

Gravitational fields

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.

13.2 Gravitational force between point masses

A LEVEL Newton's law of gravitation

$$F = Gm_1m_2 / r^2$$

F — gravitational force (N)

G — gravitational constant ($\text{N m}^2 \text{kg}^{-2}$)

m_1, m_2 — the two point masses (kg)

r — separation (m)

13.3 Gravitational field of a point mass

A LEVEL Gravitational field strength

$$g = GM / r^2$$

g — field strength (N kg^{-1})

M — mass of the point mass (kg)

r — distance from it (m)

The syllabus asks you to derive it from Newton's law of gravitation.

13.4 Gravitational potential

A LEVEL Gravitational potential

$$\phi = -GM / r$$

ϕ — gravitational potential (J kg^{-1})

M — mass (kg)

r — distance (m)

Negative because the zero of potential is at infinity.

A LEVEL Gravitational potential energy

$$EP = -GMm / r$$

EP — potential energy of the pair (J)

M, m — the two point masses (kg)