

Table 15.2 Atomic and ionic radii of transition elements

Element	²¹ Sc	²² Ti	²³ V	²⁴ Cr	²⁵ Mn	²⁶ Fe	²⁷ Co	²⁸ Ni	²⁹ Cu	³⁰ Zn
Atomic Radii** (pm)	162	147	134	128	127	126	125	124	128	134
Ionic Radii (pm) M^{+}	—	—	—	82	82	77	74	70	73	75
M^{n+}	88(3+)	74(4+)	—	62	65	65	61	60	—	—
Element	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd
Atomic Radii** (pm)	180	160	146	139	136	134	134	137	144	151
Element	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg
Atomic Radii** (pm)	187	159	146	139	137	135	135.5	138.5	144	151

** Metallic radius, 12 co-ordinate

- The Lanthanoid contraction along the lanthanoid series has been explained in terms of poor shielding or screening effect of f-subshell of pre-penultimate shell.

On moving along the lanthanoid series, the nuclear charge increases due to increase in number of protons as well as one electron increases in f-subshell of pre-penultimate shell.

Evidently increase in nuclear charge with $\uparrow$ es in atomic number predominates over $\downarrow$ es in nuclear charge due to shielding effect & thus valence shell are pulled more effectively towards nucleus to show $\downarrow$ es in atomic size.

- It is the influence of Lanthanoid contraction which is responsible for closer values of atomic radii for Zr-Hf Nb-Ta & Mo-W pairs of elements.

Table 15.17

Case	Element	Series	Atomic radius
I	²² Ti	3d	132 pm
	⁴⁰ Zr	4d	160 pm
	⁷² Hf	5d	159 pm
II	²³ V	3d	122 pm
	⁴¹ Nb	4d	146 pm
	⁷³ Ta	5d	146 pm
III	²⁴ Cr	3d	130 pm
	⁴² Mo	4d	139 pm
	⁷⁴ W	5d	140 pm