

**B.Sc. Semester-IV
Core Course-VIII (CC-VIII)
Inorganic Chemistry-III**



**II. Transition Elements
4. Transition Elements - Ionization Enthalpy**



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Transition Elements:

12 Lectures

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer & Bsworth diagrams). Difference between the first, second and third transition series. Chemistry of Ti, V, Cr Mn, Fe and Co in various oxidation states (excluding their metallurgy)

Coverage:

1. Transition Elements - Ionization Enthalpy

Ionization Enthalpy

- The first ionization enthalpies of the *d*-block elements
 - ➔ Greater than those of the *s*-block elements in the same period of the Periodic Table
 - ∴
 1. The atoms of the *d*-block elements are smaller in size
 2. Greater effective nuclear charges

Ionization Enthalpy

K → Ca (sharp ↑) ; Ca → Sc (slight ↑)

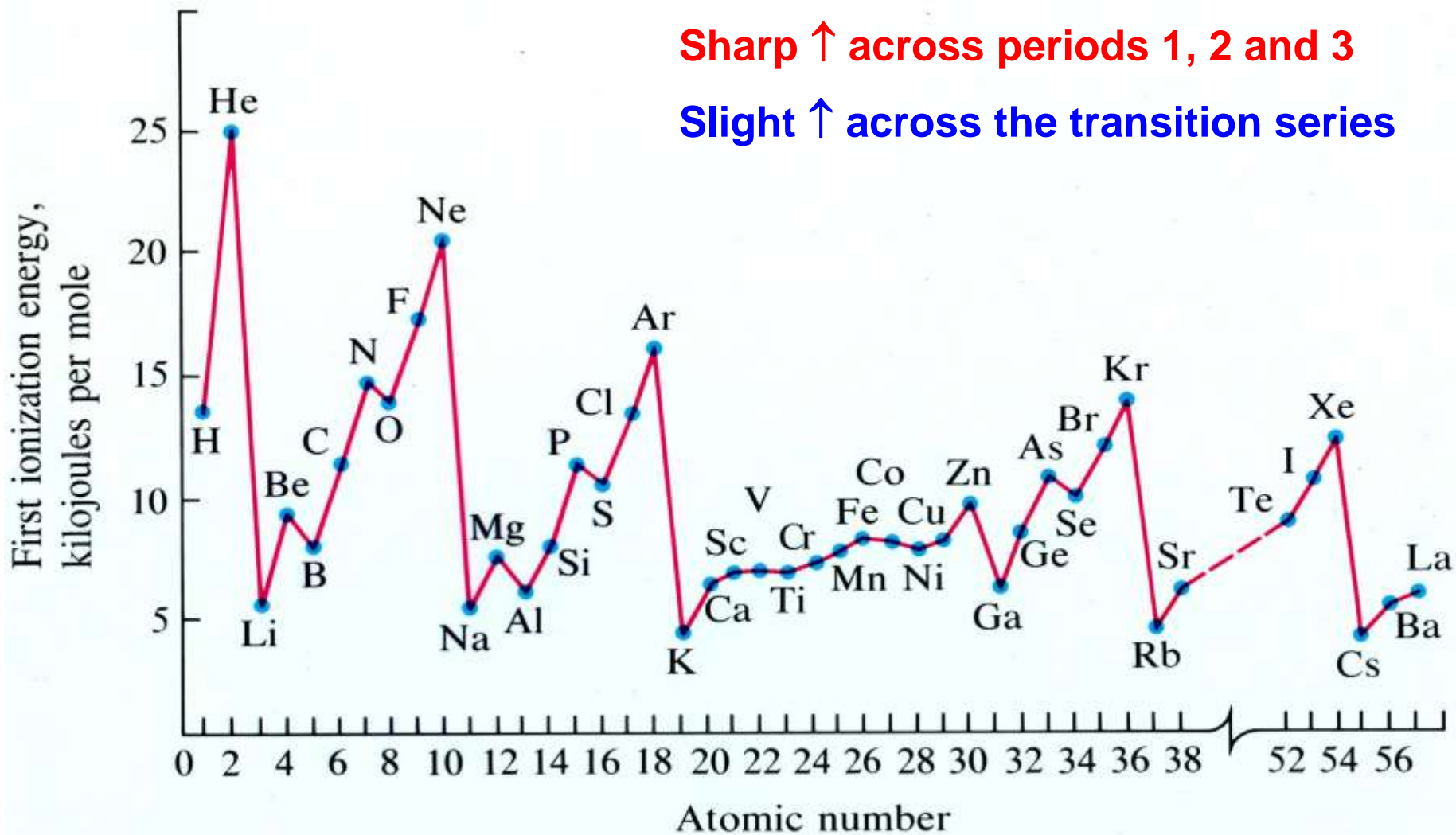
Element	Ionization enthalpy (kJ mol ⁻¹)			
	1st	2nd	3rd	4th
K	418	3 070	4 600	5 860
Ca	590	1 150	4 940	6 480
Sc	632	1 240	2 390	7 110
Ti	661	1 310	2 720	4 170
V	648	1 370	2 870	4 600
Cr	653	1 590	2 990	4 770

Ionization Enthalpy

Sc → Cu (slight ↑) ; Cu → Zn (sharp ↑)

Element	Ionization enthalpy (kJ mol ⁻¹)			
	1st	2nd	3rd	4th
Cr	653	1 590	2 990	4 770
Mn	716	1 510	3 250	5 190
Fe	762	1 560	2 960	5 400
Co	757	1 640	3 230	5 100
Ni	736	1 750	3 390	5 400
Cu	745	1 960	3 550	5 690
Zn	908	1 730	3 828	5 980

Ionization Enthalpy

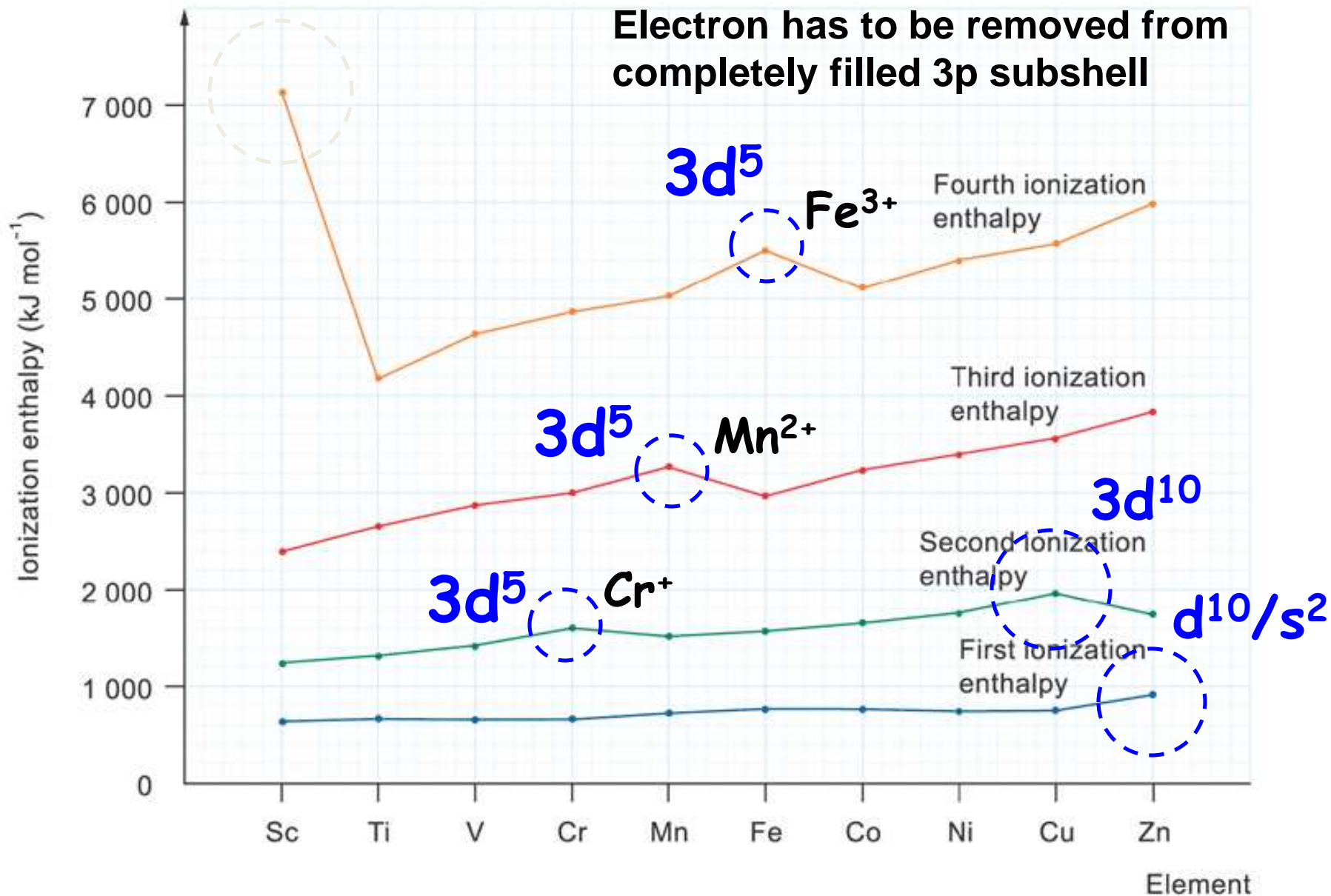


Ionization Enthalpy

- Going across the first transition series
 - ➔ the nuclear charge of the elements increases
 - ➔ additional electrons are added to the 'inner' 3d sub-shell
- The screening effect of the additional 3d electrons is significant
- The effective nuclear charge experienced by the 4s electrons increases very slightly across the series
- For 2nd, 3rd, 4th... ionization enthalpies, slight and gradual ↑ across the series are observed.

Ionization Enthalpy

Electron has to be removed from completely filled 3p subshell



Ionization Enthalpy

- The first few successive ionization enthalpies for the *d*-block elements
 - ➔ do not show dramatic changes
 - ∴ 4s and 3d energy levels are close to each other

THANK YOU