p- Block Elements

PHYSICAL PROPERTIES	GROUP 15(ns^2np^3)	GROUP 16(ns^2np^4)	GROUP 17(ns^2np^5)	GROUP 18(ns^2np^6)
Atomic(covalent) & ionic radii Across Period- ↓ses(due to ↑se in effective nuclear charge) Across Group-↑ses(due to ↑ se in no. of Shell)	N to P- considerable ↑se As to Bi- small ↑se(inert pair effect)	16 <15	Smallest(eff. nu. ch. highest) in its period. $r_{X^-} > r_X$	At. Radius= Vander Waals Radius (larger than covalent or ionic) 18 >17(due to ↑se in electronic repulsion btwn completely filled valence shell)
Electronegativity(same reason) Across Period- ↑ses Across Group-↓ses	N is 3rd most e-ve element	16 >15, O is second most e-ve element	High, F is 1st most e-ve element each halogen is the most e-ve element in its period(small size nd high eff nu ch)	
Ionisation Enthalpy(same reason) Across Period- ↑ses Across Group-↓ses $\Delta H_1 < \Delta H_2 < \Delta H_3$	15 ≫14 (small size and extra stability of half filled p-orb) IE of N(to loose all 5 e) is very large. Sum of all 3 IEs for Bi& Sb is low enough	1st IE of lighter el.(O, S, Se)< 15 (presence of half filled or.)	Very high(same reason), F- highest in group I-Smallest(shows some e+ve character- forms I^+ ion)	Very high, IE of Each element Highest in its period(due to presence of very stable completely filled valence shell)
Electron Gain Enthalpy (reason e-vity)		High, O Less –ve than S(O-high charge density)	F less –ve than Cl(Reason LHS)	High +ve value of EGE No tendency to accept es (Same reason)

Across Period-(-ve) ↑ses Across Group-(-ve)↓ses				
Electropositivity (Metallic & Non-Metallic Character/Conductivity) Metallic C Across Group-↑ ses Non Metallic C Across Group-↓ses	N,P-typical Non metal As, Sb- Metalloids Bi- typical metal N,P- Conductor, As-poor, Sb-Good, Bi- very good	O, S- Non metals(Non C), Se, Te- Metalloids(Semi C), Po- Distinctly metal(Good C)	All- typical non metals(high e-vity),	
Physical Appearance & Atomicity Agglomerisation tendency Across Group-↑ses(VW force btwn molecules) Density M.P. & B.P.	N- gas(diatomic molecule) P,As,Sb- Tetraatomic molecu Bi- Monoatomic Solid, radioactive, $t_{1/2} = 1.9 \times 10^{19}$ yr. N, P- low, As,Sb-higher, Bi-highest ↑ses regularly down d grp	O-gas(diatomic, small size forms $p\pi$ -$p\pi$ multiple bonds, Intermolecular force- weak vander walls force), other-solid(polyatomic,unable to form $p\pi$ -$p\pi$ multiple bonds due to large size, strong v w force) S,Se-puckered ring structure ----------“”””---------- Large diff. btwn O & S is due to O-diatomic & S- octaatomic MP(Po)<MP(Te)(inert pair effect)	All- diatomic, F,Cl- Gas, Br-Liquid, I-Solid Low	All-Monoatomic gas($\frac{C_p}{C_v} = 1.66$) Colourless, odourless &tasteless

				Very low(very weak interatomic force) Much lower as compare to those substances of comparable MW. He-lowest
Allotropy	Solid N- α -N(sc),β -N(hcp) P- white P(P_4tetrahedra), red P (P_4 cage), Black P(layer) etc. As- grey metallic, stable forms- yellow, black etc. Sb- metallic, yellow or α & explosive. Bi- No allotropes	O- diatomic(O_2)-more stable & Ozone(O_3) S- α,β,γ , homocyclic, plastic etc. Se-In crystalline form- red monoclinic, grey metallic. In Amorphous form- dark brown, vitreous & red amorphous. Te- Metallic & Non metallic, Po- α,β both metallic		

Few Properties of Single Block

Group 16	Group 17
Catenation(Across Group-↓ses)	Colour (show colour due to absorption of Energy of light in visible range by

	outer es) Down The Group no. of shell ↑ses →effective nuclear charge↓ses→ less energy Required for Excitation of outer es
O- little tendency, eg. Peroxide, S- Greater tendency, eg, polysulphides S_n^{2-}, polysulphuric acid $(HO_3S\text{-}(S)_n\text{-}SO_3H)$ & different allotropes.	All-coloured, F- Pale Yellow(absorbs violet) Cl- Greenish Yellow Br- Red I- Violet(absorbs yellow)

CHEMICAL PROPERTY	GROUP 15	GROUP 16	GROUP 17
Oxidation State			
* Common Oxidation State	-3,+3 & +5	-2, +2,+4 & +6	-1,+1,+3,+5 & +7
* The Stability of … oxdn state ↑ses & … oxdn state ↓ses down the group due to inert pair effect.	+3 +5	+4 +6	+5 +7
* The tendency to exhibit … oxdn state ↓ses down the group due to ↑se in size & metallic character.			
* … is more e+ve & does	-3	-2	-1

not show … oxdn state	Bi -3 * Covalency of N is restricted to 4(N cannot form compounds with +5 oxdn state) due to absence of d-orbital in valence shell. * N→ -3(NH_3, NCl_3, NBr_3) * P → +3(PCl_3, PBr_3, PCI_3), +5(PCl_5,P_2O_5) * N with O → +1,+2,+4 * In case of N, all oxdn states from +1 to +4 tend to disproportionate in acid solution. For example, $3\ HNO_2 \rightarrow HNO_3 + H_2O + 2NO$	Po -2 O → common oxdn state -2(with F) -1 with peroxide. -2 ionic bonding +4 & +6 covalent bonding S→ -2(S^{2-}), +4(SF_4), +6(SF_6) Se→ -2(Se^{2-}), +4($SeBr_4$) Te→ -2(Te^{2-}), +4($TeCl_4$)	F → only -1 +4 & +6 oxdn state of Cl, Br is observed in in oxides & oxoacids.