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Gauss law and its applications

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

Result	Formula	Units or note
Flux through a plane	flux = E A cos(theta) Valid when: uniform field over a plane surface; theta is the angle between E and the normal	N m^2/C
Gauss law	flux through closed surface = q_enclosed/epsilon_0 Valid when: any closed surface, charges at rest or moving; only enclosed charge counts	N m^2/C (epsilon_0 = 8.85 x 10^-12 C^2/(N m^2))
Long line charge	E = lambda/(2 pi epsilon_0 r) = 2 k lambda/r Valid when: infinitely long uniformly charged straight line; r is the perpendicular distance	N/C
Infinite sheet	E = sigma/(2 epsilon_0), independent of distance Valid when: infinite uniformly charged non-conducting sheet, away from its edges	N/C
Between opposite sheets	E = sigma/epsilon_0; outside zero Valid when: two large parallel sheets of equal and opposite density, away from the edges	N/C
Thin shell outside	E = k Q/r^2 for r > R (just outside the surface at r = R) Valid when: uniformly charged thin spherical shell; r is measured from the centre	N/C
Thin shell inside	E = 0 for r < R Valid when: uniformly charged thin spherical shell or conductor sphere, any point inside	N/C
Conductor surface	E = sigma/epsilon_0 just outside Valid when: conductor in electrostatic equilibrium, point just outside the surface	N/C
Cube flux shares	centre: Q/(6 epsilon_0) per face; corner: Q/(24 epsilon_0) per far face, 0 per near face Valid when: point charge at the cube centre or corner of a cube; flux of faces by symmetry	N m^2/C

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/electrostatics/gauss-law-and-its-applications

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