Chemistry class 11th Important Questions

1. Atomic Radius (Size)

General trend

- **Increases down a group**
- **Decreases across a period (left → right)**

Usual order (same period)

Group 1 > Group 2 > Group 13 > Group 14 > Group 15 > Group 16 > Group 17

Key exceptions

- **N > O > F**
  Due to strong electron–electron repulsion in compact p-orbitals
- **Ga < Al**
  Because of **d-block contraction**
- **Pb ≈ Sn** (sometimes Pb smaller)
  Due to **lanthanide contraction**

2. Ionic Radius

General trend

- **Cations < neutral atom**
- **Anions > neutral atom**
- Increases down a group

Isoelectronic series order

Greater nuclear charge → smaller ion

$N^{3-} > O^{2-} > F^{-} > Ne > Na^{+} > Mg^{2+} > Al^{3+}$

3. Ionization Energy (IE)

General trend

- **Increases across a period**
- **Decreases down a group**

Usual order (period 2)

Li < Be < B < C < N < O < F < Ne

Important exceptions

- **Be > B**
  (filled 2s orbital is more stable)
- **N > O**
  (half-filled p^3 is more stable than p^4)
- **Al < Mg**
- **S < P**

4. Electron Affinity (EA)

General trend

- Becomes **more negative across a period**
- Less negative down a group

Expected order

Cl > F > Br > I

Exceptions

- **Cl > F**
  (small size of F causes e^-–e^- repulsion)
- **N, Be, Mg, noble gases ≈ zero or positive EA**
  - N: half-filled p^3
  - Be/Mg: filled s^2
  - Noble gases: complete octet

5. Electronegativity (EN)

General trend

- **Increases across a period**
- **Decreases down a group**

Highest to lowest (common)

F > O > N > Cl > Br > I > S > C > P

Exceptions / notes

- **N > Cl** (sometimes surprises students)
- Noble gases usually **excluded**
- **F is the most electronegative element**

6. Metallic Character

General trend

- **Increases down a group**
- **Decreases across a period**

Order (period 3)

Na > Mg > Al > Si > P > S > Cl

Exception

- **Al > Mg** in some chemical reactions (due to high charge density)

7. Oxidizing & Reducing Power

Oxidizing power (non-metals)

$F_2 > Cl_2 > Br_2 > I_2$

Reducing power (metals)

Cs > Rb > K > Na > Li

Exception

- **Li is strongest reducing agent in aqueous solution**
  (high hydration enthalpy)

8. Shielding Effect

General trend

- **Increases down a group**
- Almost **constant across a period**

Exception

- **d and f electrons shield poorly**
  → causes:
  - **Lanthanide contraction**
  - High density & high IE in transition metals

9. Inert Pair Effect

Observed in

- **Heavier p-block elements (Group 13–16)**

Effect

Lower oxidation states become more stable down the group

Example

Group 13: +3 → +1 (Tl^{+} most stable)

Group 14: +4 → +2 (Pb^{2+} stable)

10. Diagonal Relationship

Elements diagonally adjacent show similar properties:

Li ↔ Mg

Be ↔ Al

B ↔ Si

Reason: similar **charge density and size**

11. Lanthanide Contraction

What it is

Gradual decrease in atomic & ionic radii from **La → Lu**

Consequences

- Zr ≈ Hf in size
- High density & melting point of 5d elements
- Ga < Al (size anomaly)

1. Acidic strength of hydrides (H–X)

Across a period (left → right)

Acidity **increases** with electronegativity:

$CH_4 < NH_3 < H_2O < HF$

Down a group (top → bottom)

Acidity **increases** with size (weaker H–X bond):

$HF < HCl < HBr < HI$

2. Acidic strength of oxoacids (same central atom)

More oxygen atoms → stronger acid

$HClO < HClO_2 < HClO_3 < HClO_4$

Reason: greater **–I effect** and better resonance stabilization.

3. Oxoacids with different central atoms (same oxidation state)

Higher electronegativity → stronger acid

$HClO_4 > HBrO_4 > HIO_4$

4. Acidic strength of binary acids of non-metals

General order:

$HF < HCl < HBr < HI$

$H_2O < H_2S < H_2Se < H_2Te$

$NH_3 < PH_3 < AsH_3 < SbH_3$

Key idea: **bond strength decreases down the group**

5. Acidic strength of metal hydroxides

Alkali metals

$LiOH < NaOH < KOH < RbOH < CsOH$

Alkaline earth metals

$Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$

(As metallic character increases, basicity increases → acidity decreases)

6. Acidic strength of oxides

Period 3 oxides

$Na_2O < MgO < Al_2O_3 < SiO_2 < P_2O_5 < SO_3 < Cl_2O_7$

- Metal oxides → basic
- Non-metal oxides → acidic
- **Al_2O_3 is amphoteric**

7. Acidic strength of organic acids

Carboxylic acids

Electron-withdrawing groups increase acidity:

$HCOOH > CH_3COOH > C_2H_5COOH$

$CF_3COOH > CCl_3COOH > CH_3COOH$

Phenols (substituent effect)

p-NO_2-phenol > phenol > p-CH_3-phenol

8. Acidic nature of hydrogen halides in water

Strong acids:

HCl ≈ HBr ≈ HI

Weak acid:

HF

Exception reason: **very strong H–F bond**

9. Acidic strength of polyprotic acids (same acid)

Successive ionization:

$H_3PO_4 > H_2PO_4^- > HPO_4^{2-} > PO_4^{3-}$