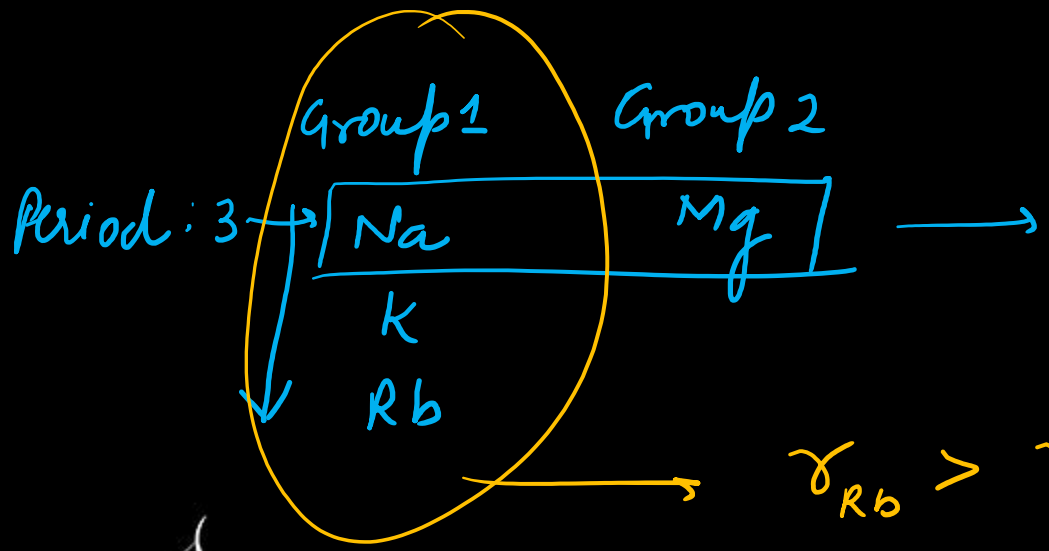
ARJUNA NEET BATCH

CLASSIFICATION OF ELEMENTS & PERIODICITY IN PROPERTIES DPP-04

Arrange the elements in increasing order of atomic radius Na, Rb, K, Mg:

(A) Na, K, Mg, Rb
(B) K, Na, Mg, Rb
(C) Mg, Na, K, Rb
(D) Rb, K, Mg, Na

Atomic radius General Trend : Increases down the group
Decreases along a period.



$r_{Mg} < r_{Na}$

$r_{Rb} > r_{K} > r_{Na}$

Increasing order of atomic radius : $Mg < Na < K < Rb$.

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Which of the following pairs of elements have almost similar atomic radii?

(A) Zr, Hf
(B) Mo, W
(C) Co, Ni
(D) All

Period 5 — Zr — Mo ⟶ 4d series

Period 6 — f block elements — Hf — W ⟶ 5d series

Atomic radii of 4d series and 5d series are almost series due to poor shielding effect of f block elements in 6th period, which increases effective nuclear charge.

(electronic repulsions within the atom)

↓

Atomic radius is less, and almost similar to 4d series.

Atomic radius $\propto \frac{1}{Z_{eff}}$ (effective nuclear charge)

$\longrightarrow$

Co, Ni → 3d series

General trend → Atomic radius decreases as we move along a period from left to right due to increase Z_{eff}.

As no. of electrons in 3d subshell increases, electronic repulsions will take place which increases the atomic radius.

In Fe, Co, Ni (screening effect), the two factors, Z_{eff} and repulsions balance each other. which keeps the atomic radius same.

The screening effect of d- electrons is :-

(A) Equal to the p - electrons
(B) Much more than p - electrons
(C) Same as f - electrons
(D) Less than p - electrons

Screening effect of different subshells is in the order: $s > p > d > f$.

The subshell present more close to nucleus has more screening effect.

Which of the following is not isoelectronic series?

(A) Cl^-, P^{3-}, Ar
(B) N^{3-}, Ne, Mg^{+2}
(C) B^{+3}, He, Li^+
(D) N^{3-}, S^{2-}, Cl^-

Isoelectronic → which has same no. of electrons
1 Negative charge → 1 e^- is added, no. of +ve charge → electrons are removed.
2 " " → 2 e^- " "

(A) Cl^- → 17+1 = 18 (no. of e⁻)
P^{3-} → 15+3 = 18
Ar = 18
Isoelectronic

(B) N^{3-} → 7+3 = 10
Ne → 10
Mg^{2+} = 12−2 = 10
Isoelectronic

(C) B^{3+} → 5−3 = 2
He → 2
Li^+ → 3−1 = 2
Isoelectronic

(D) N^{3-} = 7+3 = 10
S^{2-} = 16+2 = 18
Cl^- = 17+1 = 18
Not isoelectronic.

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same period.

Atomic radii of Fluorine and Neon in Angstrom units are given by:-

(A) 0.72, 1.60 — covalent radius
(B) 1.60, 1.60
(C) 0.72, 0.72
(D) None of these

Generally, atomic radius decreases along the period.

Neon → Noble gas → they normally do not form covalent compounds and are held together by weak forces of attraction. So Van der Waal radius is measured in case of noble gases.

∴ Noble gases have largest radii in their respective period.

$r_{Ne} > r_F$

$1.60 > 0.72$

$r_F = 0.72\ \text{Å}$

$r_{Ne} = 1.60\ \text{Å}$

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Which of the following has largest radius?

(A) $1s^2\ 2s^2\ 2p^6\ 3s^2$ → Mg, $Z=12$

(B) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ $Z=13$, Al

(C) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ $Z=15$, P

(D) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ $Z=17$, Cl

Period 3 : Mg (Grp 2) — Al (Grp 13) — P (Grp 15) — Cl (Grp 17)

In General, Atomic radius decreases as we move along a period from left to right.

order of Atomic radius: Mg > Al > P > Cl

Which of the following order of atomic/ionic radius is not correct?

(A) $I^- > I > I^+$ ✓

(B) $Mg^{+2} > Na^+ > F^-$ ✗

(C) $P^{+5} < P^{+3}$ ✓

(D) Li > Be > B ✓

(A) For same atom, atomic/ionic radii increase with increase in no. of e⁻ (anion) and decreases with decrease in no. of e⁻ (cation).

↓ no. of protons are same

order: $A^- > A > A^+$

$I^- > I > I^+$

(B) Mg^{2+} ($p=12$), Na^+ ($p=11$), F^- ($p=9$), for ↑ Iso electronic species, atomic/ionic radii decrease with increase of nuclear charge (no. of protons)

∴ order of ionic radii: $Mg^{2+} < Na^+ < F^-$

(C) $P^{3+} > P^{5+}$ (same as option 1)

5 e^- are removed (less no. of electrons)

3 e^- are removed.

(D) $Li > Be > B$ → In same period, atomic radii decreases as we move along a period from left to right.

Correct order of ionic radii is

(A) $Ti^{4+} < Mn^{7+}$ ✗ → Isoelectronic species → More the no. of protons, smaller is the radius

(B) $^{37}Cl^- < ^{35}Cl^-$ ✗

(C) $K^+ > Cl^-$ ✗

(D) $P^{3+} > P^{5+}$

$K^+ = p = 19$, $Cl^- = p = 17$] $r_{K^+} < r_{Cl^-}$

$Ti^\circ \rightarrow p \rightarrow 22$

$Mn \rightarrow p = 25$

$Mn^{7+} < Ti^{4+}$

(B) Isotopes of Cl (Cl^-)

↳ same atomic no. (no. of protons are same) but different mass no.

Both are Cl^- (no. of electrons are also same) ← so, ionic radii is same.

(D) $P^{3+} > P^{5+}$ → same atom → no. of protons are same.

but no. of electrons are different. More no. of electrons, more atomic radii

$P^{3+} = 15 - 3 = 12$, $P^{5+} = 15 - 5 = 10$

radius of $P^{3+} > P^{5+}$

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In an anion :-

(A) Number of proton decreases
(B) Protons are more than electrons
(C) Effective nuclear charge is more
(D) Radius is larger than neutral atom

Z_{eff}

$A + e^- \longrightarrow A^-$
anion

(protons are same)
electrons are more
$\therefore$ Z_{eff} is less and hence Radius is increased.

Thank You