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6. ELECTRONEGATIVE IONS

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. Super oxide ion is:

   A) O_2^{2-} B) O^{-2} C) O_2^- D) O_2

Answer:C

Solution:The superoxide ion is O_2^-, which is a diatomic anion with one extra electron compared to neutral O_2

2. 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, whereas Dichromate ($Cr_2O_7^{2-}$) is divalent and Bromide (Br^-) is monovalent.)

3. Carbonate and bicarbonate ions are respectively:

   A) CO_2^{3-} and HCO_2^- B) HCO_2^- and CO_2^{3-}

   C) HCO_3^- and CO_3^{2-} D) CO_3^{2-} and HCO_3^-

Answer:D

Solution:(Carbonate is CO_3^{2-}, while bicarbonate (hydrogen carbonate) is HCO_3^-.)

4. The Chloride and Nitrate ions are respectively:

   A) Cl^- and NO_3^- B) Cl^{2-} and NO_4^- C) Cl^+ and NO_3^- D) Cl^- and NO_3^+

Answer:A

Solution:Chloride is Cl^-, and nitrate is NO_3^-.

5. Sulphite and sulphate ions are respectively :

   A) SO_3^- and SO_4^- B) SO_4^- and SO_3^- C) SO_3^{2-} and SO_4^{2-} D) SO_4^{2-} and SO_3^{2-}

Answer:C

Solution:Sulphite is SO_3^{2-}, while sulphate is SO_4^{2-}.

6. Cations are called _____.

   A) Acidic radicals B) Basic radicals C) Neutral D) None

Answer:B

Solution:Cations are positively charged ions, also known as basic radicals.

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

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

Answer:A

Solution:Valence electrons in nitrogen = 5

To form N^{3-}, nitrogen gains 3 electrons $\rightarrow$ Valency = 3

8. Identify tetra valent ion

A) Ferri cyanide B) Ferro cyanide C) Carbide D) Hydride

Answer:C

Solution:Carbide (C^{4-}) has valency 4

Ferri/Ferro cyanide are complex ions, not tetravalen

"Hydride (H^-) has valency 1

9. If the formula of the Oxide of Metal M is M_2O, then the formula of its chloride is is

A)MCl_2 B) MCl C) MCl_3 D) MCl_4

Answer:B

Solution:In M_2O, M has a +1 valency (since oxygen is -2). Thus, chloride (Cl^-) forms MCl.

10. If the formula of a metal nitride is MN, the formula of the metal sulphate is

A)$M_2(SO_4)_3$ B)MSO_4 C)$M_3(SO_4)_2$ D)$M(SO_4)_2$

Answer:A

Solution:If M is +3, and sulphate is SO_4^{2-}, criss-cross charges: $M_2(SO_4)_3$

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11. Which of the following elements having valency 3

A)chromium B)aluminium C)nitrogen D)phosphorous

Answer:B,C,D

Solution:

Chromium (A): Variable valency (commonly +2, +3, +6), so not always 3 — not a consistent choice.

Aluminium (B): Always +3 valency

Nitrogen (C): Usually –3 in ionic compounds, but can also show +3 in some compounds

Phosphorus (D): Common valency is +3 and +5

12. Radicals are formed by

A) Single atoms only B) Two atoms of same element

C) Two atoms of different elements D) Loosing or gaining of electrons.

Answer:B,C,D

Solution: B) Two atoms of the same element (e.g., O_2^- superoxide, N_2^- nitride)

C) Two atoms of different elements (e.g., CN^- cyanide, OH^- hydroxide)

D) Losing or gaining electrons (Radicals are charged species formed by electron transfer.)

A) Single atoms only (Not always true, as radicals can be polyatomic.)

Statement Type :

A) Statement-I, is True, Statement - II is True; Statement - II is a correct explanation for Statement-I

B) Statement - I is True, Statement is True; Statement -II , is NOT a correct explanation for Statement - I

C) Statement - I is True, Statement - II , is False

D) Statement - I is False, Statement - II is True

13. **Statement I** : An ion or radical formed by the acceptance of 3 electrons is called trivalent electronegative ion.

    Statement II : SO_4^{2-} is a trivalent radical.

Answer:C

Solution:Statement I is correct because:An ion that gains 3 electrons (e.g., N^{3-}) is indeed a trivalent electronegative ion.
The term "electronegative" refers to its ability to attract electrons (anions).
Statement II is incorrect because:SO_4^{2-} is a divalent (2-) ion, not trivalent.
It is a polyatomic radical, but its net charge is 2-, not 3-.

14. **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:B

Solution:Statement I is correct
The phosphite ion (PO_3^{3-}) has a 3- charge, making it a trivalent anion.
Statement II is correct because:Ions like Cl^- or F^- (which gain 1 electron) are monovalent electronegative ions

Comprehension type

Comprehension - I

An ion or radical formed by the acceptance of 2 electrons is called bivalent electronegative ion or radical.

15. Sulphate ion is a

    A) Monovalent negative ion B) Bivalent negative ion
    C) Bivalent positive ion D) Monovalent positive ion

Answer:B

Solution:The sulfate ion (SO_4^{2-}) has a 2- charge, making it a bivalent negative ion.

16. Cl^-, O^{-2}, N^{-3} are respectively called as:

    A) mono, di, trivalent ions B) mono, tetra, divalent ions
    C) mono, tri, divalent ions D) All the above

Answer:A

Solution:Cl^-, O^{-2}, N^{-3} are respectively called as mono, di, trivalent ions.

Comprehension - II

The ion having a negative charge on it is known as electro-netative ion.

17. Phosphide and phosphate ions are respectively:

    A) PO_4^{3-} and P^{3-} B) P^{3-} and PO_4^{3-} C) PO_3^{4-} and P^{4-} D) P^{4-} and PO_3^{4-}

Answer:B

Solution:Phosphide ion = P^{3-}(gains 3 electrons, trivalent).
Phosphate ion = PO_4^{3-} (polyatomic ion with 3- charge).

18. The bivalent ion/radical among the following is :

    A) Nitride B) Phosphide C) Antimony D) Sulphate

Answer:D

Solution:The sulfate ion (SO_4^{2-}) has a 2- charge, making it a bivalent negative ion.

Integer type :

19. The valency of hypochlorite ion is_____

Answer:1

Solution:Hypochlorite ion formula: ClO^-

Charge: The ion carries a 1- charge.

Valency: Valency is the magnitude of the charge on the ion, so for ClO^-, the valency is 1.

Matrix Matching Type:

20.

Column-I	**Column-II**
a) SO_4^{2-}	1) Oxide
b) O_2^{2-}	2) Sulphite
c) SO_3^{2-}	3) Sulphate
d) S^{2-}	4) Sulphide
	5) Peroxide

Answer:a- 3,b-5,c-2,d-4

Solution:

a) SO_4^{2-}	3) Sulphate
b) O_2^{2-}	5) Peroxide
c) SO_3^{2-}	2) Sulphite
d) S^{2-}	4) Sulphide

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multi correct answer type:

1. Anions carry

A) poistive charge B) negative charge

C) Neutral D) None

Answer:B

Solution:Anions are negatively charged ions (they gain electrons).

2. Number of electrons gained by nitrogen to form nitride ion

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

Answer:C

Solution:Nitrogen (atomic number 7) gains 3 electrons to complete its octet $\rightarrow N^{3-}$

3. The species which carry negative charge are called

A) electropositive ions B) electronegative ions

C) valency D) variable valency

Answer:B

Solution: Electronegative ions = anions = negatively charged ions.

4 Chloride ion is

A) c^{-4} B) Cl^{-1} C) Cl^{-2} D) C^{-1}

Answer:B

Solution: Chloride ion is Cl^- $\rightarrow$ has a charge of –1

5. Sulphide ion has valency

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

Answer:B

Solution:Sulphide ion = S^{2-} $\rightarrow$ gained 2 electrons $\rightarrow$ valency = 2

6. The valency of Boride ion is

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

Answer:C

Solution:Boride ion = B^{3-} $\rightarrow$ accepts 3 electrons $\rightarrow$ valency = 3

7. Which of the followoing 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-}) $\rightarrow$ valency 2

B) Carbonate ion (CO_3^{2-}) $\rightarrow$ valency 2

C) Oxide ion (O^{2-}) $\rightarrow$ valency 2

D) Superoxide ion (O_2^-) $\rightarrow$charge –1 $\rightarrow$ valency 1

8. Which of the following are trivalent ?

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

Answer:C

Solution:A) Nitrate (NO_3^-) $\rightarrow$ monovalent

B) Nitrite (NO_2^-) $\rightarrow$monovalent

C) Nitride (N^{3-}) $\rightarrow$ trivalent

D) Chloride (Cl^-) $\rightarrow$ monovalent

9. Number of electrons gained by carbon is

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

Answer:D

Solution:Carbon gains 4 electrons to form C^{4-}

10. CH_3COO^{-1} is

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

Answer:C

Solution:CH_3COO^{-1} = acetate ion, conjugate base of acetic acid

JEE MAINS LEVEL QUESTIONS

1. Identify phosphide ion

A) PO_4^{-3} B) P^{4-} C) P^{3-} D) PO_3^{4-}

Answer:C

Solution:Phosphide ion is formed when phosphorus gains 3 electrons: P^{3-}.

2. Cyanide ion is represented as:

A) CN^- B) SNC^- C) SN^- D) None

Answer:A

Solution:Cyanide is a diatomic anion with the formula CN^-.

3. Which of the following is hydroxide ion?

A) H^+ B) OH^- C) OH^+ D) H^-

Answer:B

Solution:Hydroxide ion is OH^-, a common anion in bases.

4. Which of the following contains positive charge

A) Ammonium B) Nitrogen C) Oxide D) Argon

Answer:A

Solution:Ammonium (NH_4^+) is a positively charged polyatomic ion.
Nitrogen (B) is neutral, oxide (C) is O^{2-}, and argon (D) is inert.

5. Negative valency refers
   A) Protons and neutrons are equal
   B) Atom lost electrons
   C) Atom gained electrons
   D) Motion number is more than electron number

Answer:C

Solution:Negative valency means the atom gained electrons to form an anion.

6. The valency of nitrogen is
   A) 1 B) 3 C) 5 D) both B, C

Answer:D

Solution:Nitrogen shows valency 3 (e.g., in NH_3) and 5 (e.g., in NO_3^-, N_2O_5)
So both 3 and 5 are correct depending on compound.

7. What is the symbol for the nitrate ion ?
   A)NO^- B) NO_2^- C) NO_3^- D) NO_2^{3-}

Answer:C

Solution:Nitrate ion is NO_3^-.

8. The valency of carbon is
   A) 1 B) 2 C) 3 D) 4

Answer:D

Solution:Carbon needs 4 electrons to complete its octet $\rightarrow$Valency = 4

9. Which is having the highest negative valency among the following
   A) Nitrate B) Sulphate C) Oxide D) Carbide

Answer:D

Solution:Carbon has 4 valence electrons, forming 4 bonds

10. Formula for sulphide ion
    A) SO_3^{-2} B)SO_3^{-2} C) SO_2^{-2} D) S^{-2}

Answer:D

Solution:Sulphide is the monatomic ion S^{-2} .

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11. Which of the following is trivalent electronegative ions?
    A) Nitride B) Phosphide C) Phosphite D) Phosphate

Answer:A,B,C,D

Solution:Nitride (N^{3-}),Phosphide (P^{3-}) ,Phosphite (PO_3^{3-}) and Phosphate (PO_4^{3-})

12. The monovalent ion/radical among the following is :
    A) Sodium B) Carbonate C) Chromate D) Bicarbonate

Answer:A,D

Solution: A) Sodium (Na^+),D) Bicarbonate (HCO_3^-)
B) Carbonate (CO_3^{2-}) (divalent),C) Chromate (CrO_4^{2-}) (divalent)

13. which are divalent electrovalent radical

A) Oxide B) Sulphide C)Zincate D)sodium

Answer:A,B,C

Solution:Divalent electrovalent radicals have a 2± charge and form ionic bonds (e.g., O^{2-}, S^{2-}, ZnO_2^{2-}).

Comprehension Type :

Comprehension - I

An ion or radical formed by the acceptance of 2 electrons is called bivalent electronegative ion or radical.

14. The number of electrons accepted by an atom of an element is called

A) Its electronegative valency B) Its electropositive valency

C) Its outermost shell D) Both 1 and 2

Answer:A

Solution:Bivalent electronegative ion (from the passage) = Ion formed by accepting 2 electrons (e.g., O^{2-}, S^{2-}).

Electronegative valency = Measure of an atom's electron-gaining capacity.

Comprehension - II

The ion having a negative charge on it is known as electro-netative ion.

15. The trivalent ion/radical among the following is :

A) Zinc B) Boride C) Barium D) Oxide

Answer:B

Solution:Boride (B^{3+}) is a trivalent anion formed when boron gains 3 electrons.

Integer type :

16. Valency of peroxide ion is

Answer:2

Solution:The valency of the peroxide ion (O_2^{2-}) is 2.

17. Oxygen get stability by gaining _____ electrons

Answer:2

Solution:Oxygen has 6 valence electrons and gains 2 electrons to achieve a stable octet (8 electrons), forming O^{2-}

18. Valency of Bicarbonate Ion is _____

Answer:1

Solution:Bicarbonate ion formula: HCO_3^-

Valency: 1 (carries a 1- charge).

19. Valency of Borate ion is _____

Answer:3

Solution:Borate ion formula: BO_3^{3-}

Valency: 3 (carries a 3- charge).

Matrix Matching Type :

20.

Column-I	**Column-II**
a) Acetate ion	1) H^-
b) Hydride ion	2) CH_3COO^-
c) Bromide ion	3) I^-
d) Iodide ion	4) Br^-
	5) Mn^{+2}

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

Solution:

a) Acetate ion — 2) CH_3COO^-
b) Hydride ion — 1) H^-
c) Bromide ion — 4) Br^-
d) Iodide ion — 3) I^-

21. **Column-I** — **Column-II**
A) carbon — 1) trivalent
B) hypochlorite — 2) monovalent
C) sulphate — 3) divalent
D) borate — 4) tetravalent

Answer:A-4,B-2,C-3,D-1

Solution:
A) carbon — 4) tetravalent
B) hypochlorite — 2) monovalent
C) sulphate — 3) divalent
D) borate — 1) trivalent

KEY

Teaching Task

1	2	3	4	5	6	7	8	9	10
C	B	D	A	C	B	A	C	B	A
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
BCD	BCD	C	B	B	A	B	D	1	a-3,b-5,c-2,d-4

Learners Task

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1	2	3	4	5	6	7	8	9	10
B	C	B	B	B	C	D	C	D	C

JEE MAIN & ADVANCED LEVEL

1	2	3	4	5	6	7	8	9	10
C	A	B	A	C	D	C	D	D	D
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
ABCD	AD	ABC	A	B	2	2	1	3	a-2,b-1,c-4,d-3
21-a-4,b-2,c-3,d-1									