

Uses

- Helps in production of iron and steels.
- TiO in pigment industry
- MnO₂ in dry battery cells.
- As catalysts in industry.
- Ni complexes useful in the polymerization of alkynes and other organic compounds such as benzene.
- Ag Br in photographic industry.

Lanthanoid contraction in progressive decrease in atomic/ionic radii from La³⁺ and Lu³⁺

The D And F Block Elements

f- Block transition elements

Lanthanoids

Actinoids

- Electronic: configuration 4f¹⁻¹⁴ 5d⁰⁻¹ 6s²
- Atomic and ionic sizes: Decreases from La to Lu
- Oxidation states: Most common is +3. Some elements exhibit +2 and +4.

General characteristics

- Silvery white soft metals and tarnish rapidly in air.
- Hardness increases with increasing atomic number.
- Metallic structure and good conductors of heat and electricity.
- Variable density
- Trivalent Lanthanoid ions are coloured.

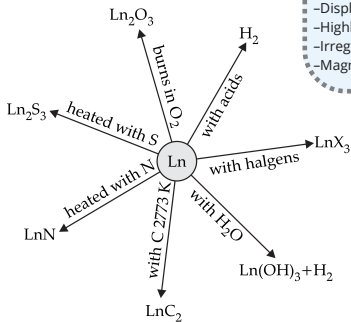
- **Ionisation Enthalpies:** Low third ionisation enthalpies

GGSRDN Educational Services Private Limited
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- **Electronic:** configuration $(n-1)f^{1-14} n d^{0-2} n s^2$
- **Ionic sizes:** Gradual decrease along the series
- **Oxidation states:** Most common +3. They show ON of +4, +5, +6 and +7.
- **General characteristics:**
 - Silvery in appearance
 - Display variety of structures
 - Highly reactive metals
 - Irregularities in metallic radii, greater than in Lanthanoids.
 - Magnetic properties more complex than lanthanoids.

Chemical Properties



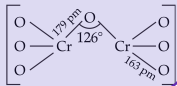
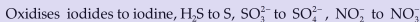
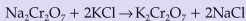
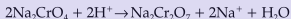
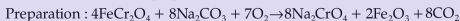
**The D And F
 Block Elements**

d- Block transition elements groups 3-12

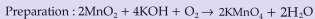
- **Position:** Between s- and p-blocks
- **Electronic configuration:** $(n-1) d^{1-10} ns^{1-2}$
- **Physical properties:** Show typical metallic properties, melting and boiling point are high; High enthalpies of atomization
- **Decrease in radius with increasing atomic number.** Lanthanoid contraction is due to imperfect shielding of one e⁻ by another in same set of orbitals.
- **Ionisation enthalpies:** Increases from left to right
- **Oxidation states:** Variable ; higher ON stable
- **Trends in M^{2+}/ME° :** E^o for Mn, Ni and Zn are more negative than expected.
- **Trends in $M^{3+}/M^{2+}E^{\circ}$:** variable
- **Chemical reactivity and E^o values :** Variable ; Ti^{2+} , V^{2+} and Cr^{2+} are strong reducing agents.
- **Magnetic properties :** Diamagnetism and paramagnetism. Magnetic moment increases with increasing atomic number.
- **Formation of coloured ions:** Form coloured compounds due to d-d transitions
- **Formation of complex compounds :** Form a large number of complex compounds
- **Catalytic properties :** Due to variable oxidation states and ability to form complexes.
- **Forms interstitial compounds :** Non - stoichiometric and are neither ionic nor covalent.
- **Alloy formation:** Due to similar atomic sizes.

Oxides and oxoanions of metals

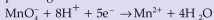
- Potassium dichromate $K_2Cr_2O_7$



- Potassium permanganate $KMnO_4$



Properties : Intense colour, weak temperature dependent paramagnetism



Oxidizes I⁻ to I₂, Fe²⁺ to Fe³⁺, C₂O₄²⁻ to CO₂, S²⁻ to S, SO₃²⁻ to SO₄²⁻, NO₂⁻ to NO₃⁻

