

A L e v e l P h y s i c s

OCR Physics Specification A - H156/H556

Mathematical Requirements

| **You should be able to:** | **Progress and understanding:** |
| --- | --- |
| **1** | **2** | **3** | **4** |
| **M0 – Arithmetic and Numerical Computation** |
| Recognise and make use of appropriate units in calculations. |  |  |  |  |
| Recognise and use expressions in decimal and standard form. |  |  |  |  |
| Use ratios, fractions and percentages. |  |  |  |  |
| Estimate results. |  |  |  |  |
| Use calculators to find and use power, exponential and logarithmic functions. [A Level only] |  |  |  |  |
| Use calculators to handle sin *x,* cos *x* and tan *x* when *x* is expressed in degrees or radians. |  |  |  |  |
| **M1 – Handling Data** |
| Use an appropriate number of significant figures. |  |  |  |  |
| Find arithmetic means. |  |  |  |  |
| Understand simple probability. |  |  |  |  |
| Make order of magnitude calculations. |  |  |  |  |
| Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined by addition, subtraction, multiplication, division and raising to powers. |  |  |  |  |
| **M2 – Algebra** |  |  |  |  |
| Understand and use the symbols:  |  |  |  |  |
| Change the subject of an equation, including non-linear equations. |  |  |  |  |
| Substitute numerical values into algebraic equations using appropriate units for physical quantities. |  |  |  |  |
| Solve algebraic equations, including quadratic equations. |  |  |  |  |
| Use logarithms in relation to quantities that range over several orders of magnitude. [A Level only] |  |  |  |  |
| **M3 – Graphs** |  |  |  |  |
| Translate information between graphical, numerical and algebraic forms. |  |  |  |  |
| Plot two variables from experimental or other data. |  |  |  |  |
| Understand that *y* = *mx* + *c* represents a linear relationship. |  |  |  |  |
| Determine the slope and intercept of a linear graph. |  |  |  |  |
| Calculate rate of change from a graph showing a linear relationship. |  |  |  |  |
| Draw and use the slope of a tangent to a curve as a measure of rate of change. |  |  |  |  |
| Distinguish between instantaneous rate of change and average rate of change. |  |  |  |  |
| Understand the possible physical significance of the area between a curve and the *x* axis and be able to calculate it or estimate it by graphical methods as appropriate. |  |  |  |  |
| Apply the concepts underlying calculus (but without requiring the explicit use of derivatives or integrals) by solving equations involving rates of change, e.g. Δx / Δt = λx using a graphical method or spreadsheet modelling. |  |  |  |  |
| Interpret logarithmic plots. [A Level only] |  |  |  |  |
| Use logarithmic plots to test exponential and power law variations. [A Level only] |  |  |  |  |
| Sketch relationships which are modelled by *y* = *k*/*x*, *y* = *kx2*, *y* = *k*/*x2*, *y* = *kx*, *y* = sin *x*, *y* = cos *x* as applied to physical relationships[A Level only] *y* = e±x, and *y* = sin2*x*, *y* = cos2*x* |  |  |  |  |
| **M4 – Geometry and Trigonometry** |  |  |  |  |
| Use angles in regular 2D and 3D structures. |  |  |  |  |
| Visualise and represent 2D and 3D forms including two-dimensional representations of 3D objects. |  |  |  |  |
| Calculate areas of triangles, circumferences and areas of circles, surface areas and volumes of rectangular blocks, cylinders and spheres. |  |  |  |  |
| Use Pythagoras’ theorem, and the angle sum of a triangle. |  |  |  |  |
| Use sin, cos and tan in physical problems. |  |  |  |  |
| Use of small angle approximations including sin θ ≈ θ, tan θ ≈ θ, cos θ ≈ 1 for small θwhere appropriate. |  |  |  |  |
| Understand the relationship between degrees and radians and translate from one to the other. |  |  |  |  |

The material in this checklist is based on the OCR Physics A Specification published at [ocr.org.uk/**alevelphysicsa**](http://www.ocr.org.uk/qualifications/as-a-level-gce-physics-a-h156-h556-from-2015/) by Oxford, Cambridge and RSA Examinations.