EngineeringRise

Quantum numbers, orbital shapes and electronic configuration

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

Result	Formula	Units or note
Allowed values	n = 1, 2, ...; l = 0 to n - 1; m_l = -l to +l; m_s = +1/2 or -1/2	dimensionless
Orbitals in a subshell	2l + 1 (s, p, d, f = 1, 3, 5, 7)	number
Orbitals and electrons in a shell	orbitals = n^2; electrons = 2 n^2	number
Electrons in a subshell	2 (2l + 1)	number
Radial, angular and total nodes	n - l - 1; l; n - 1 Valid when: hydrogen-like orbitals; n principal, l azimuthal quantum number	number
Orbital angular momentum	sqrt(l (l + 1)) x h / (2 pi) Valid when: electron with azimuthal quantum number l; result in units of h/(2 pi)	J s
Filling order (Aufbau)	increasing n + l; equal n + l: lower n first Valid when: ground state of neutral atoms; Cr, Cu and similar are exceptions	n/a (rule)
Exceptions	Cr = [Ar] 3d5 4s1; Cu = [Ar] 3d10 4s1	n/a (configuration)
Unpaired electrons in a subshell	e if e <= 2l + 1; else 2 (2l + 1) - e Valid when: ground state, Hund rule; e electrons in a single subshell	number

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/chemistry/atomic-structure/quantum-numbers-orbital-shapes-and-electronic-con

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