Nuclear physics

Cambridge IGCSE Physics

> *The syllabus introduces every one with the words "recall and use", and 0625 provides no formula sheet in any paper. Compiled by GioPhysics from the published syllabus. This is an independent study aid, not a Cambridge document; the official syllabus is the authority.*

5.1.2 The nucleus

CORE

Nuclide notation

$$^{A}_{Z}X$$

A — nucleon number (mass number)
Z — proton number (atomic number)
X — chemical symbol of the element

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Number of neutrons

number of neutrons = A − Z

A — nucleon number
Z — proton number

5.2.1 Detection of radioactivity

SUPP.

Corrected count rate

corrected count rate = measured count rate − background count rate

count rate — counts per second or per minute (counts/s, counts/min)

5.2.3 Radioactive decay

SUPP.

Alpha decay

A decreases by 4 · Z decreases by 2

α — an alpha particle is a helium nucleus, $^{4}_{2}He$

Written as a decay equation in nuclide notation.

SUPP.

Beta decay

A unchanged · Z increases by 1

β — a beta particle is an electron, $^{0}_{-1}e$

In the nucleus: neutron → proton + electron. β^+ is not included; β means β^-.

SUPP.

Gamma emission

A unchanged · Z unchanged

γ — electromagnetic radiation from the nucleus

5.2.4 Half-life

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Half-life

half-life = time for half the nuclei of an isotope to decay

$t_{½}$ — half-life (s, min, h, days, weeks, years)

Calculations at Core will not include background radiation; Supplement calculates half-life from decay curves that still contain it.

CORE
DERIVED

Fraction remaining after n half-lives

$$\text{fraction remaining} = \left(\tfrac{1}{2}\right)^{n}$$

n — number of half-lives elapsed

Not printed in the syllabus: it is the definition of half-life applied repeatedly, and it is how most half-life questions are answered.