EngineeringRise

Momentum, impulse and conservation of linear momentum

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Linear momentum	p = m v Valid when: speeds much less than light	kg m/s
Second law in momentum form	F_net = dp/dt Valid when: net force on the body; also valid when mass varies	N
Impulse (constant force)	J = F t Valid when: force constant over the contact time	N s
Impulse (varying force)	J = area under F-t graph = integral of F dt Valid when: any force that varies with time	N s
Impulse-momentum theorem	J = p_final - p_initial = m (v - u) Valid when: any force, straight-line motion, signed velocities	N s
Average force in an impact	F_avg = J/t = m (v + u)/t when the body reverses Valid when: ball reverses along a line; u and v are speeds; t is contact time	N
Conservation of momentum	m1 u1 + m2 u2 = m1 v1 + m2 v2 (no net external force) Valid when: no net external force on the system along that line	kg m/s
Recoil of a gun	V = m v/M Valid when: gun and bullet start at rest; v is bullet speed relative to the ground	m/s
Speed given relative to a moving body	v_raft = m u_rel/(M + m) from rest Valid when: system starts at rest, no external horizontal force; u_rel is relative to the raft	m/s
Force from a stream of bullets	F = n m v (stopped); 2 n m v (elastic rebound) Valid when: n bullets per second striking a target, speeds along the line of motion	N

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/laws-of-motion/momentum-impulse-and-conservation-of-linear-momentu

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