanical energy as the sum of kinetic and potential energies (326-5)
- compare empirical and theoretical values of total energy and account for discrepancies (214-7)
- analyze quantitatively problems related to kinematics and dynamics using the mechanical energy concept (326-6)
- analyze common energy transformation situations using the closed system work-energy theorem (326-7)
- analyze and describe examples where technological solutions were developed based on scientific understanding (116-4)
- determine the percentage efficiency of energy transformation (326-8)
- design an experiment, select and use appropriate tools, carry out procedures, compile and organize data, and interpret patterns in the data to answer a question posed regarding the conservation of energy (212-3, 212-8, 213-2, 214-3, 214-5, 214-11, 326-4)
- distinguish between problems that can be solved by the application of physics-related technologies and those that cannot (118-8)
- determine which laws of conservation, momentum, and energy are best used to analyze and solve particular real-life problems in elastic and inelastic interactions (326-4)

Technological Implications

- analyze and describe examples where energy- and momentum-related technologies were developed and improved over time (115-5, 116-4)
- describe and evaluate the design of technological solutions and the way they function using principles of energy and momentum (116-6)
- explain the importance of using appropriate language and conventions when describing events related to momentum and energy (114-9)

Waves (28%) (Advanced, 22%)

Fundamental Properties

- describe the production, characteristics, and behaviours of longitudinal and transverse mechanical waves (327-1)
- formulate operational definitions of major variables (212-7)
- select and integrate information from various print and electronic sources (213-7)
- analyze, from a variety of perspectives, the risks and benefits to society and to the environment when applying scientific knowledge or introducing a particular technology (118-2)
- analyze natural and technological systems to interpret their structure and dynamics (116-7)
- analyze society's influence on scientific and technological endeavours (117-2)
- construct and test a prototype of a device and troubleshoot problems as they arise (214-14)

- analyze why and how a particular technology was developed and improved over time (115-5)
- apply the universal wave equation to explain and predict the behaviour of waves (327-2)
- implement appropriate sampling procedures and evaluate the relevance, reliability, and adequacy of data and data collection methods in wave experiments (213-1, 214-8)
- apply the laws of reflection and the laws of refraction to predict wave behaviour (327-7)
- state a prediction and a hypothesis about wave behaviour based on available evidence and background information (212-4)

SOUND WAVES AND ELECTROMAGNETIC RADIATION

- apply the laws of reflection and the laws of refraction to predict wave behaviour (327-7)
- explain qualitatively and quantitatively the phenomena of wave interference, diffraction, reflection and refraction, and the Doppler-Fizeau effect (327-8)
- compare and describe the properties of electromagnetic radiation and sound (327-5)
- describe how sound and electromagnetic radiation, as forms of energy transfer, are produced and transmitted (327-6)
- analyze and describe examples where scientific understanding was enhanced as a result of the invention of a technological device (116-2)

Advanced Physics 11 Outcomes

IN-DEPTH TREATMENT (COMPLETED WITHIN THE UNITS)

- use vectors to represent position, displacement, velocity, and acceleration (325-5)
- identify and investigate questions that arise from practical problems/issues involving motion (212-1)
- analyze word problems, solve algebraically for unknowns, and interpret patterns in data (325-2)
- design an experiment, select and use appropriate tools, carry out procedures, compile and organize data, and interpret patterns in the data to answer a question posed regarding the conservation of energy (212-3, 212-8, 213-2, 214-3, 214-5, 214-11, 326-4)
- analyze quantitatively the relationships among mass, speed, kinetic energy, and heat using the law of conservation of energy (326-1)
- apply quantitatively the law of conservation of momentum to one-dimensional collisions and explosions (326-3)
- design and carry out an experiment to determine the efficiency of various machines (212-3, 213-2, 213-3, 214-7)
- describe the production, characteristics, and behaviours of longitudinal and transverse mechanical waves (327-1)

LITERATURE SEARCH AND REPORT (5%)

- develop and explain a time line of light (AP-01)
- outline the past/present scientific discoveries and match with the time line (AP-02)

INVESTIGATION: AN INDEPENDENT STUDY/EXPERIMENT (15%)

- gain information through modelling and guidance on the processes involved in scientific research and development (AP-05)
- construct a hands-on, self-directed experience and generate a report for public presentation (AP-06)