

IIT Foundation Plus

Class:-8

Chemical Bonding

Ionic Bond Formation and Properties

Teaching Task.

Q1) Ans:- 4.

Solution:- In ionic compounds, if they have to dissolve in water, hydration ^{Energy} must be greater than lattice energy of ionic compound. Lesser the lattice energy, more is the solubility.

Q2) Ans:- 2

Solution:- Ionic compounds are solids held by the strong forces of attraction called electrostatic forces b/w the positive and negative ions.

Q3) Ans:- 4.

Solution:- Ionic compounds do not exhibit space isomerism because the ionic bond is non-directional.

Q4) Ans:- 4.

Solution:- Atom having high E.A & E.N form anion
→ Anion carrying negative charge.
→ Atoms tend to gain electrons to noble gas configuration.

Q5) Ans:- 3

Solution:- Ionic compounds are soluble in polar solvents.

Q6) Ans:- 4.

Solution:- Ionic compounds have high melting and boiling point depending on the charge of the ions. The higher the charges, the stronger are cohesive forces and higher is the melting and boiling point.

Q7) Ans:- 1, 4.

Solution:- An Electrovalent compound is made up of electrically charged ion or group of ion or charged particles.

Q8) Ans:- 1

Solution:- The low ionization potential is a favourable condition for the cation formation as only a small amount of energy is required to remove the electrons to form a cation.

Q9) Ans:- 2.

Solution:- 'K' is electropositive element.

Most electro negative element combines with metal to form strong ionic bond. Among, Cl, F, Br, I, $\rightarrow$ Fluorine is most electronegative.

Q1) Ans:- 1

Solution:- Sodium Fluoride (NaF) is the most ionic compound because 'F' is more electronegative than Cl, Br, I.

JEE Advanced Level Questions

Q1) Ans:- 1

Solution:- Ionic compounds are hard solids & also brittle. Ionic compounds are break when strong force applied.

Ionic compounds are soluble in polar solvents.

Q2) Ans:- 1, 2, 3.

Solution:- Ionic compounds exists as solid, they have high M.P & B.P and also they undergo chemical reactions quickly in aqueous solution because they can form ions

Q3) Ans:- 1

Solution:- KF is more ionic than NaCl .

Compounds with larger cations and smaller anions have more ionic character.

Q4) Ans:- 1

Solution:- NaCl is bad conductor of electricity because ions are fixed in place within the crystal lattice & cannot move to conduct electricity.

Matrix Matching.

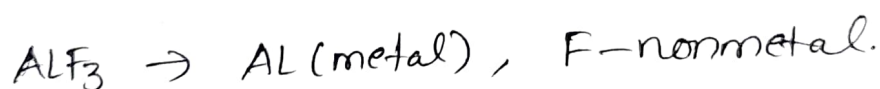
Q5) Ans:- a) 1 b) 2 c) 3 d) 4.

Solution:-

- a) Ionic compounds in aqueous $\rightarrow$ 1) Good Conductors of electricity.
b) Ionic compounds in solid state $\rightarrow$ 2) Bad conductor of electricity.
c) $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \rightarrow$ 3) Isomorphs.
d) Best polar solvent $\rightarrow$ 4) Water.

Q6) Ans:- 2.

Solution:- Ionic bonds are formed when electrons are transferred from metal to a non-metal, creating oppositely charged ions held together by electrostatic forces.



Q7) Ans:- 1

Solution:- Larger cations with lower charges have more ionic character.

KF is more ionic than NaF, MgF_2 , CaF_2

Learners Task.

Q1) Ans:- 1

Solution:- Ionic bond is formed between a metal and non-metal.

Q2) Ans:- 4

Solution:- Ionic bond is formed by transfer of electron, during this transfer of electron one atom donates its electron to form cation (oxidation) & another atom accepts electron (reduction).

Since both oxidation & reduction takes place simultaneously this is called redox reaction.

Q3) Ans:- 2

Solution:- NaH , K_2O , CaCl_2 are ionic compounds.

Carborundum (SiC) is a covalent molecule because electronegativity difference b/w Si & C is very less.

Q4) Ans:- 4.

Solution:- Smaller the size of cation, more is the polarising power of cation. Larger the size of the anion, more is its polarisability. Hence, lesser is the ionic character, more is the covalent character.

Q5) Ans:- 4.

Solution:- Al^{3+} is highly charged in nature & it can polarise the electron clouds of Cl to a large extent. So, electrons get shared b/w the two ions. Hence the compound is a covalent one, but the bond is polar covalent.

Q6) Ans:- 4.

Solution:- Larger cation and small anion forms most ionic bond $\rightarrow CsF$

Q7) Ans:- 2.

Solution:- Ionic compound stability is mostly depend on lattice energy.

Q8) Ans:- 4.

Solution:- He $\rightarrow 1s^2$ (stable Configuration)

H $\rightarrow 1s^1 \rightarrow$ Gain one electron.

Li $\rightarrow 1s^2 2s^1 \rightarrow$ Loss one electron.

Be $\rightarrow 1s^2 2s^2 \rightarrow$ Loss 2 electrons

Q9) Ans:- 2.

Solution:- Bond forms to get stability. Stability will be maximum at low P.E. So in bond formation, atom loose their P.E to get stabilized & heat is evolved. Generally bond formation is exothermic reaction.

Q10) Ans:- 1

Solution:- Ionic reactions are fast reactions. Since no breaking of bond takes place as the ions are in free state.

JEE Main Level Questions

Q1) Ans:- 1, 2, 3.

Solution:- Ionic bond formed b/w metal (Low I.E) and non-metal with high E.A
→ Electrons are transferred from metal to nonmetal.
→ Ionic bond formed b/w oxides, halides & sulphides with alkali or alkaline earth metals.

Q2) Ans:- 1

Solution:- The most favourable conditions for ionic bond are

1) Low charge on ions, 2) Large cation, 3) Small anion

Q3) Ans:- 2

Solution:- Fused NaCl conducts electricity because it releases free electrons.

Q4) Ans:- 3.

Solution:- Fused ionic compounds conduct electricity due to presence of free ions.

Q5) Ans:- 1.

Solution:- Ionic compounds have non-directional bonds.

Q6) Ans:- 3.

Solution:- A higher lattice energy means stronger ionic bonds, more energy required to break. So high melting point.

A lower lattice energy means weak ionic bonds, so it is easy to break. So low melting point.

Q7) Ans:- 3

Solution:- Due to strong electrostatic force of attraction ionic bonds possess high melting & boiling points.

Q8) Ans:- 4.

Solution:- Favourable conditions for the formation of cation

1) Large atom size.

2) Low positive charge.

3) Low ionization potential.

Q9) Ans:- 1, 2, 3, 4. JEE Advanced Level.

Solution:- Atoms can lose or gain different no. of electrons depending on their valency.

Q10) Ans:- 3, 4.

Solution:- Formation of cation is an endothermic process, meaning it absorbs energy.

Q11) Ans:- 4.

Solution:- Ionic compounds do not exhibit isomerism because ionic bonds are non-directional.

Q12) Ans:- 1

Solution:- Ca^{+2} ion is more stable than Zn^{+2} , it is due to the inert gas configuration in Ca^{+2} ion, where as in Zn^{+2} ion pseudo inert gas configuration present.

Matrix Matching:-

Q13) Ans:- a) 2 b) 1 c) 4 d) 3

Solution:-

a) Formation of Cation. $\rightarrow$ 2) $\text{Al}^{+3} < \text{Mg}^{+2} < \text{Na}^{+}$

b) Ionic bond $\rightarrow$ 1) Redox process

c) Formation of anion $\rightarrow$ 4) Decreasing electronegativity.
 $\text{F}^{-} > \text{Cl}^{-} > \text{Br}^{-} > \text{I}^{-}$

d) Lattice energy $\rightarrow$ 3) Energy released for stability.

Q14) Ans:- 2

Solution:- MgO is the most stable ionic bond

For strong ionic bond, low charge, large cation, small anion.

$\text{Li}_2\text{O} \rightarrow \text{Li}$ small cation.

$\text{Cs}_2\text{O} \rightarrow \text{Cs}$ has +1 charge but its large size weakens the bond compared to Mg.

$\text{KI} \rightarrow$ large size of anion I^- - weak ionic bond.

Q15) Ans:- 1.

Solution:- Ionic compounds do not exhibit space

isomerism because the ionic bond is a non-directional bond.

Integer Type

Q16) Ans:- 1

Solution:- NaF.

Na loses $1e^-$ to form Na^+ .

F gains $1e^-$ to form F^- .

Q17) Ans:- +7

Solution:- In KMnO_4 .

$\text{Mn}^{+7} \rightarrow$ So Electrovalency '+7'.