Australian Science Olympiad Exam Physics

This exam focuses on testing skills rather than knowledge. To do well students need to approach the problems logically and apply physical reasoning to the scenarios described. To solve the problems students may be expected to use mathematics such as algebra, trigonometry, logarithms and vector addition, read, plot or sketch graphs, estimate physical quantities, make approximations and use dimensional analysis. Students will also be expected to explain their answers in words and diagrams.

Questions may be asked on any topic; students are not always expected to be familiar with the topic. In such cases sufficient information to solve the problem is provided in the question.

Students are expected to know about experimental methods, especially methods of measurement using devices commonly found in homes and schools and methods of reducing uncertainties in measured and calculated values.

It is also expected that students have a sound understanding of Newton's laws of motion and the principle of conservation of energy. In conjunction with this a knowledge of associated physical quantities such as, e.g., momentum, kinetic energy, velocity, etc., common forces such as the gravitational, frictional and elastic forces and, if appropriate, the associated potential energies is required too. Further, students should be familiar with uniform circular motion and kinematics in two dimensions.

Other topics about which students are expected to have some knowledge are thermodynamics, waves, electrostatics and electricity. In each case students should be familiar with the relevant physical quantities in addition to understanding the physical concepts. In thermodynamics students should be familiar with the concepts of heat, temperature, pressure and specific heat capacity.

They should also know the ideal gas equation of state. In electricity students should know Ohm's law, the power dissipated in an electric circuit and how to calculate the resistance of a combination of resistors. In electrostatics students should know the electric field due to a point charge, be able to draw electric fields created by a distribution of charges and calculate the force on a charged object due to an electric field.

Students should be familiar with the properties of both standing and travelling waves and Snell's law. Students should understand the principle of superpostion and be able to apply it to both waves and electric fields.

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Physics Exam Format

The physics NQE will consist of two sections, Part A will contain some multiple choice questions and Part B will consist of some written questions. Students should attempt all questions. The marks allocated to each section will be given on the exam paper and may vary from year to year. There will be no penalty (negative marking) for incorrect answers. The multiple choice questions will cover basic concepts, primarily (but not exclusively) in mechanics. The written questions will cover a range of topics.