Five more protons, same size?

24	29
Cr	Cu
Chromium	Copper
129 pm	128 pm

Size and ionisation enthalpy across the 3d series.

The d- and f-Block Elements · NCERT 4.3.2–4.3.3

The usual trend



Nuclear charge ↑ → size ↓

Across a normal period (period 3), the growing nuclear charge pulls the atoms smaller.

Why the 3d series is different

Each new electron enters the **inner (n−1)d** subshell.

It **shields the outer ns electrons**, partly cancelling the extra nuclear charge.

Pull ↑ and shielding ↑ nearly balance → size changes only a little.

Metallic radius (pm)



A small fall at the start, then **nearly constant** in the middle of the series.

1st ionisation enthalpy (kJ/mol)



Rises **slowly**: 631 (Sc) → 906 (Zn). Across period 3 it roughly triples (Na 496 → Ar 1520).

Zn is highest: its $3d^{10}$ $4s^2$ configuration is very stable.

Remember

New electrons go into the inner (n−1)d.

↓

Shielding nearly cancels the extra nuclear charge.

↓

Size and ionisation enthalpy change slowly across a transition series.

Quick check

40	72
Zr	Hf
Zirconium	Hafnium
160 pm	159 pm

Zr and Hf are in the same group, yet almost the same size. Why?

Hint: what sits between them in the periodic table?