

2. ION TRENDS IN PERIODIC TABLE & FORMULA**SOLUTIONS****TEACHING TASK****JEE MAINS LEVEL QUESTIONS**

1. If an element X has an atomic number of 12, what is the likely charge of its dipositive ion?

a) +1 b) -2 c) +2 d) -1

Answer:C

Solution:Atomic number 12 = Magnesium (Mg) with electron configuration: 2,8,2.
To form a dipositive ion (Mg^{2+}), it loses 2 valence electrons.

Charge = +2.

2. If an element with atomic number 15 loses three electrons, what charge will its ion have?

a) +1 b) +2 c) +3 d) -3

Answer:C

Solution:Atomic number 15 = Phosphorus (P) with electron configuration: 2,8,5.
Loses 3 electrons $\rightarrow P^{3+}$ ion.

Charge = +3.

3. What is the electron configuration of a di-positive ion?

a) The same as its neutral atom
b) One less electron shell than its neutral atom
c) Two less electron shells than its neutral atom
d) Three less electrons shells than its neutral atom

Answer:A

Solution:A dipositive ion (e.g., Mg^{2+}) loses electrons but retains the same number of electron shells as the neutral atom.

Only the number of electrons changes, not the shells.

4. The Di-positive electropositive ion formed by which element is represented by the symbol Ba^{2+} ?

a) Boron b) Barium c) Bismuth d) Beryllium

Answer:B

Solution: Ba^{2+} is the barium ion (Group 2, alkaline earth metal).
Barium loses 2 electrons to achieve stability.

5. A tripositively charged ion of an element 'X' has the same number of electrons as in trinegatively charged N^{3-} . Then identify 'X'.

A) Cu B) Al C) Mg D) Si

Answer:B

Solution: N^{3-} (nitride ion) has 10 electrons ($7 + 3$).

Tripositive ion of Al (Al^{3+}) has 10 electrons ($13 - 3$).

6. Which of the following statement is correct

- A) Nickel ion is a Divalent ion B) Antimonous ion is a Trivalent ion
C) Ammonium ion is a Monovalent ion D) All the above

Answer:D

Solution:(A) Nickel ion (Ni^{2+}) is divalent.

(B) Antimonous ion (Sb^{3+}) is trivalent.

(C) Ammonium ion (NH_4^+) is monovalent.

7. Which of the following compounds contains an electropositive ion with a 2+ charge?

- a) KBr b) CaO c) Al_2O_3 d) LiF

Answer:B

Solution:CaO contains Ca^{2+} (calcium ion, Group 2).

8. Which of the following elements tends to form bivalent electronegative ions?

- a. Phosphorus (P) b. Sodium (Na) c. Sulfur (S) d. Potassium (K)

Answer:C

Solution:Sulfur forms S^{2-} (gains 2 electrons) as a bivalent anion.

Others:P (forms P^{3-}), Na/K (form cations, not anions).

9. Choose the trivalent anions from the following:

- i) Aluminate ii) Dichromate iii) Bromide iv) Boride
A) i, ii, iii B) (i), (iv) C) i, iii D) i, ii, iii, iv

Answer:B

Solution:Aluminate (AlO_3^{3-}) and Boride (B^{3-}) are trivalent anions.

Dichromate ($\text{Cr}_2\text{O}_7^{2-}$) is divalent; Bromide (Br^-) is monovalent.

10. What is valency and valence electrons in nitride ion ?

- A) 3, 5 B) 5, 8 C) 3, 8 D) 8, 8

Answer:C

Solution:Nitride ion (N^{3-}) has:

Valency = 3 (charge magnitude).

Valence electrons = 8 (5 original + 3 gained = stable octet).

11. Which of the following elements is known for exhibiting variable valency?

- a) Sodium b) Magnesium c) Iron d) Chlorine

Answer:C

Solution:Iron (Fe) shows variable valency (e.g., Fe^{2+} in FeO and Fe^{3+} in Fe_2O_3)

12. Which of the following statements is true about variable valency?

- a. It is only observed in nonmetals.
b. It is unrelated to the electron configuration of an element.
c. It is a property mainly exhibited by alkali metals.
d. It is associated with the ability of elements to involve electrons in outermost shell and penultimate shell

Answer:D

Solution:Variable valency arises when elements use both valence and penultimate shell electrons (common in transition metals).

13. Select the correct formula for each of the following compounds:

i) Calcium carbonate

ii) Calcium hydrogen carbonate

- | | | | |
|-----------------------------|--------------------------|--------------------------------|-----------------------------|
| (i) | (ii) | (i) | (ii) |
| A) $\text{Ca}(\text{OH})_2$ | CaCO_3 | B) CaCO_3 | $\text{Ca}(\text{HCO}_3)_2$ |
| C) CaCO_3 | $\text{Ca}(\text{OH})_2$ | D) $\text{Ca}(\text{HCO}_3)_2$ | $\text{Ca}(\text{OH})_2$ |

Answer:B

Solution: Calcium carbonate: CaCO_3 (neutral salt).

Calcium hydrogen carbonate: $\text{Ca}(\text{HCO}_3)_2$ (contains HCO_3^- ions).

14. Number of electrons transfer takes place from magnesium to oxygen in the formation of magnesium oxide.

- A) 4 B) 3 C) 2 D) 1

Answer:C

Solution: Magnesium (Mg) loses 2 electrons to form Mg^{2+} .

Oxygen (O) gains 2 electrons to form O^{2-} .

Net transfer: 2 electrons.

15. A metal M forms a compound M_2HPO_4 . What will be the formula of the metal sulphate?

- A) M_2SO_4 B) MSO_4 C) M_3SO_4 D) M_4SO_4

Answer:A

Solution: In the compound M_2HPO_4 , the metal M has a +1 charge to balance the -2 charge of the HPO_4 ion. Since the sulfate ion (SO_4) has a -2 charge as well, the formula for the metal sulfate will be M_2SO_4 to maintain charge neutrality.

16. If the formula of a metal nitrite is $\text{M}(\text{NO}_2)_2$ then the formula of its dihydrogen phosphate is

- A) $\text{M}_2(\text{PO}_4)_3$ B) MHPO_4 C) $\text{M}(\text{H}_2\text{PO}_4)_2$ D) M_2HPO_4

Answer:C

Solution: $\text{M}(\text{NO}_2)_2$ implies metal M has +2 valency (NO_2^- is nitrite ion).

Dihydrogen phosphate ion = H_2PO_4^- .

To balance charges: $\text{M}^{2+} + 2\text{H}_2\text{PO}_4^- \rightarrow \text{M}(\text{H}_2\text{PO}_4)_2$

17. The chemical formula of potassium per-chlorate is

- A) KClO B) KClO_2 C) KClO_3 D) KClO_4

Answer:D

Solution: Perchlorate = ClO_4^- (highest oxidation state of Cl, +7).

Potassium (K^+) combines with $\text{ClO}_4^- \rightarrow \text{KClO}_4$.

JEE ADVANCED LEVEL QUESTIONS

MULTIPLE CORRECT ANSWER TYPE

1. Which of the following statements are wrong?

- (A) An atom is electrically neutral
 (B) An atom & its ion have an unequal number of protons
 (C) The size of a cation is smaller than that of corresponding atom
 (D) An atom & its corresponding anion have equal number of electrons

Answer:B,D

Solution: (A) Correct: Atoms are electrically neutral (protons = electrons).

(B) Wrong: Ions and their parent atoms have the same number of protons (atomic number doesn't change). Only electrons differ.

(C) Correct: Cations are smaller than their parent atoms (loss of electron shell or increased effective nuclear charge).

(D) Wrong: Anions have more electrons than their parent atoms (e.g., Cl^- has 18 electrons vs. Cl 's 17).

2. Which of the following elements having valency 3

A) chromium

B) aluminium

C) nitrogen

D) phosphorous

Answer: A, B, C, D

Solution: (B) Aluminium (Al):

Atomic number = 13, configuration = 2, 8, 3.

Valency = +3 (loses 3 electrons to form Al^{3+}).

(C) Nitrogen (N) & (D) Phosphorus (P):

Group 15 elements with 5 valence electrons.

Valency = 3 (e.g., NH_3 , PH_3) or 5 (e.g., HNO_3).

(A) Chromium (Cr):

Transition metal with variable valency (e.g., +2, +3, +6).

3. Which of the following are correct statement

A) The chemical formula of water is H_2O

B) The chemical formula of Sulphuric acid is H_2SO_4

C) The chemical formula of carbonic acid is H_2CO_2 D) All the above

Answer: A, B

Solution: (A) Correct: Water = H_2O .

(B) Correct: Sulfuric acid = H_2SO_4 .

(C) Wrong: Carbonic acid = H_2CO_3 (not H_2CO_2).

REASON AND ASSERTION TYPE

4. Assertion: Electropositive ions are generally smaller in size compared to their parent atoms.

Reason: The loss of electrons reduces the electron cloud, leading to a decrease in the ionic radius of electropositive ions.

Answer: A

Solution: Assertion (True): Electropositive ions (cations) are formed by losing electrons, which reduces electron-electron repulsion and increases effective nuclear charge, resulting in a smaller size compared to the parent atom.

Reason (True and Correct Explanation):

Loss of electrons shrinks the electron cloud, decreasing the ionic radius.

5. Assertion: Electronegative ions are generally formed by nonmetals.

Reason: Nonmetals have a higher tendency to gain electrons to achieve a stable electron configuration and form negative ions.

Answer:A

Solution:

Assertion (True): Nonmetals (e.g., Cl, O) gain electrons to form anions (Cl^- , O^{2-}).

Reason (True and Correct Explanation): Nonmetals have high electronegativity and tend to gain electrons to complete their octet (stable configuration).

6. Assertion: The criss-cross method facilitates the prediction of formulas for ionic compounds with polyatomic ions like NH_4^+ and SO_4^{2-} .

Reason: Treating polyatomic ions as single units, the criss-cross method determines the overall formula by exchanging charges.

Answer:A

Solution: Assertion (True):

The criss-cross method works for polyatomic ions (e.g., $(\text{NH}_4)_2\text{SO}_4$ is formed by exchanging charges: NH_4^+ (charge +1) and SO_4^{2-} (charge -2)).

Reason (True and Correct Explanation): Polyatomic ions (e.g., NH_4^+ , SO_4^{2-}) are treated as single charged units, and their charges are criss-crossed to balance the formula.

STATEMENT TYPE

7. **Statement-I** : Electropositive ions are commonly found in metals.

Statement-II : Metals tend to lose electrons easily, forming electropositive ions, which are responsible for the metallic bonding in metals.

Answer:1

Solution: Statement-I (True):

Metals (e.g., Na, Mg) lose electrons to form electropositive ions (Na^+ , Mg^{2+}).

Statement-II (True and Correct Explanation):

Metallic bonding occurs due to the sea of delocalized electrons from electropositive ions.

Example: In Na metal, Na^+ ions are surrounded by free electrons.

8. **Statement I** : PO_3^{3-} is a trivalent electronegative ion.

Statement II : An ion or a radical formed by the acceptance of one electron is called monovalent electronegative ion.

Answer:2

Solution: Both are correct there is no proper explanation

9. **Statement I** : PCl_5 stands for phosphorous penta chloride.

Statement II : SO_3 stands for sulphur trioxide

Answer:2

Solution: Statement-I (True): PCl_5 is correctly named phosphorus pentachloride (prefix "penta-" for 5 Cl atoms).

Statement-II (True but Independent):

SO_3 is correctly named sulfur trioxide, but it doesn't explain Statement-I.

COMPREHENSION TYPE**Comprehension - I**

10. What is electronegativity?

- A) The ability of an atom to lose electrons
- B) The measure of an atom's ability to attract and hold onto electrons
- C) The total number of electrons in an atom
- D) The size of an atom

Answer:B

Solution: Electronegativity describes how strongly an atom attracts electrons in a chemical bond.

11. Which type of ions are formed when atoms gain electrons?

- A) Cations
- B) Anions
- C) Isotopes
- D) Radicals

Answer:B

Solution: When atoms gain electrons, they become negatively charged ions, called anions.

12. In the periodic table, where are the most electronegative elements usually found?

- A) Group 1
- B) Group 2
- C) Group 17 (halogens)
- D) Group 18 (noble gases)

Answer:C

Solution: Halogens are highly electronegative, especially fluorine, which is the most electronegative element.

13. What charge do electronegative ions typically carry?

- A) Positive
- B) Negative
- C) Neutral
- D) Variable

Answer:B

Solution: Electronegative ions (anions) have a negative charge due to gaining electrons.

Comprehension - II

13. Determine the chemical formula for the ionic compound formed by combining calcium ions and Sulphate Ions

- a) CaSO_4
- b) Ca_2SO_4
- c) $\text{Ca}(\text{SO}_4)_2$
- d) $\text{Ca}_2(\text{SO}_4)_2$

Answer:A

Solution: Calcium ion: Ca^{2+}

Sulphate ion: SO_4^{2-}

Explanation: The charges are equal and opposite (+2 and -2), so one ion of each is enough to balance the charges (CaSO_4)

14. What is the correct formula for the ionic compound formed between calcium (Ca) and bromine (Br)?

- A. CaBr
- B. CaBr_2
- C. Ca_2Br
- D. CaBr_3

Answer:B

Solution: Calcium ion: Ca^{2+} , Bromide ion: $\text{Br}^- \rightarrow \text{CaBr}_2$

15. What is the correct chemical formula for the compound formed by the combination of iron(II) ions and phosphate ions?

- A. $\text{Fe}_3(\text{PO}_4)_2$
- B. $\text{Fe}_3(\text{PO}_4)_4$
- C. Fe_2PO_4
- D. Fe_3PO_4

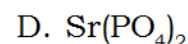
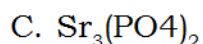
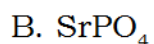
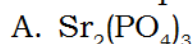
Answer:A

Solution: Iron(II): Fe^{2+}

Phosphate: PO_4^{3-}

Fe^{2+} and $\text{PO}_4^{3-} \rightarrow \text{Fe}_3(\text{PO}_4)_2$

16. Determine the chemical formula for the compound formed between strontium ions and phosphate ions



Answer: C

Solution: Ion 1s: Sr^{2+} (charge = +2)

PO_4^{3-} (charge = -3)

Criss-Cross: $\text{Sr}_3(\text{PO}_4)_2$ (LCM of charges: 6 total + and - charges).

INTEGER TYPE

17. Charge on mercuric ion _____

Answer: +2

Solution: The mercuric ion is the Hg^{2+} ion. Here, mercury (Hg) is in its +2 oxidation state, so the charge on the mercuric ion is +2.

18. The valency of hypochlorite ion is _____

Answer: 1

Solution: The hypochlorite ion is ClO^- . Its valency (combining capacity) is 1 because it has a single negative charge and can form compounds by combining with one H^+ ion (e.g., HClO , hypochlorous acid) or one Na^+ ion (e.g., NaClO , sodium hypochlorite).

19. Charge on bisulphide ion is _____

Answer: -1

Solution: The bisulphide ion (also called hydrosulfide ion) is HS^- . It carries a -1 charge because it has one extra electron compared to the neutral H_2S molecule.

MATRIX MATCHING TYPE

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

Solution:

Column-I

- a) Mercurous chloride
- b) Lead chromate
- c) Solid carbondioxide
- d) Calcium oxychloride

Column-II

- 4) Hg_2Cl_2
- 1) PbCrO_4
- 3) CO_2
- 2) CaOCl_2

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1. In which group of the periodic table do elements tend to form monovalent electropositive ions?

a) Group 1

b) Group 14

c) Group 17

d) Group 18

Answer:A

Solution: Group 1 elements (alkali metals) have 1 valence electron and tend to lose it to form M^+ ions (monovalent electropositive ions).

Example: $Na \rightarrow Na^+ + e^-$

2. Number of electrons present in ammonium ion are

- A) 9 B) 10 C) 11 D) 12

Answer:B

Solution: Nitrogen (N) has 7 electrons, Hydrogen (H) has 1 electron each ($\times 4 = 4$).

Total electrons in $NH_4 = 7 + 4 = 11$.

Since NH_4^+ has a +1 charge, it loses 1 electron, so $11 - 1 = 10$ electrons.

3. Which of the following ions is not tripositive?

- a) Fe^{3+} b) Al^{3+} c) Ca^{3+} d) B^{3+}

Answer:C

Solution: Fe^{3+} (Iron(III)), Al^{3+} (Aluminum), B^{3+} (Boron in some cases) are tripositive (3+ charge).

Calcium (Ca) forms only Ca^{2+} (dipositive), not Ca^{3+} .

4. Which element, when forming a di positive ion, would have a similar electron configuration to neon?

- a) Aluminum (Al) b) Magnesium (Mg) c) Nickel (Ni) d) Potassium (K)

Answer:B

Solution: Neon (Ne) has 10 electrons (configuration: 2,8).

Magnesium (Mg, atomic no. 12) loses 2 electrons to form Mg^{2+} (10 electrons, same as Ne).

5. The di-positive ion formed by zinc (Zn) has how many electrons?

- a) 26 b) 27 c) 28 d) 29

Answer:C

Solution: Zinc (Zn) has atomic number 30 (30 electrons).

Zn^{2+} loses 2 electrons, so $30 - 2 = 28$ electrons.

6. Which of the following does not have valency 2

- A) sulphate ion B) carbonate ion C) oxide ion D) superoxide ion

Answer:D

Solution: A) Sulphate ion (SO_4^{2-})

Charge: -2, Valency: 2

B) Carbonate ion (CO_3^{2-})

Charge: -2, Valency: 2

C) Oxide ion (O^{2-})

Charge: -2, Valency: 2

D) Superoxide ion (O_2^-)

Charge: -1, Valency: 1

The superoxide ion contains two oxygen atoms with an overall charge of -1, making its effective valency 1, not 2.

7. Which of the following are trivalent ?

- A) nitrate ion B) nitrite ion C) nitride ion D) chloride ion

Answer:C

Solution: Nitrate (NO_3^-) and nitrite (NO_2^-) have valency 1.

Chloride (Cl^-) has valency 1.

Nitride (N^{3-}) has valency 3 (gains 3 electrons).

8. Number of electrons gained by carbon is

- A) 2 B) 1 C) 3 D) 4

Answer:D

Solution:Carbon (C) has 4 valence electrons and tends to gain 4 electrons to achieve a stable octet

9. $\text{CH}_3\text{COO}^{-1}$ is

- A) carbonate ion B) carbide ion C) acetate ion D) acetic acid

Answer:C

Solution: CH_3COO^- is the acetate ion, the conjugate base of acetic acid (CH_3COOH).

10. Valency of tin in SnCl_2 and SnCl_4 is

- A) 3,2 B) 2,3 C) 3,4 D) 2,4

Answer:D

Solution:In SnCl_2 , tin has +2 oxidation state (valency = 2).

In SnCl_4 , tin has +4 oxidation state (valency = 4).

11. Valency of Iron in FeCl_2 and FeCl_3 is

- A) 3,2 B) 2,3 C) 3,4 D) 2,4

Answer:B

Solution:In FeCl_2 , iron has +2 oxidation state (valency = 2).

In FeCl_3 , iron has +3 oxidation state (valency = 3).

12. In the criss-cross method, what do the numerical subscripts represent in a chemical formula?

- a. Number of moles b. Atomic masses
c. Charge of ions d. Number of atoms

Answer:D

Solution:The criss-cross method balances charges of ions to determine the ratio of atoms in a compound.

Example: $\text{Al}^{3+} + \text{O}^{2-} \rightarrow \text{Al}_2\text{O}_3$ (subscripts 2 and 3 represent the number of atoms).

JEE MAIN LEVEL QUESTIONS

1. Which of the following is a property of monovalent electropositive ions?

- a) Gain electrons easily b) Form negative ions
c) Have a stable electron configuration d) Lose electrons easily

Answer:D

Solution:Monovalent electropositive ions (e.g., Na^+ , K^+) are formed when Group 1 elements lose 1 electron to achieve stability.

They do not gain electrons (eliminates a and b).

Their stable configuration is after losing electrons, not before (eliminates c).

2. What is the chemical symbol for a dipositive ion formed by an element with an atomic number of 20?

- a) O^{2-} b) Ca^{2+} c) N^{2-} d) H^+

Answer:B

Solution:Atomic number 20 = Calcium (Ca).

Calcium forms Ca^{2+} (dipositive ion) by losing 2 valence electrons.

3. Which of the following elements is most likely to form a tripositive electropositive ion?

- a) Oxygen (O) b) Nitrogen (N) c) Aluminum (Al) d) Fluorine (F)

Answer:C

Solution:Aluminum (Al, Group 13) loses 3 electrons to form Al^{3+} .

Oxygen (O), Nitrogen (N), and Fluorine (F) are electronegative and do not form electropositive ions.

4. Which element, when forming a di-positive ion, would have a similar electron configuration to argon?

- a) Potassium (K) b) Calcium (Ca) c) Scandium (Sc) d) Titanium (Ti)

Answer:B

Solution:Argon (Ar) has 18 electrons.

Calcium (Ca, atomic no. 20) loses 2 electrons to form Ca^{2+} (18 e^- , same as Ar).

5. In which group of the periodic table are elements most likely to form di-positive ions?

- a) Group 1 (Alkali metals) b) Group 2 (Alkaline earth metals)
c) Group 17 (Halogens) d) Group 18 (Noble gases)

Answer:B

Solution:Group 2 elements (e.g., Mg, Ca) lose 2 electrons to form M^{2+} ions.

6. What is the charge on the electropositive ion formed by an element in Group 2 of the periodic table?

- a) 1+ b) 2+ c) 3+ d) 4+

Answer:B

Solution:Group 2 elements form M^{2+} ions (e.g., Mg^{2+} , Ca^{2+}).

7. In the compound $Mg(NO_2)_2$, what is the electropositive ion?

- a) Magnesium (Mg) b) Nitrogen (N) c) Oxygen (O) d) Hydrogen (H)

Answer:A

Solution: $Mg(NO_2)_2$ contains Mg^{2+} (electropositive ion) and NO_2^- (nitrite ion).

8. The compound Na_3PO_4 contains which electropositive ion?

- a) Sodium (Na) b) Phosphorus (P) c) Oxygen (O) d) Chlorine (Cl)

Answer:A

Solution: Na_3PO_4 (Sodium phosphate) has Na^+ ions and PO_4^{3-} ions.

9. The anion is usually

- A) larger in size than consecutive atom
B) smaller in size than consecutive atom
C) same in size than consecutive atom D) None of the above

Answer:A

Solution:Anions are larger than their parent atoms because they gain electrons, increasing electron-electron repulsion.

10. Which compound doesnot contain a bivalent electronegative ion?

- a. Sodium chloride (NaCl) b. Water (H₂O)
c. Magnesium oxide (MgO) d. Calcium carbonate (CaCO₃)

Answer:A

Solution:NaCl: Cl⁻ (monovalent).

H₂O: O²⁻ (bivalent).

MgO: O²⁻ (bivalent).

CaCO₃: CO₃²⁻ (bivalent).

11. Which is having the highest negative valency among the following

- A) Nitrate B) Sulphate C) Oxide D) Carbide

Answer:D

Solution:Nitrate (NO₃⁻): Valency = 1.

Sulphate (SO₄²⁻): Valency = 2.

Oxide (O²⁻): Valency = 2.

Carbide (C⁴⁻): Valency = 4 (highest).

12. Which of the following is not a monovalent electronegative ion formed by nitrogen?

- a) Nitride ion b) Nitrate ion c) Nitrite ion d) All the above

Answer:A

Solution:Nitride (N³⁻): Trivalent.

Nitrate (NO₃⁻) and Nitrite (NO₂⁻): Monovalent.

13. Identify the right chemical formula for the following compounds.

- i) Calcium sulphate ii) Magnesium oxide iii) Potassium nitrite

A) Ca(HSO₄)₂

B) CaSO₄

C) CaS

D) None of the above

MgO

MgO

Mg₂O₂

KNO₃

KNO₂

KNO₃

Answer:B

Solution:Calcium sulphate: CaSO₄

Magnesium oxide: MgO

Potassium nitrite: KNO₂

14. Correct formula of a trivalent metal nitride is:

A) M₃N₂

B) M₃N₃

C) MN

D) Both B and C

Answer:C

Solution:Trivalent metal (M³⁺) + Nitride (N³⁻).

Charge balance is key: M³⁺ + N³⁻ → MN.

15. Metal sulphate of a metal 'M' is written as M₂(SO₄)₃ then its metal chloride is

A)MCl

B) MCl₂

C) MCl₃

D) None

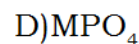
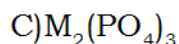
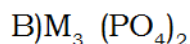
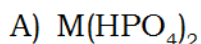
Answer:C

Solution:M₂(SO₄)₃ implies M³⁺

Chloride ion is Cl⁻, so formula is MCl₃.

16. The sulphate of a metal has the formula M₂(SO₄)₃ . The formula for its phosphate

will be



Answer:D

Solution: $M_2(\text{SO}_4)_3$ implies M^{3+} .

Phosphate ion is PO_4^{3-} .

Charges cancel out: $M^{3+} + \text{PO}_4^{3-} \rightarrow M\text{PO}_4$.

ADVANCED LEVEL QUESTIONS

MULTIPLE CORRECT ANSWER TYPE

- Which of the following statements is not correct about Electropositive ions
 - The number of electrons in electropositive ions are less in number than protons due to loss of electrons
 - The Size of the Electropositive ion is considerably more than a neutral atom due to increase of attractions of Protons on electrons left after forming ion.
 - Size of the Electropositive ion is directly proportional to number of electrons lost for a particular element.

Answer:B,C

Solution: Option A (Correct): Electropositive ions form by losing electrons, so electrons < protons. (True).

Option B (Incorrect):

Size of electropositive ions is SMALLER than the neutral atom because:

Loss of electrons reduces electron-electron repulsion.

The same nuclear charge now attracts fewer electrons, pulling them closer.

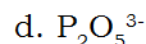
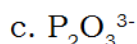
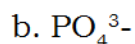
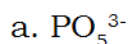
Misconception: The statement claims size increases, which is false.

Option C (Incorrect):

Size DECREASES as more electrons are lost (e.g., $\text{Fe}^{2+} > \text{Fe}^{3+}$ in size).

The statement claims size is directly proportional to electrons lost, which is the opposite of reality

- The trivalent electronegative ion commonly found in phosphate compounds is represented by the chemical symbol:



Answer:B

Solution: The phosphate ion (PO_4^{3-}) is a trivalent anion (charge = 3-).

It is the most common and stable form of phosphorus in compounds like Na_3PO_4 .

Incorrect options: PO_5^{3-} (Does not exist in stable chemistry).

$\text{P}_2\text{O}_3^{3-}$ (Hypothetical, not standard).

$\text{P}_2\text{O}_5^{3-}$ (Incorrect representation; P_2O_5 forms PO_4^{3-} in solution).

- In which of the following compounds metal is having valency 1?

A) NaCl

B) LiCl

C) MgCl_2

D) CsCl

Answer:A,B,DSolution:Valency 1 metals lose 1 electron to form M^+ ions.NaCl: Na^+ (Valency = 1).LiCl: Li^+ (Valency = 1).CsCl: Cs^+ (Valency = 1). MgCl_2 (Exception): Mg^{2+} has valency 2 (forms dipositive ions).**REASON AND ASSERTION TYPE**

4. Assertion: Electropositive ions have a strong tendency to gain electrons.

Reason: Electropositive ions actually have a tendency to lose electrons to achieve a stable electron configuration.

Answer:DSolution:Assertion (False):Electropositive ions (e.g., Na^+ , Ca^{2+}) do not gain electrons—they already lost electrons to form cations.

Reason (True):Electropositive elements lose electrons to achieve stability

5. Assertion: Fluoride ions (F^-) are negatively charged.

Reason: Fluorine gains electrons to achieve a stable electron configuration and becomes a negatively charged ion.

Answer:ASolution:Assertion (True):Fluoride ion (F^-) has a -1 charge due to an extra electron.Reason (True + Correct Explanation):Fluorine (F) gains 1 electron to complete its octet (2,8), forming F^- .6. Assertion : The criss-cross method ensures charge balance in the compound, as seen in the formation of aluminum sulfate ($\text{Al}_2(\text{SO}_4)_3$)Reason: The 3^+ charge on aluminum is criss-crossed with the 2^- charge on sulfate, resulting in the balanced formula $\text{Al}_2(\text{SO}_4)_3$ **Answer:A**

Solution:Assertion (True):

The criss-cross method balances charges by swapping ion charges as subscripts ($\text{Al}^{3+} + \text{SO}_4^{2-} \rightarrow \text{Al}_2(\text{SO}_4)_3$).

Reason (True + Correct Explanation):

 Al^{3+} (3^+) and SO_4^{2-} (2^-) are criss-crossed to give $\text{Al}_2(\text{SO}_4)_3$, ensuring total charge = 0.

COMPREHENSION TYPE**Comprehension-I**

7. Which of the following element exist as both Bivalent and trivalent ions

- A) Tin B) Manganese C) Arsenic D) Mercury

Answer:B

Solution: Mn^{2+} : Manganese(II) chloride ($MnCl_2$).

Mn^{3+} : Manganese(III) oxide (Mn_2O_3).

Tin (Sn): Only $2+$ and $4+$.

Arsenic (As): Forms anions, not cations.

Mercury (Hg): Only $1+$ and $2+$

Comprehension-II

8. Chemical formula for sodium sulphate is Na_2SO_4 . The formula for trivalent metal sulphate will be:

- A) $M_2(P_2O_7)_3$ B) $M_4P_3O_{14}$ C) $M_2(SO_4)_3$ D) M_3PO_4

Answer:C

Solution: Let the trivalent metal ion be M^{3+} .

Sulfate ion remains SO_4^{2-} .

To balance charges:

Find the least common multiple (LCM) of $+3$ and $-2 \rightarrow 6$.

$2 M^{3+}$ ions ($2 \times +3 = +6$) balance $3 SO_4^{2-}$ ions ($3 \times -2 = -6$).

Formula: $M_2(SO_4)_3$.

INTEGER TYPE

9. Valency of Mercuric ion is _____

Answer:2

Solution: Mercuric ion = Hg^{2+} (Mercury in its $+2$ oxidation state).

Example: $HgCl_2$ (Mercuric chloride).

10. Common valency exhibited by Tin and Lead is _____

Answer:2

Solution: Both Tin (Sn) and Lead (Pb) commonly exhibit $+2$ valency (though they can also show $+4$).

Sn^{2+} (Stannous ion), e.g., $SnCl_2$.

Pb^{2+} (Plumbous ion), e.g., $Pb(NO_3)_2$.

11. Oxygen get stability by gaining _____ electrons

Answer:2

Solution: Oxygen (atomic number 8) has 6 valence electrons.

To achieve a stable octet (like Neon), it gains 2 electrons, forming O^{2-} .

12. How many molecules of magnesium chloride is formed when 1 volume of magnesium is react with two volumes of hydrogen chloride

Answer:1

Solution: Balanced equation: $Mg + 2HCl \rightarrow MgCl_2 + H_2$

1 volume of Mg reacts with 2 volumes of HCl to produce 1 molecule of $MgCl_2$.

MATRIX MATCHING TYPE

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

Column- I**Compound Name**

- a. Sodium acetate
- b. Phosphoric Acid
- c. Aluminium Nitride
- d. Calcium Carbide

Column-II**Charges on Ions****2) +1, -1**

3) +1, -3

1) +3, -3

4) 2, -4

Solution: Sodium acetate (CH_3COONa)Ions: Na^+ (sodium ion) and CH_3COO^- (acetate ion).Charges: +1 (Na^+) and -1 (CH_3COO^-).Phosphoric acid (H_3PO_4)

Not ionic! Phosphoric acid is a covalent molecule (no discrete ions).

Misconception Alert: If forced to assign charges (incorrectly):

 H^+ (+1) and PO_4^{3-} (-3), but this is not accurate for the pure acid.Aluminium nitride (AlN)Ions: Al^{3+} (aluminium ion) and N^{3-} (nitride ion).Charges: +3 (Al^{3+}) and -3 (N^{3-}).Calcium carbide (CaC_2)Ions: Ca^{2+} (calcium ion) and C_2^{2-} (carbide ion).Charges: +2 (Ca^{2+}) and -2 (C_2^{2-}) (each carbon in C_2^{2-} has -1).Closest Match: 4) +2, -4 (assuming total charge on C_2^{2-} is -4, but standard is -2).

KEY

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

