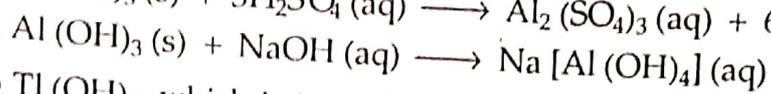
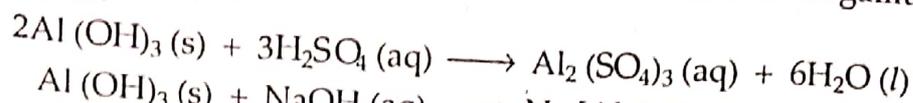


The trihalides are strong Lewis acids. Anhydrous aluminium chloride is used as a catalyst in Friedel Crafts reaction.

(f) **Oxides and hydroxides** : These elements form oxides and hydroxides of the type M_2O_3 and $M(OH)_3$, whose basic character increases from Al to Tl. Aluminium and gallium hydroxides show amphoteric behaviour.



In contrast to $Tl(OH)_3$, which is insoluble in water, **Tl(OH) is soluble and is a strong base.** Many of the Tl(I) compounds are similar to the corresponding alkali metal compounds.

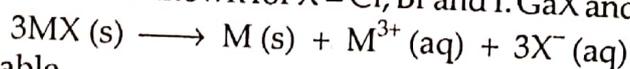
(g) **Hydrated salts** : Al, Ga and Tl ions exist as octahedral aqua ions, $[M(H_2O)_6]^{3+}$ in aqueous solution and many salts like nitrates, halides, sulphates and perchlorates exist as hydrates.

Alums : Aluminium sulphate forms double salts with sulphates of other metals and are called **alums**, having the general formula $MAI(SO_4)_2 \cdot 12H_2O$, where M is a univalent cation, NH_4^+ , Na^+ or K^+ . The trivalent metal cations of about the same size as that of Al^{3+} are capable of replacing aluminium in alums.

Examples : Ti^{3+} , Cr^{3+} , Mn^{3+} , Fe^{3+} and Co^{3+} .

Alums are extensively used in the softening of hard water and as mordant in dyeing and printing of textiles. A mordant helps to bind the dye to the fabric.

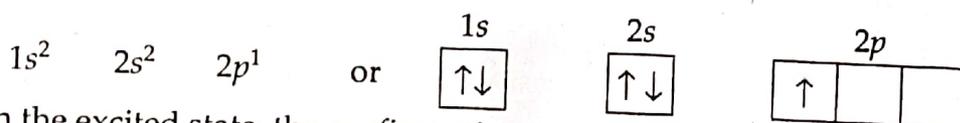
(h) **Disproportionation** : The +1 oxidation state gets stabilised progressively from Ga to Tl. The monohalide, GaX , InX and TlX are known for $X = Cl, Br$ and I . GaX and InX disproportionate in water.



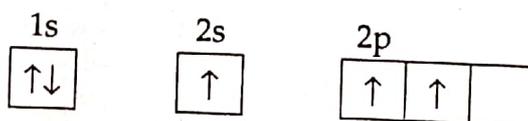
Tl(I) is, however, stable.

11.3 BORON

Boron is the first member of Group 13 of the Periodic Table and is the only non-metal of this group. The ground state electronic configuration of boron is:



In the excited state, the configuration is:



Group 13	
5	B
13	Al
31	Ga
49	In
81	Tl

Boron has three electrons in its valence orbitals. Boron forms a variety of covalent molecular compounds because of its **small size, high ionization enthalpy** and **low electronegativity**. In this respect, boron resembles carbon and silicon and differs from other members of its own group.

Electron deficient : Since the number of valence electrons (three) is one less than the number of valence orbitals (one s and three p), it forms compounds, especially the hydrides, which are **electron deficient**. Many of the boron compounds thus behave as Lewis acids e.g., BF_3 combines with NH_3 (Lewis base) to give $H_3N : \longrightarrow BF_3$

