

Nuclear physics

Cambridge International AS & A Level Physics

Unlike IGCSE, 9702 gives you a data sheet: it is page 2 of Papers 1, 2 and 4, with more formulae on page 3 of Paper 4. Everything marked GIVEN is printed for you; everything else you must recall. Compiled by GioPhysics from the published syllabus. This is an independent study aid, not a Cambridge document; the official syllabus is the authority.

23.1 Mass defect and nuclear binding energy

A LEVEL Mass-energy equivalence

$$E = mc^2$$

E — energy (J)

m — mass (kg)

c — speed of light in free space ($m\ s^{-1}$)

A LEVEL Energy released in a nuclear reaction

$$E = c^2 \Delta m$$

Δm — mass defect (kg)

E — energy released (J)

23.2 Radioactive decay

A LEVEL Activity and decay constant

$$A = \lambda N$$

A — activity (Bq)

λ — decay constant (s^{-1})

N — number of undecayed nuclei

A LEVEL Decay constant and half-life

$$\lambda = 0.693 / t_{1/2}$$

λ — decay constant (s^{-1})

$t_{1/2}$ — half-life (s)

A LEVEL Exponential decay

$$x = x_0 e^{(-\lambda t)}$$

x — activity, number of nuclei or count rate

x_0 — its initial value