Dynamics

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.*

3.1 Momentum and Newton's laws of motion

AS

Newton's second law

$$F = ma$$

F — resultant force (N)
m — mass (kg)
a — acceleration (m s^{-2})

Force and acceleration are in the same direction. A special case of $F = \Delta p/\Delta t$ for constant mass.

AS

Linear momentum

$$p = mv$$

p — momentum (kg m s^{-1}, N s)
m — mass (kg)
v — velocity (m s^{-1})

3.2 Non-uniform motion

AS

Force as rate of change of momentum

$$F = \Delta p / \Delta t$$

F — resultant force (N)
Δp — change in momentum (kg m s^{-1})
Δt — time taken (s)

3.3 Linear momentum and its conservation

AS

Conservation of momentum

$$\text{total momentum before} = \text{total momentum after}$$

p — summed over the system, with direction

For a closed system. Applies in one and two dimensions.

AS

Perfectly elastic collision

$$\text{relative speed of approach} = \text{relative speed of separation}$$

v — relative speed along the line of collision (m s^{-1})

The test for a perfectly elastic collision; total kinetic energy is also conserved.