7. CHEMICAL BONDING - II

IONIC BOND OR ELECTROVALENT BOND

SOLUTIONS

TEACHING TASK

JEE MAIN LEVEL QUESTIONS

1. Which of the following statements is true regarding the formation of an ionic bond?

a) It requires the sharing of electrons.

b) It involves the transfer of electrons from one atom to another.

c) It forms between atoms with similar electronegativities.

d) It is primarily influenced by the size of the atoms.

Answer:B

Solution:Ionic bonds form when electrons are transferred from a metal (low electronegativity) to a nonmetal (high electronegativity), creating oppositely charged ions (e.g., Na^+Cl^-).

2. Which of the following factors is NOT favorable for the formation of an ionic bond?

a) High electronegativity difference between atoms

b) Small size difference between ions

c) Low ionization energy of the atom

d) High electron affinity of the atom

Answer:B

Solution: Ionic bonds favor:
Large electronegativity difference (a)
Low ionization energy (c, metals lose e^- easily)
High electron affinity (d, nonmetals gain e^- easily).
Small size difference (b) is irrelevant; ionic bonds depend on charge, not size matching.

3. Which of the following is not a correct statement about an ionic compound

1. The higher the temperature, the more the solubility

2. The higher the dielectric constant of the solvent, the more the solubility

3. The higher the dipole moment of the solvent, the more the solubility

4. The higher the lattice energy, the more the solubility

Answer:4

Solution:Higher lattice energy reduces solubility because stronger ionic bonds are harder to break in water.

4. In a crystal cations and anions are held together by

1. Electrons 2. Electrostatic forces 3. Nuclear forces 4.Covalent bonds

Answer:2

Solution: Ionic crystals are held by electrostatic attraction between +ve (cations) and -ve (anions) ions.

5. Which of the following is not a property of ionic compounds

1. They are solids 2. They have high melting points

3. They are conductors in molten state

4. They exhibit space isomerism

Answer:4

Solution: Ionic compounds:
Are solids (1) with high MP/BP (2).
Conduct electricity when molten/dissolved (3).
Do not show isomerism (a property of covalent complexes).

6. Which of the following statement is correct

1. Atom having very high electron effinity / electro negativity forms anion very easily.

2. Formation of anion carrying less negative charge is easy.

3. Formation of anion having inert gas configuration is very easy. 4. All

Answer:4

Solution:All statements are correct:
High electronegativity $\rightarrow$ easy anion formation (e.g., F^-).
Less negative charge (e.g., O^-) forms more easily than O^{2-}.
Inert gas config (e.g., Cl^-) is highly stable.

7. Which of the following statement is incorrect

1. Ionic compounds have high melting points and high boiling points

2. A nonbonding array of alternate positive and negative ions exist

3. Ionic compounds dissolve in non polar solvents.

4. Ionic compounds do not exhibit space isomerism

Answer:3

Solution:Ionic compounds dissolve in polar solvents (e.g., water), not nonpolar ones (like oil).

8. Compared with covalent compounds, electro-valent compounds, generally have

1. Low melting points and low boiling points

2. Low melting points and high boiling points

3. High melting points and low boiling points

4. High melting points and high boiling points

Answer:4

Solution:Ionic compounds have strong electrostatic forces, requiring high energy to melt/boil.

9. In an ionic compound, which of the following factors contributes to the high melting and boiling points?

a) Weak electrostatic forces between ions

b) Strong covalent bonds within ions

c) Lattice energy resulting from attraction between ions

d) Presence of lone pairs on ions

Answer:C

Solution:Lattice energy (energy to separate ions) determines MP/BP.

10. What factor primarily determines the strength of an ionic bond?

a) Size of the ions **b) Charge of the ions**

c) Bond length **d) Molecular weight of the compound**

Answer:B

Solution:Strength α (Charge of ions × 1/radius).

11. An electrovalent compound is made up of

1. Electrically charged particles 2. Neutral molecules

3. Neutral atoms 4. Electrically charged atom or group of atoms

Answer:1

Solution:An electrovalent compound is made up of electrically charged particles. Electrovalent compounds, also known as ionic compounds, are formed when one atom transfers electrons to another, creating positively and negatively charged ions. These charged ions then attract each other due to electrostatic forces, forming the compound.

12. Which of the following is a favourable factor for cation formation?

1. Low ionisation potential **2. High electron affinity**

3. High electronegativity **4. Small atomic size**

Answer:1

Solution:Metals with low ionization energy (e.g., K) lose e^- easily to form cations.

13. Potassium forms a highly ionic compound when it combines with

1. Chlorine 2. Fluorine 3. Bromine 4. Iodine

Answer:2

Solution: KF is the most ionic because F has the highest electronegativity, maximizing charge separation.

14. Most ionic compound among the following is

1. Sodium fluoride **2. Sodium Chloride**

3. Sodium bromide **4.Sodium iodide**

Answer:1

Solution: NaF has the greatest electronegativity difference (Na=0.93, F=3.98).

15. In which of the following pairs would you expect the most covalent character in the bond?

a) Potassium and oxygen **b) Sodium and chlorine**

c) Carbon and hydrogen **d) Magnesium and sulfur**

Answer:C

Solution:C-H bonds are purely covalent (similar electronegativities). Others are ionic (e.g., Na^+Cl^-).

16. Which of the following properties is NOT typical of ionic compounds?

A) High melting and boiling points B) Conductivity in molten state

C) Soft and malleable **D) Solubility in water**

Answer:C

Solution:Ionic crystals are hard and brittle due to rigid lattice structures.

17. What happens to ionic compounds when dissolved in water?

A) They remain as individual ions. B) They form covalent bonds.

C) They precipitate out of solution. **D) They form a solution of ions.**

Answer:D

Solution:Dissolved ionic compounds dissociate into free ions (e.g., $NaCl \rightarrow Na^+ + Cl^-$).

JEE ADVANCED LEVEL QUESTIONS

MULTI CORRECT ANSWERS

1. In the formation of an ionic bond, which factors contribute to stability?

a) Complete transfer of electrons from one atom to another

b) Formation of ions with noble gas electron configurations

c) Presence of a lattice energy releasing process

d) Strong electrostatic attraction between oppositely charged ions

Answer:A,B,C,D

Solution:Ionic bonds stabilize through:

Complete e^- transfer (e.g., $Na \rightarrow Na^+ + Cl^-$).

Ions achieving noble gas configurations (Na^+ = Ne; Cl^- = Ar).

Lattice energy (energy released when ions form a crystal lattice).

Coulombic attraction between +ve and -ve ions.

2. Which properties favor the formation of ionic compounds over covalent com pounds?

a) High electronegativity difference between atoms

b) Large atomic radius difference between atoms

c) Presence of metal cations and nonmetal anions

d) Low ionization energy of the participating atoms

Answer:A,C,D

Solution:Ionic compounds form when:

Electronegativity difference > ~1.7 (e.g., NaF).

Metals (low IE) lose e^- easily; nonmetals gain e^-.

Not b): Size difference is irrelevant (e.g., small Li^+ and large I^- form LiI).

3. Which of the following true for ionic compounds?

1. They are hard solids

2. They can be broken down into pieces very easily

3. They are soluble in non-polar solvents 4. None of the above

Answer:1,2

Solution: They are hard solids → True

They can be broken down into pieces very easily → True (they are brittle)

They are soluble in non-polar solvents → False (they dissolve in polar solvents, e.g. water)

4. Which of the following are true?

1. Ionic compounds exists as solid.

2. Ionic compounds have high melting point and high boiling point.

3. Ionic compounds undergo chemical reactions quickly in aqueous solutions.

4. None of these

Answer:1,2,3

Solution:Ionic compounds exist as solids

Ionic compounds have high melting point and high boiling point

Ionic compounds undergo chemical reactions quickly in aqueous solutions → they dissociate into ions and react fast.

5. Which of the following are characteristics of compounds formed by ionic bonds?

a) Brittle nature in the solid state

b) High electrical conductivity in molten or aqueous state

c) Formation of giant molecular structures

d) Solubility in nonpolar solvents

Answer:A,B

Solution:

a) Brittle nature in the solid state

b) High electrical conductivity in molten or aqueous state

c) Formation of giant molecular structures → wrong (that is covalent, like diamond, SiO_2)

d) Solubility in nonpolar solvents → wrong (they are soluble in polar solvents

REASON AND ASSERTION TYPE

A) Both (A) and (R) are true and (R) is the correct explanation of(A)

B) Both (A) and (R) are ture and (R) is not the correct explanation of (A)

C) (A) is true but (R) is false D) (A) is false but (R) is true

6. Assertion: Ionic bonds are favored when there is a large difference in electrone gativity between atoms.

Reason: Electronegativity difference leads to the transfer of electrons from one atom to another, resulting in the formation of ions which then attract each other to form ionic bonds.

Answer:A
Solution:
Assertion (A): True (Large electronegativity difference $\rightarrow$ ionic bonding, e.g., NaF).

Reason (R): Correct explanation (e^- transfer creates ions + electrostatic attraction).

7. Assertion: Ionic bonds are more likely to form between elements with low ionization energy and high electron affinity.

Reason: Low ionization energy allows atoms to lose electrons easily, while high electron affinity facilitates the acceptance of electrons, both of which are necessary for the formation of ions in ionic bonding.

Answer:A
Solution:
Assertion (A): True (Metals with low IE lose e^- easily; nonmetals with high EA gain e^-).
Reason (R): Correct explanation (These properties facilitate ion formation).

8. Assertion: Ionic bonds are favored in compounds with highly polarizable ions.

Reason: Highly polarizable ions can distort their electron clouds easily, enhanc ing their ability to attract each other electrostatically and form stable ionic bonds.

Answer:D(BOTH ARE INCORRECT)
Solution:Highly polarizable ions (large, easily distorted anions or very polarizing cations) actually increase covalent character (Fajan's rules). So the assertion is incorrect and the reason is not a correct statement to support ionic bonding

9. Assertion: Ionic bonds are favored in compounds with small cations and large anions.

Reason: Small cations can tightly pack around large anions, maximizing the attractive forces between opposite charges and stabilizing the ionic lattice structure.

Answer:D
Solution:
Small cations + large anions often lead to close packing and high lattice energy (reason is true), but according to Fajan's rules a small, highly polarizing cation with a large polarizable anion tends to increase covalent character — so the assertion as phrased (that this favors ionic bonding) is misleading/false even though the geometric/packing/attraction part of the reason is true

10. Assertion: Ionic bonds are favored in compounds with high lattice energies.

Reason: High lattice energies indicate strong attractions between ions in the

solid state, which is characteristic of compounds held together by ionic bonds.

Answer:A

Solution:Assertion (A): True (High lattice energy = strong ionic bonds, e.g., MgO).
Reason (R): Correct explanation (Lattice energy measures ion attraction strength).

11. Assertion: Ionic compounds have high melting and boiling points.

Reason: Ionic compounds form a three-dimensional lattice structure held together by strong electrostatic forces of attraction between oppositely charged ions.

Answer:A

Solution:Assertion (A): True (Ionic compounds require high energy to break lattice).
Reason (R): Correct explanation (Strong Coulombic forces in 3D lattice).

12. Assertion: Ionic compounds are generally soluble in water.

Reason: Water molecules are polar and can surround and solvate individual ions, leading to their dissociation from the crystal lattice and subsequent dissolution.

Answer:A

Solution:Assertion (A): True (Polar water solvates ions, e.g., NaCl dissolves).
Reason (R): Correct explanation (Hydration energy overcomes lattice energy).

13. Assertion: Ionic compounds conduct electricity when molten or in aqueous solution.

Reason: In the molten state or in solution, the ions in ionic compounds become mobile and can carry electric current due to their ability to move freely and carry charge.

Answer:A

Solution:Assertion (A): True (Mobile ions carry current when molten/dissolved).
Reason (R): Correct explanation (Free ions = charge carriers).

14. Assertion: Ionic compounds are brittle in nature.

Reason: The strong electrostatic forces holding the ions in a fixed position within the lattice structure cause the lattice to shatter when subjected to external stress, resulting in brittleness.

Answer:A

Solution:Assertion (A): True (Ionic crystals shatter under stress).
Reason (R): Correct explanation (Fixed ion positions $\rightarrow$ slip planes misalign).

15. Assertion: Ionic compounds exhibit high compressibility.

Reason: Ionic compounds have a significant amount of space between ions in their crystal lattice, allowing for compression when subjected to pressure.

Answer:D(BOTH ARE INCORRECT)

Solution:Ionic solids are typically incompressible (ionic lattices are tightly packed and stiff), and the idea that there is "significant space" that permits compression is incorrect.

STATEMENT TYPE

1) Statement-I, Statement-II both are true
2) Statement-I, Statement-II both are false
3) Statement-I is true, Statement-II is false.
4) Statement-I is false, Statement-II is true.

16. Statement I : KF is more ionic than NaC*l*.
Statement II: Compounds having large cation and small anion is more ionic than compound having small cation and large anion.

Answer:1

Solution:KF has a larger electronegativity difference (K–F) than Na–Cl, so KF is more ionic.

A large cation + small anion pair is less polarizing (less distortion of electron clouds) and therefore shows more ionic character.

17. Statement I : NaCl is bad conductor in the solid state
Statement II : Na^+ and Cl^- ions are not free in the solid state

Answer:1

Solution:Solid NaCl is a poor conductor of electricity.

In the solid state Na^+ and Cl^- are held in fixed positions in the crystal lattice (not free to move).

COMPREHENSION TYPE

The Chemical bond formed due to electron transfer is called ionic bond or electro valent bond. Ionic bond will be formed more easily between the elements with low ionization potential and high electron affinity.

18. Which of the following has electrovalent bond?
1. HCl 2. AlF_3 3. CH_4 4. $BeCl_2$

Answer:2

Solution:AlF_3 is ionic because:

Aluminum (Al) is a metal (low electronegativity, tends to lose electrons).

Fluorine (F) is the most electronegative nonmetal (tends to gain electrons).

Large electronegativity difference (~2.5) $\rightarrow$ pure ionic bond.

19. Which of the following is more ionic?

1. KF 2. NaF 3. MgF_2 4. CaF_2

Answer:1

Solution:

The ionic character increases with:Larger cation (low polarizing power)
Smaller anion (harder to polarize).
KF $\rightarrow$ K? large cation, F^- small anion $\rightarrow$ most ionic
NaF $\rightarrow$ less ionic than KF (Na^+ smaller, more polarizing).
MgF2 $\rightarrow$ Mg^{2+}(higher charge, strong polarizing power) $\rightarrow$ more covalent nature.
CaF2 $\rightarrow$ Ca^{2+}, again more covalent compared to KF

MATRIX MATCH TYPE

20.

Column-I	**Column-II**
a) Ionic compounds in aqeous	**1) Good conductor of electricity**
b) Ionic compounds in solid state	**2) Bad conductor of electricity**
c) $ZnSO_4$. $7H_2O$ and $FeSO_4$. $7H_2O$	**3) Isomorphs**
d) Best polar solvent	**4) Water**
	5) $CHCl_3$

Answer:a-1,b-2,c-3,d-4

Solution:

a) Ionic compounds in aqeous	1) Good conductor of electricity
b) Ionic compounds in solid state	2) Bad conductor of electricity
c) $ZnSO_4$. $7H_2O$ and $FeSO_4$. $7H_2O$	3) Isomorphs
d) Best polar solvent	4) Water

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)

1. Ionic bond is formed between

1. Metal and a Non metal 2. Two non-metals
3. Two Metals 4. All the above

Answer:1

Solution:Ionic bonds form between metals (electron donors) and non-metals (electron acceptors)

2. Formation of ionic bond is a

1. Redox process 2. Oxidation process
3. Reduction process 4. All the above

Answer:1

Solution:Metal loses e^- (oxidation).
Non-metal gains e^- (reduction).

3. Which of the following is not an ionic compound

1. Sodium hydride **2. Carborundum**

3. Potassium oxide **4.Calcium carbide**

Answer:2

Solution:SiC is a covalent network solid (like diamond).

4. Least ionic compound among the following is

1. NaCI **2. KCI** **3. CsI** **4. LiI**

Answer:4

Solution:Li^+ is small and highly polarizing, while I^- is large and polarizable $\rightarrow$ covalent character increases.

5. Which of the following is not an ionic compound

1. BaC_2 **2.Al_2O_3** **3. CaH_2** **4. $AICI_3$**

Answer:4

Solution:

$BaC_2 \rightarrow$ ionic

$Al_2O_3 \rightarrow$ ionic with covalent character

$CaH_2 \rightarrow$ ionic

$AlCl_3 \rightarrow$ covalent (though in melt partially ionic, but mostly covalent dimer Al_2Cl_6

6. The most ionic compound among the following is

1. KCI **2. NaCI** **3. CsI** **4. CsF**

Answer:4

Solution:Trend $\rightarrow$ greater difference in electronegativity & small cation + large anion difference.

KCl $\rightarrow$ionic

NaCl $\rightarrow$ ionic but less than KCl

CsI $\rightarrow$low ionic (large ions, low electronegativity difference)

CsF $\rightarrow$ highest ionic (largest ΔEN, small anion F^-, large cation Cs^+ $\rightarrow$ minimal polarization)

7. Stability of ionic compound is influenced by

1. Electronegativity **2. Lattice energy**

3. Sublimation energy **4. Electron affinity**

Answer:2

Solution:Lattice energy (energy released when ions form a crystal) is the primary stabilizer. Higher lattice energy ? more stable compound (e.g., MgO > NaCl).
Other factors (1, 3, 4) influence bond formation but not stability directly.

8. Which of the following will try to achieve helium configuration?

1. Hydrogen **2. Lithium** **3. Berylium** **4. All the above**

Answer:4

Solution:H gains $1e^-$ $\rightarrow$He ($1s^2$).

Li loses $1e^- \rightarrow$ He ($1s^2$).
Be loses $2e^- \rightarrow$ He ($1s^2$).

9. During bond formation potential energy of the system
1. Increases 2. decreases 3.remains the same 4. cannot be predicted
Answer:2
Solution:Separated atoms (high PE) $\rightarrow$ bonded atoms (lower PE).
Energy is released as bonds form (exothermic process).

10. Ionic reactions are
1. Fast 2. Slow 3. Very slow 4. medium
Answer:1
Solution:Ionic reactions (e.g., precipitation, acid-base) are instantaneous due to strong electrostatic attraction between ions.

JEE MAINS LEVEL QUESTIONS

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1. Which of the following factors primarily determines the formation of an ionic bond?
a) Electronegativity difference between atoms
b) Size of the atoms involved
c) Electron affinity of the atoms
d) Ionization energy of the atoms
Answer:A
Solution:Ionic bonds form due to a large electronegativity difference, leading to electron transfer.

2. What is the primary role of the valence electrons in the formation of an ionic bond?
a) They are transferred from one atom to another.
b) They are shared between two atoms.
c) They repel each other, causing atoms to bond.
d) They form pi bonds between atoms.
Answer:A
Solution:In ionic bonding, valence electrons are transferred from the metal to the nonmetal.

3. Which of the following statements are correct about ionic bond formation?
1. Ionic bond is formed between an atom of low ionisation potential and an atom of high electron affinity.
2. Ionic bond is formed by the transfer of one or more electrons from one atom to the other.
3. Generally oxides, Halides and Sulphides of alkali and alkaline earth metals are ionic
4. None of the above.

Answer:1,2,3
Solution:All three statements describe ionic bond formation and examples.
low ionization potential donor + high electron affinity acceptor
Electron transfer
Oxides, halides, sulphides of alkali/alkaline earth metals

4. Most favourable conditions for ionic bond are
1. Low charge on ions, large cation and small anion
2. High charge on ions, small cation and large anion
3. High charge on ions, large cation and small anion
4. Low charge on ions, small cation and large anion

Answer:1
Solution:The most favorable conditions for ionic bond formation are low charge on ions, large cation and small anion

5. In which of the following pairs of elements would you expect the most pronounced ionic character in their bond?
a) Carbon and hydrogen **b) Sodium and chlorine**
c) Oxygen and fluorine **d) Nitrogen and oxygen**

Answer:B
Solution:The largest electronegativity difference (metal + nonmetal) leads to the most ionic bond.

7. Which of the following conducts electricity
1. Crystalline NaCI **2. Fused NaCI**
3. Molten sulphur **4. Diamond**

Answer:2
Solution:Ionic compounds conduct electricity when molten (fused) or dissolved, not as solids.

8. Fused ionic compounds
1. are insulators **2. are used as semi-conductors**
3. conduct electricity **4. do not conduct electricity**

Answer:3
Solution:Fused ionic compounds have mobile ions that allow conduction

9. Ionic Compounds properties include
1. a non directional bond. **2. good electrical conductors in solid state**
3. Both A & B **4. None**

Answer:1
Solution:Ionic bonds are non-directional, and they do not conduct in the solid state.

10. If cation is common in the ionic compounds, then
1. compound with high lattice energy will have high m.p.
2. compound with low lattice energy will have low m.p
3. Both A & B **4. None**

Answer:3

Solution:Higher lattice energy = higher melting point, and vice versa

11. The presence of strong electrostatic forces of attraction between the ions gives

1. High melting points 2. High Boiling points 3. Both A & B 4. None

Answer:3

Solution:Strong electrostatic forces result in high melting/boiling points.

12. Which of the factors favour formation of cation

1. Atoms with large atomic size 2. less positive charge

3. low ionisation potential 4. All the above

Answer:4

Solution:Large size, low charge, and low ionization energy favor cation formation.

13. Which combination of elements is most likely to form an ionic bond?

A) Nitrogen and hydrogen B) Carbon and oxygen

C) Sodium and chlorine D) Chlorine and fluorine

Answer:C

Solution:Metal (Na) + nonmetal (Cl) combination forms an ionic bond.

14. Which of the following properties is characteristic of ionic compounds?

A) Conductivity in the solid state B) Softness and malleability

C) High volatility D) High melting and boiling points

Answer:D

Solution:Ionic compounds have high melting/boiling points due to strong ionic bonds.

15. Which of the following statements about ionic compounds is false?

A) They are generally composed of a metal and a nonmetal.

B) They have high melting and boiling points.

C) They are typically soluble in nonpolar solvents.

D) They conduct electricity when molten or in solution.

Answer:C

Solution: Ionic compounds dissolve in polar solvents, not nonpolar ones.

JEE ADVANCED LEVEL QUESTIONS

MULTI CORRECT ANSWERS

1. What factors contribute to the formation of stable ionic compounds?

a) Lattice energy exceeding hydration energy

b) Formation of a stable crystal lattice structure

c) High melting and boiling points d) Strong ionic character in bonding

Answer:A,B,C,D

Solution:a) Lattice energy exceeding hydration energy (Higher lattice energy stabi-

lizes the solid state.)
b) Formation of a stable crystal lattice structure (Ordered arrangement enhances stability.)
c) High melting & boiling points $\rightarrow$ consequence of strong ionic bonds (indicates stability)
d) Strong ionic character in bonding (Complete electron transfer strengthens the bond.)

2. Which of the following are factors favoring the formation of ionic bonds in compounds?
a) High polarizability of atoms involved
b) Large differences in electronegativity
c) Presence of metallic bonding
d) Low ionization energy of nonmetal atoms

Answer:B

Solution:a) High polarizability $\rightarrow$ favors covalent character (Fajan's rule), not ionic.
b) Large differences in electronegativity $\rightarrow$ ionic bond formation
c) Presence of metallic bonding $\rightarrow$ irrelevant, this is metallic bonding type
d) Low ionization energy of nonmetal $\rightarrow$incorrect, nonmetals need high electron affinity, not low ionization energy

3. Which conditions promote the formation of ionic bonds in compounds?
a) High electrostatic potential energy between ions
b) Formation of a stable octet or duplet electron configuration
c) Complete transfer of valence electrons from one atom to another
d) High lattice energy due to strong ionic interactions

Answer:B,C,D

Solution:
A)High potential energy means the system is energetically unfavorable. Ionic bonds form when potential energy is minimized due to attractive forces.
b) Formation of a stable octet or duplet electron configuration (Atoms achieve noble gas configuration.)
c) Complete transfer of valence electrons from one atom to another (Key feature of ionic bonds.)
d) High lattice energy due to strong ionic interactions (Stabilizes the solid structure.)

4. Atoms can lose or gain _____ number of electrons.
1. 1 2. 2 3. 3 4. 4

Answer:1,2,3,4

Solution:
1.1 (e.g., $Na \rightarrow Na^{+} + e^{-}$)
2. 2 (e.g., $Mg \rightarrow Mg^{2+} + 2e^{-}$)
3. 3 (e.g., $Al \rightarrow Al^{3+} + 3e^{-}$)
4. 4 (Rare, but possible, e.g., Sn^{4+} in $SnCl_4$)

5. Among the following which is correct information about the formation of cation?

1. Formation of cation is exothermic. **2. In this energy releases.**

3. It is an endothermic process. **4. It is an energy absorbing process**

Answer:3,4

Solution:

3. It is an endothermic process. (Requires energy to remove electrons.)
4. It is an energy-absorbing process. (Same as endothermic.)

REASON AND ASSERTION TYPE

A) Both (A) and (R) are true and (R) is the correct explanation of(A)

B) Both (A) and (R) are ture and (R) is not the correct explanation of (A)

C) (A) is true but (R) is false D) (A) is false but (R) is true

6. Assertion: Ionic bonds are favored in compounds where the cation has a low charge density.
Reason: Low charge density of cations allows for effective delocalization of charge, reducing the repulsive forces and stabilizing the ionic lattice structure.

Answer:C

Solution:

A is correct: Low charge density (large cation + low charge) reduces repulsion and stabilizes the lattice.
R is incorrect: Delocalization of charge is a metallic bonding concept, not ionic. The correct reason is that low charge density reduces cation-anion repulsion.

7. Assertion: Ionic bonds are favored in compounds formed between metals and nonmetals.
Reason: Metals tend to lose electrons to form positively charged cations, while nonmetals tend to gain electrons to form negatively charged anions, facilitating the formation of ionic bonds.

Answer:A

Solution:

A is correct: Metals (low IE) + nonmetals (high EA) form ionic bonds.
R is correct & explains A: Electron transfer (metal $\rightarrow$nonmetal) is the basis of ionic bonding.

8. Assertion: Ionic bonds are favored in compounds with low melting and boiling points.
Reason: Ionic compounds typically have high melting and boiling points due to strong electrostatic attractions, hence compounds with low melting and boiling points are less likely to have strong ionic bonding.

Answer:D

Solution:

A is false: Ionic compounds have high melting/boiling points due to strong ionic forces.
R is true: Strong electrostatic forces lead to high melting/boiling points, so low values suggest weak ionic bonding.

9. Assertion: Ionic compounds are good conductors of heat.
Reason: Ionic compounds have rigid lattice structures with closely packed ions, facilitating efficient transfer of heat energy through the lattice.

Answer:D(both are incorrect)

Solution:
In the solid state, ionic compounds are poor conductors of heat because their ions are held in a fixed lattice.
Heat transfer in solids can also occur through lattice vibrations (phonons), but these vibrations are less efficient in ionic compounds due to the strong interactions between ions.

10. Assertion: Ionic compounds are usually hard solids at room temperature.
Reason: The strong electrostatic forces between ions result in a rigid and organized lattice structure, imparting hardness to ionic compounds.

Answer:A

Solution:A is correct: Ionic compounds are hard due to strong ion-ion attractions.
R is correct & explains A: The rigid lattice (from strong Coulombic forces) makes them hard.

11. Assertion: Ionic compounds are insoluble in nonpolar solvents.
Reason: Nonpolar solvents cannot effectively solvate ions due to their lack of polarity, resulting in negligible interaction with the ionic lattice and thus insolubility.

Answer:A

Solution:A is correct: Ionic compounds dissolve in polar solvents (like water), not nonpolar ones (like hexane).
R is correct & explains A: Nonpolar solvents lack dipole moments to stabilize ions (no ion-dipole interactions).

STATEMENT TYPE

1) Statement-I, Statement-II both are true
2) Statement-I, Statement-II both are false
3) Statement-I is true, Statement-II is false.
4) Statement-I is false, Statement-II is true.

12. Statement I : Ionic compounds exhibits isomerism
Statement II : Ionic bond is non directional bond

Answer:4

Solution:Statement I (False): Ionic compounds do not exhibit isomerism because their bonding is non-directional and their structure depends only on ion size and

charge, not spatial arrangement.
Statement II (True): Ionic bonds are non-directional because electrostatic attraction acts equally in all directions around an ion.

13. Statement I: Among Ca^{2+} and Zn^{2+} ions, Ca^{2+} is more stable than Zn^{2+}
Statement II: Ca^{2+} has inert gas configuration

Answer:1

Solution:Statement I (True):
Ca^{2+} (Calcium ion) has a stable noble gas configuration ([Ar]), making it highly stable.
Zn^{2+} (Zinc ion) has a pseudo-noble gas configuration ([Ar] $3d^{10}$), which is stable but less stable than a true noble gas configuration.
Statement II (True):
Ca^{2+} attains the electron configuration of Argon (inert gas) after losing 2 electrons, contributing to its stability.

COMPREHENSION TYPE

Ionic compounds exist as solids. since electrostatic forces of attraction are extending in all directions, each ion tends to gather as many of opposite kind ions around it self. A nonbonding array of alternate positive and negative ions exist. As a result no isolated decrete molecule exist in the Crystal in lattice, gaint molecules are formed in the crystal.

14. Most stable ionic compound among the following is
1. Li_2O 2. MgO 3. Cs_2O 4. KI

Answer:2

Solution:
Stability in ionic compounds depends on:
Lattice Energy ($\uparrow$ charge & $\downarrow$ ion size $\rightarrow$ stronger lattice)
Charge Density (small, highly charged ions form stronger bonds)
Comparison:

MgO ($Mg^{2+} + O^{2-}$) $\rightarrow$ High charge (+2/-2) and small ions $\rightarrow$ Very high lattice energy $\rightarrow$ Most stable.
Li_2O ($Li^{+} + O^{2-}$) $\rightarrow$ Lower charge (+1/-2) $\rightarrow$Less stable than MgO.
Cs_2O ($Cs^{+} + O^{2-}$) $\rightarrow$ Large Cs? ion $\rightarrow$Lower lattice energy $\rightarrow$ Less stable.
KI ($K^{+} + I^{-}$) $\rightarrow$ Large ions and +1/-1 charge $\rightarrow$Weakest lattice energy $\rightarrow$ Least stable.

15. Ionic compounds do not exhibit space isomerism because
1. ionic bond is a non directional bond
2. ionic bond is a directional bond
3. High Melting points 4. High Boiling points

Answer:1

Solution:Isomerism requires directional bonding (e.g., covalent bonds with specific spatial arrangements).
Ionic bonds are non-directional $\rightarrow$ Electrostatic attraction acts uniformly in all directions $\rightarrow$ No fixed orientation $\rightarrow$ No possibility of structural/space isomers.

MATRIX MATCHING TYPE

16.

Column-I	**Column-II**
a) Formation of cation	**1) redox process**
b) ionic bond	**2) $Al^{+3} < Mg^{+2} < Na^{+}$**
c) Formation of cation	**3) Energy released for stability**
d) lattice energy	**4) $F^{-} > Cl^{-} > Br^{-} > I^{-}$**

Answer:a-2,b-1,c-4,d-3

Solution:

a) Formation of cation	2) $Al^{+3} < Mg^{+2} < Na^{+}$
b) ionic bond	1) redox process
c) Formation of anion	4) $F^{-} > Cl^{-} > Br^{-} > I^{-}$
d) lattice energy	3) Energy released for stability

INTEGER TYPE

17. The number of electrons transferred from Sodium to Fluorine during the formation of ionic bond is _____

Answer:1

Solution:Sodium (Na) has 1 valence electron (configuration: 2,8,1).
Fluorine (F) needs 1 electron to complete its octet (configuration: 2,7 $\rightarrow$ needs 1).
1 electron is transferred from Na to F, forming Na^{+} and F^{-}.

18. The maximum electrovalency in ionic bond is _____

Answer:4

Solution:
The maximum electrovalency in ionic bond corresponds to the highest oxidation state attained by elements in ionic compounds. For example, Al^{3+}, Si^{4+}.
Maximum electrovalency = 4

KEY

				TEACHING TASK					
			JEE MAIN LEVEL QUESTIONS						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	B	4	2	4	4	3	4	C	B
11	**12**	**13**	**14**	**15**	**16**	**17**			
1	1	**2**	**1**	C	C	D			
			JEE ADVANCED LEVEL QUESTIONS						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A,B,C,D	A,C,D	1,2	1,2,3	A,B	A	A	D	D	A
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	
A	A	A	A	D	1	1	2	1	
20									
a-1,b-2,c-3,d-4									
				LEARNERS TASK					
			Conceptual Understanding Questions (CUQ'S)						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	1	2	4	4	4	2	4	2	1
			JEE MAINS LEVEL QUESTIONS						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	A	1,2,3	**1**	B		**2**	**3**	**1**	**3**
11	**12**	**13**	**14**	**15**					
3	**4**	C	D	C					
			JEE ADVANCED LEVEL QUESTIONS						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A,B,C,D	B	B,C,D	1,2,3,4	3,4	C	A	D	D	A
11	**12**	**13**	**14**	**15**	**16**		**17**	**18**	
A	**4**	1	2	1	a-2,b-1,c-4,d-3		1	4	