

## INTEGRATED PLUS

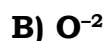
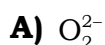
### 10. ELECTRONEGATIVE IONS

#### SOLUTIONS

#### TEACHING TASK

#### JEE MAINS LEVEL QUESTIONS

1. Super oxide ion is:



**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)

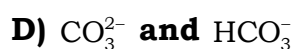
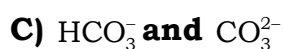
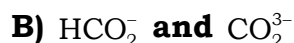
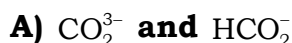
C) i, iii

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.)

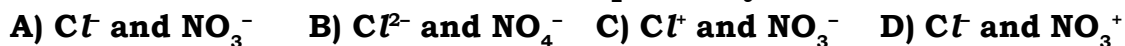
3. Carbonate and bicarbonate ions are respectively:



**Answer:D**

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

4. The Chloride and Nitrate ions are respectively:



**Answer:A**

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

5. Sulphite and sulphate ions are respectively :



**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 tetravalent

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**

- 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.,  $\text{O}_2^-$  superoxide,  $\text{N}_2^-$  nitride)  
 C) Two atoms of different elements (e.g.,  $\text{CN}^-$  cyanide,  $\text{OH}^-$  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 :  $\text{SO}_4^{2-}$  is a trivalent radical.**

**Answer:C**

Solution:Statement I is correct because:An ion that gains 3 electrons (e.g.,  $\text{N}^{3-}$ ) is indeed a trivalent electronegative ion.

The term "electronegative" refers to its ability to attract electrons (anions).

Statement II is incorrect because: $\text{SO}_4^{2-}$  is a divalent (2-) ion, not trivalent.

It is a polyatomic radical, but its net charge is 2-, not 3-.

**14. Statement I :  $\text{PO}_3^{3-}$  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 ( $\text{PO}_3^{3-}$ ) has a 3- charge, making it a trivalent anion.

Statement II is correct because:Ions like  $\text{Cl}^-$  or  $\text{F}^-$  (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 ( $\text{SO}_4^{2-}$ ) has a 2- charge, making it a bivalent negative ion.

**16.  $\text{Cl}^-$ ,  $\text{O}^{2-}$ ,  $\text{N}^{3-}$  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:  $\text{Cl}^-$ ,  $\text{O}^{2-}$ ,  $\text{N}^{3-}$  are respectively called as mono, di, trivalent ions.

### Comprehension - II

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

**17. Phosphide and phosphate ions are respectively:**

**A)  $\text{PO}_4^{3-}$  and  $\text{P}^{3-}$     B)  $\text{P}^{3-}$  and  $\text{PO}_4^{3-}$     C)  $\text{PO}_3^{4-}$  and  $\text{P}^{4-}$     D)  $\text{P}^{4-}$  and  $\text{PO}_3^{4-}$**

**Answer:B**

Solution: Phosphide ion =  $\text{P}^{3-}$  (gains 3 electrons, trivalent).

Phosphate ion =  $\text{PO}_4^{3-}$  (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 ( $\text{SO}_4^{2-}$ ) 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:  $\text{ClO}^-$

Charge: The ion carries a 1- charge.

Valency: Valency is the magnitude of the charge on the ion, so for  $\text{ClO}^-$ , the valency is 1.

### Matrix Matching Type:

**20. Column-I**

**a)  $\text{SO}_4^{2-}$**

**b)  $\text{O}_2^{2-}$**

**c)  $\text{SO}_3^{2-}$**

**d)  $\text{S}^{2-}$**

**Column-II**

**1) Oxide**

**2) Sulphite**

**3) Sulphate**

**4) Sulphide**

**5) Peroxide**

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

Solution:

a)  $\text{SO}_4^{2-}$

b)  $\text{O}_2^{2-}$

c)  $\text{SO}_3^{2-}$

d)  $\text{S}^{2-}$

3) Sulphate

5) Peroxide

2) Sulphite

4) Sulphide

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## LEARNERS TASK

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### CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

- 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  $\rightarrow \text{N}^{3-}$

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)  $\text{c}^{-4}$  B)  $\text{Cl}^{-1}$  C)  $\text{Cl}^{-2}$  D)  $\text{C}^{-1}$

**Answer:B**

**Solution:** Chloride ion is  $\text{Cl}^- \rightarrow$  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 following does not have valency 2  
A) sulphate ion B) carbonate ion C) oxide ion D) superoxide ion

**Answer:D**

**Solution:**A) Sulphate ion ( $\text{SO}_4^{2-}$ )  $\rightarrow$  valency 2

B) Carbonate ion ( $\text{CO}_3^{2-}$ )  $\rightarrow$  valency 2

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

D) Superoxide ion ( $\text{O}_2^-$ )  $\rightarrow$  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 ( $\text{NO}_3^-$ )  $\rightarrow$  monovalent

B) Nitrite ( $\text{NO}_2^-$ )  $\rightarrow$  monovalent

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

D) Chloride ( $\text{Cl}^-$ )  $\rightarrow$  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  $\text{C}^{4-}$

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

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

Answer:C

Solution: $\text{CH}_3\text{COO}^{-1}$  = acetate ion, conjugate base of acetic acid

### JEE MAINS LEVEL QUESTIONS

1. Identify phosphide ion

- A)  $\text{PO}_4^{-3}$       B)  $\text{P}^{4-}$       C)  $\text{P}^{3-}$       D)  $\text{PO}_3^{4-}$

Answer:C

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

2. Cyanide ion is represented as:

- A)  $\text{CN}^-$       B)  $\text{SNC}^-$       C)  $\text{SN}^-$       D) None

Answer:A

Solution:Cyanide is a diatomic anion with the formula  $\text{CN}^-$ .

3. Which of the following is hydroxide ion?

- A)  $\text{H}^+$       B)  $\text{OH}^-$       C)  $\text{OH}^+$       D)  $\text{H}^-$

Answer:B

Solution:Hydroxide ion is  $\text{OH}^-$ , 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 ( $\text{NH}_4^+$ ) is a positively charged polyatomic ion.

Nitrogen (B) is neutral, oxide (C) is  $\text{O}^{2-}$ , 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  $\text{NH}_3$ ) and 5 (e.g., in  $\text{NO}_3^-$ ,  $\text{N}_2\text{O}_5$ )  
So both 3 and 5 are correct depending on compound.

**7. What is the symbol for the nitrate ion ?**

- A)  $\text{NO}^-$                       B)  $\text{NO}_2^-$                       C)  $\text{NO}_3^-$                       D)  $\text{NO}_2^{3-}$

**Answer:C**

Solution:Nitrate ion is  $\text{NO}_3^-$ .

**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)  $\text{SO}_3^{-2}$                       B)  $\text{SO}_3^{-2}$                       C)  $\text{SO}_2^{-2}$                       D)  $\text{S}^{-2}$

**Answer:D**

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

## **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 ( $\text{N}^{3-}$ ), Phosphide ( $\text{P}^{3-}$ ), Phosphite ( $\text{PO}_3^{3-}$ ) and Phosphate ( $\text{PO}_4^{3-}$ )

**12. The monovalent ion/radical among the following is :**

- A) Sodium                      B) Carbonate                      C) Chromate                      D) Bicarbonate

**Answer:A,D**

Solution: A) Sodium ( $\text{Na}^+$ ), D) Bicarbonate ( $\text{HCO}_3^-$ )

B) Carbonate ( $\text{CO}_3^{2-}$ ) (divalent), C) Chromate ( $\text{CrO}_4^{2-}$ ) (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  $2\pm$  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-negative 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

- a) Acetate ion
- b) Hydride ion
- c) Bromide ion
- d) Iodide ion

##### Column-II

- 1)  $H^-$
- 2)  $CH_3COO^-$
- 3)  $I^-$
- 4)  $Br^-$



