Variations in periodic properties

Properties	Across a period (Left to right)	Down a group (Top to bottom)
Number of valence electrons	Increases by one	Remains the same
Number of shells	Remains the same	Increases by one
Nuclear charge (The total charge in the nucleus of all the protons)	Increases (number of protons increases)	Increases (number of protons increases)
Atomic radius (It is the distance between center of nucleus and outer most shell of the atom)	Decreases (the number of shells remain the same but the electrons are been added to same shell so the nuclear charge increases. The electrons are attracted towards the nucleus with a greater force thereby bringing the outermost shell closer to the nucleus hence atomic size decreases.)	Increases (Increase in the number of shells dominates over increase in nuclear charge hence atomic size increases.)
Metallic character (lose electron/s)	Decreases (as atomic size decreases, tendency to lose electrons decreases, hence metallic character decreases)	Increases (as atomic size increases, tendency to lose electrons increases, hence metallic character increases)
Non-metallic character (gain electron/s)	Increases	Decreases
Ionization potential (amount of energy required to remove an electron from outer most shell of an isolated gaseous atom)	Increases (because the atomic size decreases due to increase in nuclear charge and electrons in the outermost shell are more strongly held so greater energy is required to remove the electron)	Decreases (Increase in atomic size decreases the ionization potential and increase in nuclear charge increases the ionization potential. Here the effect of increase in atomic size dominates over the effect of increase in nuclear charge. Hence, ionization potential decreases)
Electron affinity (The amount of energy released when an atom in gaseous state accepts an electron to form an anion)	Increases (exception, for noble gases it is zero) (As the nuclear charge increases electron affinity increases because with an increase in nuclear charge the tendency of an atom to accept electrons increases)	Decreases (both atomic size and nuclear charge increases but the increase in atomic size dominates over increase in nuclear charge hence electron affinity decreases on moving down a group)
Electronegativity (It is the tendency of an atom to attract electrons to itself when combined in a compound.	Increases (with the exception of noble gases) (As the nuclear charge increases electronegativity increases because an increase in nuclear charge increases the force of attraction on the electron)	Decreases (both atomic size and nuclear charge increases but the increase in atomic size dominates over increase in nuclear charge hence electronegativity decreases on moving down a group.
Oxidizing nature (loss of electrons)	Increases (smaller the ionization energy, easier to remove electron)	Decreases
Reducing nature (gain of electrons)	Decreases (the tendency to lose electrons decreases across the period)	Increases
Oxides	Strongly basic to strongly acidic	Acidic to basic
Hydroxides	Strongly basic to amphoteric	Less basic to strongly basic
Oxy-acids	Weak oxy-acids to strong oxy-acids	Strong oxy-acids to weak oxy-acids
Hydrides	Strongly basic to strongly acidic	Less acidic to more acidic

Comparision of alkali metals in Group 1 [IA] and the halogens in 17 [VIIA]

Property	Group 1[IA]	Group 17 [VIIA]
Elements	Li, Na, K, Rb, Cs, Fr	F, Cl, Br, I, At
Valency	Univalent (1 valence electron)	Univalent (7 valence electrons)
Nature	Highly reactive, highly electropositive, light soft metals Metals are soft hence can be cut with a knife.	Highly reactive, highly electronegative, non – metals Gaseous – F & Cl, Liquid – Br, Solid at room temperature - I
Conductivity	Good conductors of heat and electricity	Bad or non conductors of heat and electricity
Reducing / Oxidizing nature	Strong reducing agents (one valence electron can easily removed)	Strong oxidizing agents (electron acceptors)
Ionisation energy	They have lowest I.E. in their period	They have high I.E. (lower than noble gases) in their period
Electron affinity	They have low electron affinity, decreases down the group	They have high electron affinity, decreases down the group Exception, Cl has high E.A. than fluorine.
Electronegativity	Low electronegativity	High electronegativity
Melting point and boiling point	Decreases down the group	Increases down the group
Reactions with non-metals	Electrovalent compounds formed (NaCl, KBr)	Covalent compounds formed (HCl, PCl_3, S_2Cl_2)
Reactions with Hydrogen	Ionic hydrides formed (LiH, NaH)	Covalent hydrides formed (HF, HCl, HBr, HI)

Types of elements within group and period

1.	Alkali metals	Group-1 [IA]	Light metals
2.	Alkaline earth metals	Group-2 [IIA]	Light metals, Two electrons in their outermost orbit
3.	Metalloid		Boron, Silicon
4.	Transition elements	Group-3 to 12 IB to VII B, VIII	Heavy metals, Two outermost shells incomplete (penultimate shell incomplete)
5.	Inner transition elements	Lanthanides series, Group 3 and 6^{th} period Actinides series, Group 3 and 7^{th} period	14 elements from atomic numbers 57 to 81 (Rare earth elements) 14 elements from atomic numbers 89 to 103 (Radioactive elements)
6.	Post transition elements	Group 13-16 [III B to VI A]	
7.	Halogens.	Group 17 (VII A)	One electron short of octet
8.	Noble / Inert gases	Group 18 (0)	Outermost shell complete
9.	Typical elements	Period 3	They summarise the features of their respective groups.

10.	Normal or Representative elements	Groups 1, 2, 13 to 17	The elements which have their outermost shell incomplete
11.	Bridge elements	Period 2 elements Li, Be, B, C	They reflect the properties of the period 3 element (Mg, Al, Si), which are diagonal.