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Atomic radii trend down the group

order of size $V < Nb \simeq Ta$ (due to poor S.E of 4f subshell Lanthanide Contraction)

I T.S / 3d series — Sc Ti V ..... Cu Zn

II T.S / 4d series — 39 Y, 40 Zr Nb - - - - Ag Cd

III T.S / 5d series — 57 La, 72 Hf Ta - - - - - Au Hg

89 Ac, 104 Ku/Rf

{57 72} {39 40}

18 32 (14)

58 Ce — 71 Lu : 4f series / lanthanide

90 Th — 103 Lr : 5f series / Actinide series

3d series element < 4d series element ≃ 5d series element

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$H^{\ominus}$

① largest size of cation = Cs^{+}

& smallest size of cation = H^{+}

② largest size of monoatomic anion = $I^{\ominus}$

& smallest size of monoatomic anion = $F^{\ominus}$

Que Why not $H^{\ominus}$

$H^{\ominus} \simeq Br$

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Ionisation energy [I.E]

amount of required energy for removal of outer shell e^- from an isolated gaseous atom.

$$Na_{(g)} \xrightarrow{-e} Na^{+}_{(g)}, \text{ I.E}$$

$$Na_{(g)} \xrightarrow{-e} Na^{+}_{(g)}, \text{ I.E}$$

$$Na \xrightarrow[I.E_1]{-e} Na^{+} \xrightarrow[I.E_2]{-e} Na^{+2} \xrightarrow[I.E_3]{-e} Na^{+3}$$

$$\frac{e}{p} = \frac{11}{11} \quad \frac{10}{11} \quad \frac{9}{11}$$

Order of I.E

Z_{eff} III > Z_{eff} II > Z_{eff} I

Successive I.E

always

$$I.E_1 < I.E_2 < I.E_3$$

Correct order of I.E

(1) $(I.E)_n < (I.E)_{(n-1)}$

(2) $(I.E)_n > (I.E)_{(n-1)}$

(3) $(I.E)_n = (I.E)_{n-1}$

(4) none

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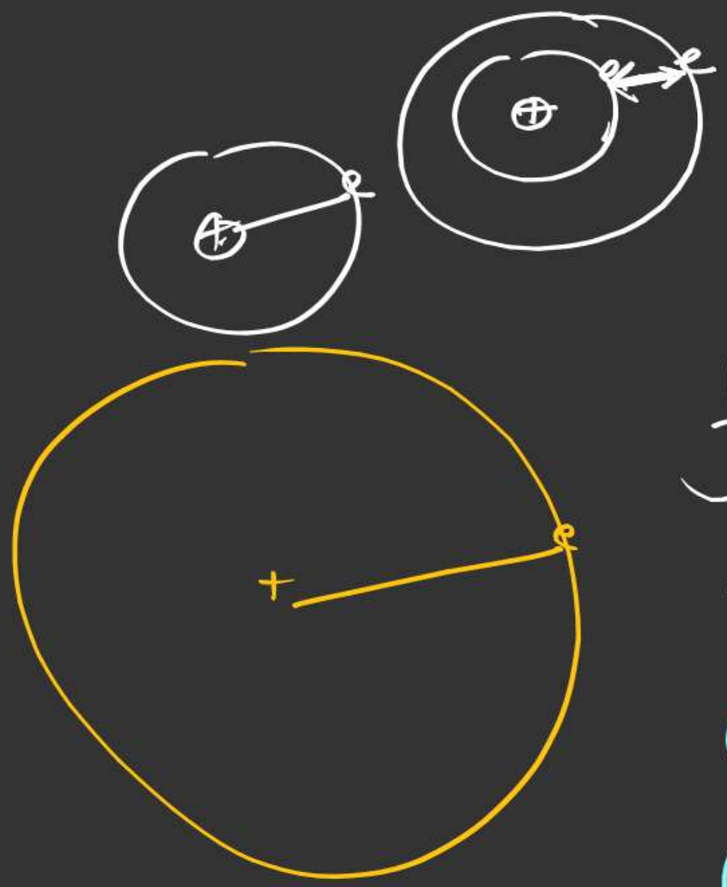

Unit

1 ev/atom = 96.4 KJ/mole

1 ev/atom = 23.1 KCal/mole

factors aff. $\pm E$

1. $Z \uparrow \Rightarrow \pm E \uparrow$
2. $Z_{eff} \uparrow \Rightarrow \pm E \uparrow$
3. $n \uparrow \Rightarrow \pm E \downarrow$
4. $\ell \uparrow \Rightarrow \pm E \downarrow$

(5) Half filled | fully filled.

$N = 1s^2 2s^2 2p^3$

$O = 1s^2 2s^2 2p^4$

$N > O$

$P > S$

$As > Se$

$Ne = 1s^2 2s^2 2p^6$

fully filled conf. → higher energy

Pertetration effect (Closeness towards nucleus)

$Be = 1s^2\ 2s^2$

$B = 1s^2\ 2s^2\ 2p^1$

Order of I.E

Be > B

Mg > Al

Ca > Ga

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trends along the period

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

Z_{eff} ↑ I.E ↑

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

due to fully filled conf.

Na < Al < Mg < Si < S < P < Cl < Ar

K < Ga < Ca < Ge < Se < As < Br < Kr

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down the group.

S-Block

Be
Mg
Ca
Sr
Ba
Ra

Li
Na
K
Rb
Cs
* Fr
87

down the group.
size ↑ I.E ↓

Li > Na > K > Rb > Cs < Fr
(∞)

Li > Na > K > Rb > * Fr > Cs

due to poor S.E of 4f subshell

87 Fr = 14 (4f) (6s)

Be > Mg > Ca > Sr > * Ba < Ra *

Be > Mg > Ca > Sr > Ra > Ba

88 Ra = 14 (4f) (6s)

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Que Order of size

$$Sc < Y < La < Ac$$