EngineeringRise

Group 15 and 16 trends and unique behaviour

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

Result	Formula	Units or note
Valence electrons	group 15: ns2 np3; group 16: ns2 np4 Valid when: neutral ground-state atoms of groups 15 and 16	number = group - 10
IE1 group 15 (kJ mol^-1)	N 1402, P 1012, As 947, Sb 834, Bi 703	kJ mol^-1
IE1 group 16 (kJ mol^-1)	O 1314, S 1000, Se 941, Te 869, Po 812	kJ mol^-1
E-H bond enthalpies	N-H 389, P-H 322, As-H 297, Sb-H 255; O-H 463, S-H 347, Se-H 276, Te-H 238	kJ mol^-1
Boiling points of hydrides	NH3 239.7, PH3 185.5, AsH3 210.6, SbH3 254.6; H2O 373, H2S 213, H2Se 232, H2Te 269	K
Triple versus single	N: 3 x 160 - 945 = -465; P: 3 x 213 - 490 = +149 Valid when: per pair of atoms: 3 single bonds against 1 triple bond; mean bond enthalpies	kJ mol^-1
Heat to atomise a hydride	q = (mass / molar mass) x (bonds per molecule) x bond enthalpy Valid when: complete atomisation; mean bond enthalpy per mole of bonds; mass converted to moles	kJ
Group 15 oxides	N2O3, P2O3 acidic; As2O3, Sb2O3 amphoteric; Bi2O3 basic	n/a (qualitative)
Max covalency	N 4; P 6; O limited; S 6 Valid when: N has no d orbitals; heavier members can use vacant d orbitals	number of ligands

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/chemistry/p-block-elements/group-15-and-16-trends-and-unique-behaviour

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