Periodic trends: radii, ionisation enthalpy, electron gain enthalpy, valence and oxidation states

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

Result	Formula	Units or note
Effective nuclear charge	Zeff = Z - shielding Valid when: multi-electron atoms or ions; shielding from Slater rules or an estimate	dimensionless
Isoelectronic electron count	electrons = Z - charge Valid when: monatomic atoms and ions; charge signed (+ cation, - anion)	number
Radius order in isoelectronic set	radius decreases as Z increases Valid when: isoelectronic species (same number of electrons) only	pm
Ionisation enthalpy dips (period 2 and 3)	Be > B, N > O, Mg > Al Valid when: first ionisation enthalpy only, for these pairs in periods 2 and 3	kJ per mol
Jump in successive IE	IE(n+1) / IE(n) is large after the valence electrons Valid when: successive ionisation enthalpies of one atom; jump follows the valence electrons	dimensionless
Overall electron gain enthalpy	sum of consecutive steps Valid when: gaseous atom gaining electrons one at a time; add the signed steps	kJ per mol
Halogen electron gain order	Cl > F > Br > I (magnitude) Valid when: first electron gain enthalpy of gaseous halogen atoms	kJ per mol
Oxidation states of non-metals	max = valence electrons, min = max - 8 Valid when: p-block non-metals of groups 14 to 17 except F and O; not for metals	integer

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/chemistry/classification-of-elements-and-periodicity/periodic-trends-radii-ionisati

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