ELECTRONEGATIVE IONS
SOLUTIONS

TEACHING TASK

1.The hydroxide ion is:

A) OH^+ B) OH^- C) O_2H D) HO_2

Answer:B

Solution:The hydroxide ion is OH^- (Hydroxide always has a -1 charge)

2.Which is a monovalent anion?

A) O^{2-} B) F^- C) N^{3-} D) S^{2-}

Answer:B

Solution: Fluoride gains 1 electron to form F^-, charge = -1

3.The ammonium ion (NH_4^+) is a:

A) Acidic radical B) Basic radical C) Neutral molecule D) Noble gas

Answer:B

Solution:It behaves like a metal ion in salts

4.The sulfate ion carries a charge of:

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

Answer:C

Solution:SO_4^{2-} is the sulfate ion

5.Which pair shows trivalent anions?

A) PO_4^{3-}, AlO_3^{3-} B) CO_3^{2-}, NO_3^- C) Cl^-, Br^- D) SO_4^{2-}, OH^-

Answer:A

Solution: PO_4^{3-}, AlO_3^{3-} (Both have 3- charge)

6.The formula for calcium phosphate is:

A) $CaPO_4$ B) $Ca_2(PO_4)_3$ C) $Ca_3(PO_4)_2$ D) $Ca(PO_4)_3$

Answer:C

Solution:The formula for calcium phosphate is $Ca_3(PO_4)_2$

7.Iron exhibits +2 valency in:

A) Fe_2O_3 B) $FeCl_3$ C) FeO D) $FeSO_4$

Answer:C,D

Solution:C) FeO and D) $FeSO_4$ (Both contain Fe^{2+})

8.The valency of nitrogen in NO_2 is:

A) +1 B) +2 C) +4 D) +5

Answer:C

Solution:The valency of nitrogen in NO2 is +4 (Each O contributes -2, total -4, so N is +4)

9.If a metal M forms MCl_3, its oxide will be:

A) MO B) M_2O_3 C) MO_2 D) M_3O_2

Answer:B

Solution: M_2O_3 (M has valency +3, so oxide is M_2O_3)

10.The phosphate ion (PO_4^{3-}) has:

A) 5 valence electrons on P B) P with +5 oxidation state

C) 3 oxygen atoms D) A +3 charge

Answer:A,B

Solution:A) 5 valence electrons on P $\rightarrow$ Phosphorus is in Group 15 $\rightarrow$it has 5 valence electrons. $\rightarrow$So, this statement is correct.

B) P with +5 oxidation state

PO_4^{3-}

$P + 4(-2) = -3$

$P = -3 + 8 = 5$

MULTI CORRECT ANSWERS

11.Which of the following elements have valency 2?

A) Magnesium (Mg) B) Oxygen (O) C) Sodium (Na) D) Calcium (Ca)

Answer:A,B,D

Solution:A) Magnesium (Mg):

Atomic number = 12 $\rightarrow$Electron configuration: 2,8,2

Loses 2 electrons to form Mg^{2+} → Valency = 2

B) Oxygen (O): Atomic number = 8 → Electron configuration: 2,6
Gains 2 electrons to form O^{2-} → Valency = 2

D) Calcium (Ca):
Atomic number = 20 → Electron configuration: 2,8,8,2
Loses 2 electrons to form Ca^{2+} → Valency = 2

Why C) Sodium (Na) is incorrect:
Sodium (Na) has 1 valence electron → Valency = 1 (forms Na^{+}).

12.Which statements about sulfate ion (SO_4^{2-}) are correct?
A) It's a compound ion B) It has a +2 charge
C) It forms when sulfur gains 6 electrons
D) It neutralizes 2 H^+ ions in acids
Answer:A,D
Solution:A) It's a compound ion:
Correct. SO_4^{2-} is a polyatomic ion (1 sulfur + 4 oxygen atoms).
D) It neutralizes 2 H^+ions in acids:
Correct. In acids like H_2SO_4, SO_4^{2-} balances 2 H^+ ions

Statement type

A) Both Statements are true, Statement II is the correct explanation of Statement I.
B) Both Statements are true, Statement II is not correct explanation of Statement I.
C) Statement I is true, Statement II is false.
D) Statement I is false, Statement II is true.

13. Statement I: Chloride (Cl^-) is a monovalent electronegative ion.
Statement II: Chlorine gains one electron to achieve a stable octet.
Answer:A
Solution:Statement I is true:
Cl^- is monovalent (charge = -1) and electronegative (chlorine tends to gain electrons).
Statement II is true and explains I:

Chlorine (atomic number 17) has 7 valence electrons and gains 1 electron to complete its octet (2,8,8), forming Cl^-.

14.Statement I: Iron can form both Fe^{2+} and Fe^{3+} ions.

Statement II: Iron loses electrons from both valence and penultimate shells.

Answer:B

Solution:Statement I is true:

Iron exhibits variable valency: Fe^{2+} (ferrous) and Fe^{3+} (ferric).

Statement II is true but unrelated to I:

Fe loses electrons from 4s (valence) and 3d (penultimate) shells:

Fe^{2+}: Loses two 4s electrons.

Fe^{3+}: Loses two 4s + one 3d electron.

However, this electron loss mechanism doesn't explain why iron has two valencies (it just describes how it happens).

Comprehension type

Comprehension - I

The species which carry negative charge on them **(or)** The species formed by gain of electrons by an atom are called Electronegative Ions. **(or)** Anions.

15. What happens when a fluorine atom (F) gains 1 electron?

A) It becomes a neutral neon atom

B) It becomes a positive ion

C) It becomes a negative ion

D) It disappears

Answer:C

Solution:Fluorine (F) has 9 protons (+) and 9 electrons (-) in its neutral state.

When it gains 1 electron, it becomes F^- (10 electrons, 9 protons).

The extra electron gives it a net -1 charge, making it a negative ion (anion)

16.Which of these is NOT an anion?

A) O^{2-} B) Cl^- C) Na^+ D) S^{2-}

Answer:C

Solution:Anions are negatively charged ions formed by gaining electrons:

A) O^{2-} (oxide), B) Cl^- (chloride), D) S^{2-}(sulfide) are all anions.

C) Na^+ is a cation (positively charged ion formed by losing electrons).

Comprehension - II

A radical formed by gaining 4 electrons is called tetravalent negative ions.

17.Which of these elements CANNOT form a tetravalent negative ion (X^{4-}) in nature?

A) Carbon (C) B) Silicon (Si) C) Oxygen (O) D) Lead (Pb)

Answer:C

Solution:Oxygen (O): Cannot form O^{4-} because:

It's too electronegative (prefers gaining 2 electrons to form O^{2-}).

Gaining 4 electrons would require enormous energy (unfeasible in nature).

18.If a tetravalent negative ion (X^{4-}) existed, what would happen if it touched water?

A) Nothing – it would stay stable

B) It would explode, stealing protons

C) It would turn into a gas

D) It would become neutral

Answer:B

Solution: X^{4-} ion would be:

Extremely unstable (highly negative charge).

Violently reactive with water (H_2O) because:

It would steal protons (H^+) from water to neutralize its charge.

This would trigger a rapid, exothermic reaction (likely explosive).

Integer type

19. The valency of the nitrate ion (NO_3^-) **is** _____.

Answer:1

Solution: Valency of an ion = The magnitude of its charge.

NO_3^- has a single negative charge, so its valency = 1.

Matrix Matching

20.Column-I (Ion/Formula)	**Column-II (Name)**
(a) O^{2-}	**(1) Oxide**
(b) CO_3^{2-}	**(2) Carbonate**
(c) PO_4^{3-}	**(3) Phosphate**
(d) NH_4^+	**(4) Ammonium**
(e) NO_3^-	**(5) Nitrate**

Options:

A) a-1, b-2, c-3, d-4, e-5 **B) a-5, b-3, c-2, d-1, e-4**

C) a-1, b-3, c-5, d-2, e-4

Answer:A

Solution:

(a) O^{2-}	**(1) Oxide**
(b) CO_3^{2-}	**(2) Carbonate**
(c) PO_4^{3-}	**(3) Phosphate**
(d) NH_4^{+}	**(4) Ammonium**
(e) NO_3^{-}	**(5) Nitrate**

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1.Fluoride ion carries a:

A) +1 charge B) -1 charge C) 0 charge D) +2 charge

Answer:B

Solution:Fluorine gains 1 electron to form F^-

2. Number of electrons gained by oxygen to form oxide ion (O^{2-}):

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

Answer:B

Solution:Oxygen gains 2 electrons to achieve octet

3.The sulfate ion (SO_4^{2-}) is a:

A) Monovalent anion B) Divalent anion C) Trivalent anion D) Neutral molecule

Answer:B

Solution: The sulfate ion (SO_4^{2-}) is a Divalent anion (Carries 2 negative charges)

4.The valency of phosphate ion (PO_4^{3-}) is:

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

Answer:C

Solution:The valency of phosphate ion (PO_4^{3-}) is 3 (It has a 3- charge, so valency = 3)

5.Which ion does NOT exist in nature?

A) Cl^- B) O^{2-} C) C^{4-} D) N^{3-}

Answer:C

Solution:Carbon cannot stably gain 4 electrons to form C^{4-}

6.The carbonate ion (CO_3^{2-}) forms when carbon:

A) Gains 4 electrons B) Shares 4 electrons

C) Loses 2 electrons D) Becomes neutral

Answer:B

Solution:The carbonate ion (CO_3^{2-}) forms when carbon Shares 4 electrons (Forms covalent bonds with 3 oxygens)

7.Iron shows a valency of +3 in:
A) FeO B) Fe_2O_3 C) $FeCl_2$ D) FeS
Answer:B
Solution:Ferric oxide with Fe^{3+} ions

8.The nitrite ion (NO_2^-) has a valency of:
A) 1 B) 2 C) 3 D) 4
Answer:A
Solution:The nitrite ion (NO_2^-) has a valency of 1 (Net charge is -1, so valency = 1)

9.Which element can form BOTH +2 and +3 ions?
A) Sodium (Na) B) Aluminum (Al) C) Iron (Fe) D) Calcium (Ca)
Answer:C
Solution: Iron (Fe) $\rightarrow$Forms Fe^{2+} and Fe^{3+}

10.Why can't nitrogen form N^{5-}ions?
A) It's too small to hold 5 extra electrons B) Nitrogen only forms positive ions
C) Noble gases block it D) It becomes invisible
Answer:A
Solution: It's too small to hold 5 extra electrons (Nitrogen's small size makes 5 extra electrons impossible to stabilize)

JEE MAIN LEVEL QUESTIONS

1.The chloride ion is written as:
A) Cl^+ B) Cl^- C) Cl^{2-} D) Cl
Answer:B
Solution: Chlorine gains 1 electron to form a negative ion

2.How many electrons does oxygen gain to form O^{2-}?
A) 1 B) 2 C) 3 D) 4
Answer:B
Solution: Oxygen needs 2 more electrons to complete its octet

3.Which of these is a positive ion?
A) OH^- B) NH_4^+ C) CO_3^{2-} D) SO_4^{2-}
Answer:B
Solution: Ammonium ion has a +1 charge

4.The valency of the sulfate ion (SO_4^{2-}) is:
A) 1 B) 2 C) 3 D) 4
Answer:B
Solution: The ion has a 2- charge, so its valency is 2

5.Which ion is trivalent?
A) Nitride (N^{3-}) B) Oxide (O^{2-}) C) Fluoride (F^{-}) D) Chloride (Cl^{-})
Answer:A
Solution: Nitrogen gains 3 electrons to form N^{3-}

6.The formula for the phosphate ion is:
A) PO_3^{-} B) PO_4^{3-} C) PO_2^{-} D) P^{3-}
Answer:B
Solution: PO_4^{3-}(Phosphate consists of 1 phosphorus and 4 oxygens with a 3- charge)

7.Iron exhibits a valency of +2 in:
A) Fe_2O_3 B) FeO C) $FeCl_3$ D) $FePO_4$
Answer:B
Solution: FeO (Iron(II) oxide contains Fe^{2+} ions)

8.Which element can show valency 4?
A) Sodium (Na) B) Carbon (C) C) Oxygen (O) D) Neon (Ne)
Answer:B
Solution: Carbon Forms compounds like CO_2 and CH_4 where it shows valency 4

9.The cyanide ion (CN^{-}) contains:
A) Carbon and nitrogen B) Carbon and oxygen
C) Chlorine and nitrogen D) Sulfur and carbon
Answer:A
Solution: CN^{-} is made of one carbon and one nitrogen atom

10.Why can't helium form negative ions?
A) It's too heavy B) Its outer shell is already full
C) It's a metal D) It has no protons
Answer:B
Solution: Helium has a complete duplet configuration, so it doesn't gain electrons

ADVANCED LEVEL QUESTIONS

MULTI CORRECT ANSWERS

11. Which are monovalent anions?

A) Fluoride (F^{-}) B) Oxide (O^{2-}) C) Chloride (Cl^{-}) D) Nitride (N^{3-})

Answer:A,C
Solution: Monovalent anions have a single negative charge.

F^{-} and Cl^{-} each carry a -1 charge.

O^{2-} (oxide) is divalent (-2 charge).

N^{3-} (nitride) is trivalent (-3 charge).

12.Which ions have a -2 charge?

A) Sulfate B) Carbonate C) Ammonium D) Phosphate

Answer:A,B

Solution: Both sulfate and carbonate ions carry a -2 charge.

Ammonium (NH_4^+) is a +1 cation.

Phosphate (PO_4^{3-}) has a -3 charge.

13.Which elements can show +2 AND +3 valency?

A) Iron (Fe) B) Copper (Cu) C) Aluminum (Al) D) Lead (Pb)

Answer:A

Solution: Iron shows Fe^{2+} (ferrous) and Fe^{3+} (ferric) states.

14.Which statements about phosphate (PO_4^{3-}) are TRUE?

A) It's a trivalent anion

B) It contains phosphorus and oxygent)

C) It forms when phosphorus gains 5 electrons

D) It's found in DNA

Answer:A,B,D

Solution: A) Correct: PO_4^{3-} has a -3 charge (trivalent).

B) Correct: Phosphate consists of 1P + 4O atoms.

C) Incorrect: Phosphorus shares electrons (doesn't gain 5).

D) Correct: Phosphate groups form DNA's backbone.

Comprehension type

Comprehension - I

A bivalent electronegative ion forms when an atom gains 2 electrons to achieve stability.

15. The sulfate ion (SO_4^{2-}) is bivalent because it:

A) Loses 2 protons B) Gains 2 electrons

C) Shares 2 electrons D) Loses 2 neutrons

Answer:B

Solution: The charge on SO_4^{2-} is -2, meaning it has gained 2 electrons to become stable.

This aligns with the definition of a bivalent anion

Comprehension - II

Trivalent anions carry a -3 charge and often bond with +3 ions (e.g., Al^{3}?).

16.Which of these is a trivalent anion?

A) Nitride (N^{3-}) B) Oxide (O^{2-}) C) Chloride (Cl^-) D) Sodium (Na^+)

Answer:A

Solution: A trivalent anion has a 3- charge, meaning it gains 3 electrons.
Nitride (N^{3-}) is trivalent because nitrogen (N) gains 3 electrons to achieve a stable octet.

INTEGER TYPE

17.Valency of the chloride ion (Cl^-) is _____.

Answer:1

Solution: The chloride ion has a -1 charge, so its valency = 1.

18.Sulfur gains _____ electrons to form sulfide ion (S^{2-}).

Answer:2

Solution: Sulfur (atomic number 16) needs 2 more electrons to complete its octet, forming S^{2-}.

19.Valency of the carbonate ion (CO_3^{2-}) is _____.

Answer:2

Solution: CO_3^{2-} has a -2 charge, so its valency = 2.

20.Phosphate ion (PO_4^{3-}) has a valency of _____.

Answer:3

Solution: PO_4^{3-} carries a -3 charge, giving it a valency of 3.

21.In iron(III) oxide (Fe_2O_3), the valency of iron is _____.

Answer:3

Solution: The "(III)" indicates iron is in its +3 state (Fe^{3+}).

22.If a hypothetical "carbide ion" (C^{4-}) existed, its valency would be _____.

Answer:4

Solution: The superscript 4- means the ion has a -4 charge, so valency

MATRIX MATCHING

23. Column-I (Ion/Formula)	**Column-II (Name)**
(a) NH_4^+	**(1) Ammonium ion**
(b) OH^-	**(2) Hydroxide ion**
(c) SO_4^{2-}	**(3) Sulfate ion**
(d) NO_3^-	**(4) Nitrate ion**
(e) PO_4^{3-}	**(5) Phosphate ion**

A) a-1, b-2, c-3, d-4, e-5 B) a-2, b-3, c-4, d-5, e-1 C) a-5, b-4, c-3, d-2, e-1

Answer:A

Solution:

(a) NH_4^+	(1) Ammonium ion
(b) OH^-	(2) Hydroxide ion
(c) SO_4^{2-}	(3) Sulfate ion

(d) NO_3^- (4) Nitrate ion

(e) PO_4^{3-} (5) Phosphate ion

24. Column-I (Element/Ion) Column-II (Valency)

(A) Nitrogen (in NH_3) (1) 3 (Trivalent)

(B) Chloride (Cl^-) (2) 1 (Monovalent)

(C) Oxide (O^{2-}) (3) 2 (Divalent)

(D) Phosphate (PO_4^{3-}) (4) 3 (Trivalent)

(E) Carbon (in CH_4) (5) 4 (Tetravalent)

A) A-1, B-2, C-3, D-4, E-5

B) A-3, B-1, C-2, D-5, E-4

C) A-5, B-4, C-3, D-2, E-1

Answer:A

Solution:

(A) Nitrogen (in NH_3) (1) 3 (Trivalent)

(B) Chloride (Cl^-) (2) 1 (Monovalent)

(C) Oxide (O^{2-}) (3) 2 (Divalent)

(D) Phosphate (PO_4^{3-}) (4) 3 (Trivalent)

(E) Carbon (in CH_4) (5) 4 (Tetravalent)

KEY

				TEaching task					
1	2	3	4	5	6	7	8	9	10
B	B	B	C	A	C	C,D	C	B	A,B
11	12	13	14	15	16	17	18	19	20
A,B,D	A,D	A	B	C	C	C	B	1	A
				LEARNERS Task					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)						
1	2	3	4	5	6	7	8	9	10
B	B	B	C	C	B	B	A	C	A
			JEE Main LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	B	B	B	A	B	B	B	A	B
			ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	20
A,C	A,B	A	A,B,D	B	A	1	2	2	3
21	22	23	24						
3	4	A	A						

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