

Classification of Elements: one-page cheat sheet

NEET Chemistry · Unit 9 · Inorganic Chemistry

1 • Classification & nomenclature

Scientist	Basis
Döbereiner	triads (middle mass = mean)
Newlands	law of octaves
Lothar Meyer	atomic volume curve
Mendeleev	atomic mass
Moseley	atomic number (modern law)

IUPAC roots 0 nil, 1 un, 2 bi, 3 tri, 4 quad, 5 pent, 6 hex, 7 sept, 8 oct, 9 enn

$Z = 119$ un + un + enn + ium = **ununennium** (Uue)

2 • Blocks

Block	Valence configuration
s	ns^{1-2}
p	ns^2np^{1-6}
d	$(n-1)d^{1-10}ns^{0-2}$
f	$(n-2)f^{1-14}(n-1)d^{0-1}ns^2$

Period no. = outermost shell n

Group (p) = valence electrons + 10

3 • Size

Period radius **decreases** (rising Z_{eff})

Group radius **increases** (new shells)

Cation / anion cation < atom < anion



Isoelectronic ions: more nuclear charge, smaller ion.

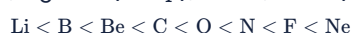
Ga vs Al Ga (135 pm) < Al (143 pm): poor d shielding

Zr ≈ Hf **lanthanoid contraction** (also Nb ≈ Ta)

4 • Ionisation enthalpy

Trend rises across a period, falls down a group

Anomalies Be > B, Mg > Al (s vs p); N > O, P > S (half-filled p^3)



Successive $\Delta_i H_1 < \Delta_i H_2 < \Delta_i H_3$; big jump after the valence shell is empty

5 • Electron gain enthalpy

Element	$\Delta_{eg}H$ (kJ mol ⁻¹)
Cl	-349 (most negative)
F	-328
Br	-325
I	-295
S	-200
O	-141

Cl > F and S > O: the compact 2p shell repels the incoming electron.

Noble gases are positive.

6 • Electronegativity

Pauling F 4.0, O 3.5, N 3.0, Cl 3.0, C 2.5, Si 1.8

Mulliken $\chi = \frac{1}{2}(\text{IE} + \text{EA})$

Trend up across a period, down a group

Link more electronegative, less metallic



7 • Nature of oxides

Nature	Examples
Basic	Na ₂ O, MgO, BaO
Amphoteric	Al ₂ O ₃ , ZnO, SnO ₂
Acidic	SiO ₂ , P ₄ O ₁₀ , SO ₃ , Cl ₂ O ₇
Neutral	CO, NO, N ₂ O

Across a period: basic to acidic. Higher oxidation state of the same element: more acidic.

8 • Second-period anomaly

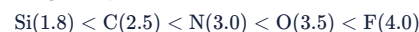
Cause small size, high electronegativity, **no d -orbitals**

Result maximum covalency 4 (BF₄⁻, not BF₆³⁻)

Diagonal Li–Mg, Be–Al, B–Si

Seen in NEET 2024

Order the electronegativity of N, O, F, C, Si.



Seen in NEET 2023

Largest ion with a neon configuration: N³⁻, O²⁻, F⁻, Na⁺?

All have 10 electrons. N³⁻ has the least nuclear charge (+7), so it is the **largest**.

9 • Quick orders

Period 3, first ionisation enthalpy:



Period 2, atomic radius:



Electron gain Cl > F > Br > I; S > O

Seen in NEET 2025

Which are main-group configurations?

[Ne]3s¹ (Na) and [Kr]4d¹⁰5s²5p⁵ (I) are s and p block. [Ar]3d³4s² (V) is a d -block element.

Seen in NEET 2020

Oxide	Nature
CO	neutral
BaO	basic
Al ₂ O ₃	amphoteric
Cl ₂ O ₇	acidic

Seen in NEET 2021

Why do Zr (40) and Hf (72) have almost identical radii?

14 poorly shielding 4f electrons raise Z_{eff} : **lanthanoid contraction**.

Six traps to remember

- Be > B and N > O in first ionisation enthalpy, against the general rise.
- Cl, not F, has the most negative electron gain enthalpy.
- In an isoelectronic series, Al³⁺ is the **smallest**, N³⁻ the largest.

- Zr and Hf have almost equal radii because of lanthanoid contraction.
- Ga is smaller than Al, because the 3d electrons shield poorly.
- Al₂O₃ is amphoteric, CO is neutral, and Cl₂O₇ is acidic.