Fajan's rule :-

Special point :-

(1) Cation of d-block have more polarising power as compared to s-block cation, hence shows more covalent character.

(2) Some d-block cation Zn^{2+}, Cd^{2+}, Hg^{2+}, Ce^{4+} shows more polarisation power because of their

Pseudo inert gas Configuration.

{inert gas + d^{10}}

ex:- $Zn^{2+} \longrightarrow [Ar]\ 3d^{10}\ 4s^0$

(3) LiCl can dissolve benzene/pyridine because of its covalent character.

(4) Low (∝) (covalent character) Na^+, K^+, Rb^+, Cs^+ in Periodic table.

Q Ques. Compare Covalent Character in following.

(i) LiCl > NaCl > KCl > RbCl

(ii) $\overset{+1}{N}a_2O < \overset{+2}{M}gO < \overset{+3}{A}l_2O_3$

Smaller ← Li — I → large

(iii) LiI > NaBr > KCl > RbF

(iv) $\underline{Mn^{+2}O} < \underline{Mn^{+2}S}$

{ Size of Anion $S^{2-} > O^{2-}$ }

(v) $\underline{MnS} > \underline{K_2S} > \underline{PbS}$

d-block

S-block

(vi) $\underline{NaCl} < \underline{Cu^{+1}Cl}$

Application of fajan's rule :-

(1) Thermal Stability :-

Thermal Stability of Covalent Compound < Ionic compound.

Thermal Stability ∝ Ionic Compound ∝ $\frac{1}{\text{Covalent Compound}}$

$\boxed{\text{Thermal Stability} \propto \frac{1}{\alpha}}$ *

(α)

Q. Compare Thermal Stability in following -

(1) $Li_2CO_3 < Na_2CO_3 < K_2CO_3 < Rb_2CO_3 < Cs_2CO_3$

(2) $LiOH < NaOH < KOH < RbOH < CsOH$

(3) $BeSO_4 < MgSO_4 < CaSO_4 < BaSO_4$

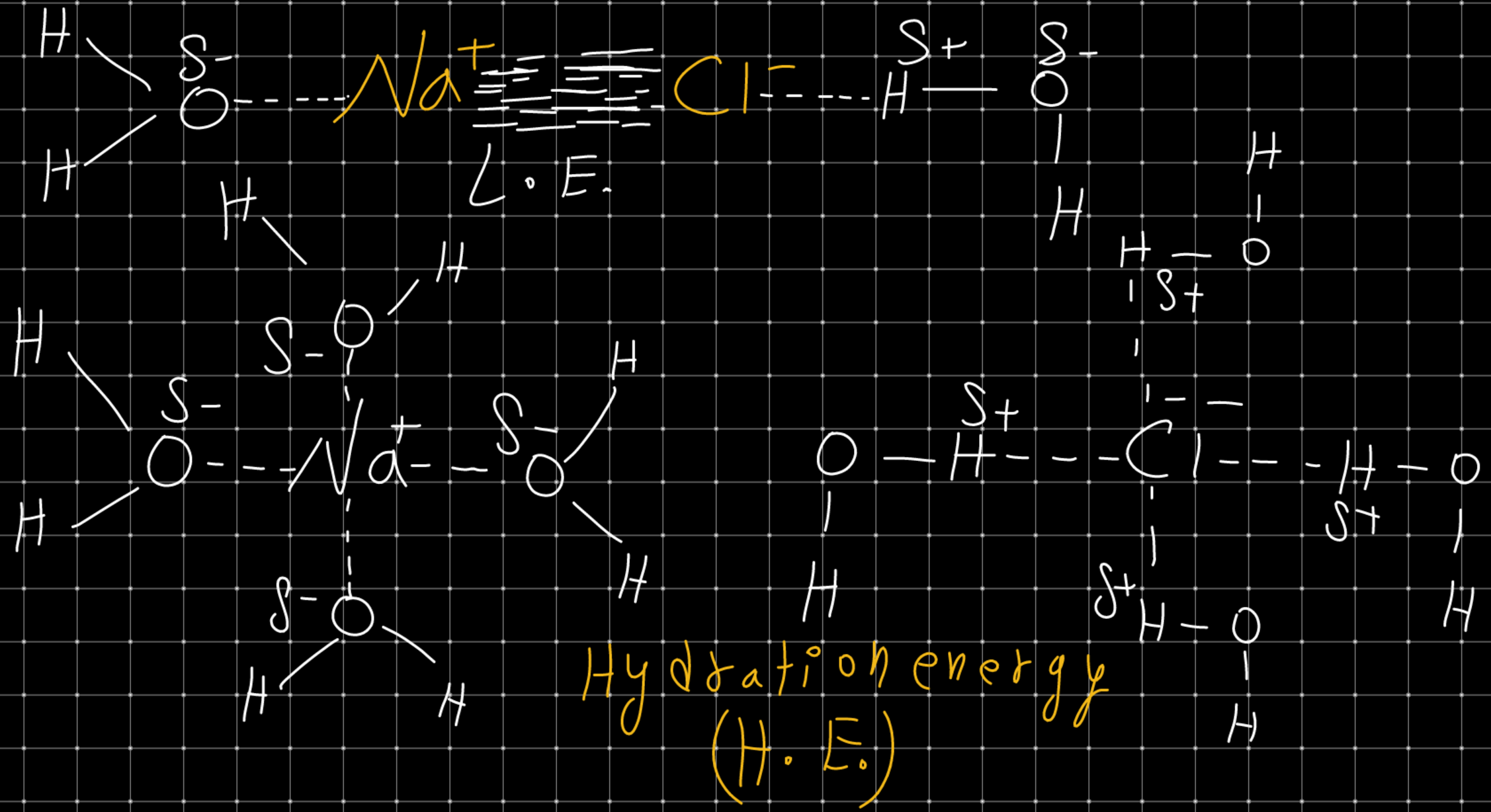
(2) Solubility :-

Solvation / Hydration :-

(1) Whenever any compound generally ionic or polar covalent compound is dissolved in polar solvent. (H_2O; $\mu \neq 0$). The different of ions of compound will seperated

and will get surrounded by solvent molecules
This process is called solvation or Hydration.

(2) The energy released during this process is called solvation / Hydration energy (H.E.)

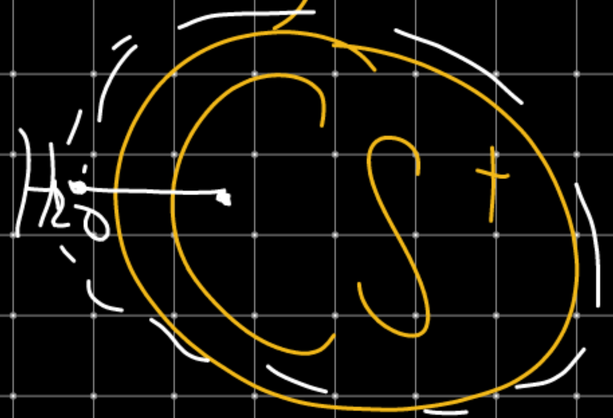

L.E.
Hydration energy
(H.E.)

If a compound is soluble then

$$H.E. > L.E.^{*}$$

Application of Solvation/Hydration :-

(1) Hydrated radii :- (Hydration)



Charge density ↑ Hydration ↑ Hydrate radii ↑

Charge is more and size is small forms large hydrated radii.

Q. Compare the size of following.

(i) $Li^+_{(aq)} > Na^+_{(aq)} > K^+_{(aq)} > Rb^+_{(aq)} > Cs^+_{(aq)}$

(ii) $Li^+_{(g)} < Na^+_{(g)} < K^+_{(g)} < Rb^+_{(g)} < Cs^+_{(g)}$

(2) Ionic mobility :-

The tendency of migration of ion in Solution.

$$\text{Ionic mobility} \propto \frac{1}{\text{Hydration}}$$

$$Li^{+}_{(aq)} < Na^{+}_{(aq)} < K^{+}_{(aq)} < Rb^{+}_{(aq)} < Cs^{+}_{(aq)}$$

(3) Electrical Conductance :-

$$\text{Electrical Conductance} \propto \text{Ionic mobility} \propto \frac{1}{\text{Hydration}}$$

Ex (i) $Na^{+}_{(aq)} > Mg^{2+}_{(aq)} > Al^{+3}_{(aq)}$

(ii) $Li^{+}_{(aq)} < Na^{+}_{(aq)} < K^{+}_{(aq)} < Rb^{+}_{(aq)} < Cs^{+}_{(aq)}$

Solubility order :-

Two general rule regarding Solubility Order -

(1) If anion and cation comparable size (~~rtwr~~-) the cation radius influence Lattice energy So L.E. decreases much more then Hydration energy.

$$\text{Solubility} \propto \frac{1}{\text{L.E.}}$$

(Small anion H^-, OH^-, F^-, Cl^-, O^{2-})

(2) If the anion is large as compared to cation ($r^- >>> r^+$) so L.E. almost constant so H.E. decreases much more then L.E.

$$\text{Solubility} \propto \text{H.E.}$$

Usage anion :

SO_4^{2-}, NO_3^-, SO_3^{2-}

HSO_3^-, HCO_3^- ClO_4^-

Br^-, I^-