CHEMISTRY OF GROUP 17,18 IN P-BLOCK ELEMENTS

GROUP 17 ELEMENTS

37. **Atomic and ionic radii:** Halogens have the smallest atomic radii in their respective periods because of maximum effective nuclear charge.

38. **Ionisation enthalpy:** They have very high ionization enthalpy because of small size as compared to other groups.

39. **Electron gain enthalpy:** Halogens have maximum negative electron gain enthalpy because these elements have only one electron less than stable noble gas configuration.

    Electron gain enthalpy becomes less negative down the group because atomic size increases down the group.

40. **Eelctronegativity:** These elements are highly electronegative and electronegativity decreases down the group. They have high effective nuclear charge.

41. **Bond dissociation enthalpy:**

    Bond dissociation enthalpy follows the order $Cl_2 > Br_2 > F_2 > I_2$

    This is because as the size increases bond length increases.

    Bond dissociation enthalpy of Cl_2 is more than F_2 because there are large electronic repulsions of lone pairs present in F_2.

42. **Colour:** All halogens are coloured because of absorption of radiations in visible region which results in the excitation of outer electrons to higher energy levels.

43. **Oxidising power:** All halogens are strong oxidisinga gents because they have a strong tendency to accept electrons.

    Order of oxidizing power is $F_2 > Cl_2 > Br_2 > I_2$

44. **Reactivity with H_2:**

    Acidic strength: HF < HCl < HBr < HI

    Stability: HF > HCl > HBr > HI

    This is because of decrease in bond dissociation enthalpy.

    Boiling point: HCl < HBr < HI < HF

    HF has strong intermolecular H bonding

As the size increases van der Waals forces increases and hence boiling point increases.

% Ionic character: HF > HCl > HBr > HI

Dipole moment: HF > HCl > HBr > HI

Electronegativity decreases down the group.

Reducing power: HF < HCl < HBr < HI

45. **Reactivity with metals:** Halogens react with metals to form halides.

Ionic character: MF > MCl > MBr > MI

Halides in higher oxidation state will be more covalent than the one in the lower oxidation state.

46. **Interhalogen compounds: Reactivity of halogens towards other halogens:**

Binary compounds of two different halogen atoms of general formula

$X X'_n$ are called interhalogen compounds where n = 1, 3, 5, or 7

These are covalent compounds.

All these are covalent compounds.

Interhalogen compounds are more reactive than halogens because X-X' is a more polar bond than X-X bond.

All are diamagnetic.

Their melting point is little higher than halogens.

XX' (CIF, BrF, BrCl, ICl, IBr, IF) (Linear shape)

XX'_3 (CIF_3, BrF_3, IF_3, ICl_3) (Bent T- shape)

XX'_5 – CIF_5, BrF_5, IF_5, (square pyramidal shape)

XX'_7 – IF_7 (Pentagonal bipyramidal shape)

47. **Oxoacids of halogens:**

Fluorine forms only one oxoacid HOF (Fluoric (I) acid or hypofluorous acid) due to high electronegativity.

Acid strength: $HOCl < HClO_2 < HClO_3 < HClO_4$

Reason: $HClO_4 \rightarrow H^+ + ClO_4^-$

most stable

Acid strength: HOF > HOCl > HOBr > HOI

This is because Fluorine is most electronegative.

GROUP 18 ELEMENTS:

48. **Ionisation enthalpy:** They have very high ionization enthalpy because of completely filled orbitals.

Ionisation enthalpy decreases down the group because of increase in size.

49. **Atomic radii:** Increases down the group because number of shells increases down the group.

50. **Electron gain enthalpy:** They have large electron gain enthalpy because of stable electronic configuration.

51. **Melting and boiling point:** Low melting and boiling point because only weak dispersion forces are present.

52. XeF_2 is linear, XeF_4 is square planar and XeF_6 is distorted octahedral. KrF_2 is known but no true compound of He Ne and Ar are known.

53. **Compounds of Xe and F:**

$$Xe + F_2 \xrightarrow{673\ K,\ 1\ bar} XeF_2$$

$$Xe + 2F_2 \xrightarrow[7\ bar]{873\ K} XeF_4$$

$$Xe + 3F_2 \xrightarrow[60-70\ bar]{573\ K} XeF_6$$

$$XeF_4 + O_2F_2 \longrightarrow XeF_6 + O_2$$

XeF_2, XeF_4 and XeF_6 are powerful fluorinating agents.

54. **Compounds of Xe and O:**

$$6\,XeF_4 + 12\,H_2O \longrightarrow 4\,Xe + 2\,XeO_3 + 24\,HF + 3\,O_2$$

$$XeF_6 + 3\,H_2O \longrightarrow XeO_3 + 6\,HF$$