17. Oxidation and Reduction

SOLUTIONS

TEACHING TASK

JEE MAIN LEVEL QUESTIONS

1. Oxidation state of nitrogen is not an integer in
   A) Hydroxyl amine (NH_2OH) B) Ammonia (NH_3)
   C) Hydrazine (N_2H_4) D) Hydrazoic acid (N_3H)

Answer:D

Solution:A) NH_2OH: N = -1
B) NH_3: N = -3
C) N_2H_4: N = -2
D) HN_3: N = -1/3 (average, not integer)

2. The oxidation state of phosphorus is maximum in
   A) Phospine (PH_3) B) Diphosphine (P_2H_4)
   C) Metaphosphoric acid (HPO_3) D) Phosphorus acid (H_3PO_3)

Answer:C

Solution:A) PH_3: P = -3
B) P_2H_4: P = -2
C) HPO_3: P = +5
D) H_3PO_3: P = +3

3. The oxidation state of oxygen is maximum in
   A) Bleaching powder ($CaOCl_2$) B) Oxygen difluoride (OF_2)
   C) Dioxygen difluoride (O_2F_2) D) Hydrogen peroxide (H_2O_2)

Answer:B

Solution:A) $CaOCl_2$: O = -2
B) OF_2: O = +2
C) O_2F_2: O = +1
D) H_2O_2: O = -1

4. The oxidation number of chlorine is maximum in
   A) $HOCl$ B) Cl_2O_6 C) $KClO_4$ D) $NaClO_3$

Answer:C

Solution:A) HOCl: Cl = +1
B) Cl_2O_6: Cl = +6
C) $KClO_4$: Cl = +7
D) $NaClO_3$: Cl = +5

5. One of the following element always exhibits only -1 oxidation state in all of its compounds with other elements. The element is
   A) Hydrogen B) Sodium C) Fluorine D) Oxygen

Answer:C

Solution:Fluorine is always -1 in compounds

6. In one of the following compounds, the oxidation number of sulphur is not a

whole number

A) $Na_2S_4O_6$ B) H_2SO_5 C) H_2SO_4 D) $Na_2S_2O_3$

Answer:A

Solution:A) $Na_2S_4O_6$

2(1)+4S+6(-2)=0

4S=10---->S=2.5

Others have integer values

7. Which of the following statements is wrong

A) Oxidation number of oxygen is +1 in peroxides

B) Oxidation number of oxygen is +2 in oxygen difluoride

C) Oxidation number of oxygen is -1/2 is super oxides

D) Oxidation number of oxygen is -2 in most of its compounds

Answer:A

Solution:O is -1 in peroxides (not +1)

8. In the conversion of $CrO_4^{-2} \rightarrow Cr_2O_7^{2-}$, the oxidation number of chromium

A) increases B) decreases

C) becomes zero D) remains unchanged

Answer:D

Solution:CrO_4^{-2}

Cr+4(-2)= -2

Cr=-2+8$\rightarrow$Cr=6

$Cr_2O_7^{2-}$

2Cr+7(-2)= -2

2Cr=12

Cr=6

9. Oxidation number of carbon is zero in the compound

A) methyl chloride B) chloroform

C) glucose D) carbon tetrachloride

Answer:C

Solution: A) Methyl chloride (CH_3Cl)

H = +1 (each), Cl = -1

Let C = x

Equation: x + 3(+1) + (-1) = 0 $\rightarrow$ x + 3 - 1 = 0 $\rightarrow$ x = -2

Oxidation state: -2

B) Chloroform ($CHCl_3$)

H = +1, Cl = -1 (each)

Equation: x + 1 + 3(-1) = 0 $\rightarrow$ x + 1 - 3 = 0 $\rightarrow$ x = +2

Oxidation state: +2

C) Glucose ($C_6H_{12}O_6$)

For organic compounds, we calculate average oxidation state:

H = +1 (each), O = -2 (each)

Total: 6x + 12(+1) + 6(-2) = 0 $\rightarrow$ 6x + 12 - 12 = 0 $\rightarrow$ 6x = 0 $\rightarrow$ x = 0

Average oxidation state: 0 (but individual carbons vary)

D) Carbon tetrachloride (CCl_4)

Cl = -1 (each)

Equation: x + 4(-1) = 0 $\rightarrow$ x - 4 = 0 $\rightarrow$ x = +4

Oxidation state: +4

10. If three electrons are lost by Mn^{+3}, its final oxidation state would be

A) 0 B) +6 C) +2 D) +4

Answer:B

Solution:Initial: +3

Final: +3 + 3 = +6

11. Oxidation number and Covalency of sulphur in S_8 molecule are respectively

A) 6 and 8 B) 0 and 8 C) 0 and 2 D) 6 and 2

Answer:C

Solution:In S_8 (elemental sulfur), each sulfur atom has an oxidation number of 0 since it's in its free state.

Covalency refers to the number of covalent bonds formed by an atom. In S_8 (a puckered ring structure), each sulfur forms 2 covalent bonds with neighboring sulfur atoms.

12. Sum of the oxidation numbers of carbon in acetaldehyde is

A) – 2 B) +2 C) – 4 D) –1

Answer:A

Solution:Acetaldehyde(CH_3CHO) has 2 carbon atoms:

CH_3 group (C1):3 H atoms (+1 each)

Let C1 = x

Equation: x + 3(+1) = 0 $\rightarrow$ x = -3

CHO group (C_2):1 H atom (+1), 1 O atom (-2)

Let C2 = y

Equation: y + 1 + (-2) = 0 ?$\rightarrow$y = +1

Total oxidation numbers: -3 (C1) + +1 (C2) = -2

13. In bleaching powder oxidation states of Cl are

A) –1, +2 B) –2, +1 C) –1, +1 D) –2,+1

Answer:C

Solution:Bleaching powder ($CaOCl_2$) contains two chlorine atoms with different oxidation states:

Cl^- (hypochlorite ion, ClO^-): Cl = +1

Cl^- (chloride ion, Cl^-): Cl = -1

Thus, the oxidation states are –1 and +1.

14. Oxidation numbers of sodium, mercury in sodium amalgam are

A) zero, zero B) +1, –1 C) –2, +2 D) 0, +1

Answer:A

Solution:Sodium amalgam is an alloy of sodium (Na) and mercury (Hg).

In alloys, elements retain their elemental oxidation state (0) because no electron transfer occurs.

Thus, both Na and Hg have oxidation numbers of 0.

15. Which of the following is a redox reaction

A) $CH_3COOH+C_2H_5OH \rightarrow CH_3COOC_2H_5+H_2O$

B) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

C) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

D) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

Answer:C

Solution:

A) $CH_3COOH+C_2H_5OH \rightarrow CH_3COOC_2H_5+H_2O$

Type of Reaction: Esterification (organic reaction forming an ester).

Oxidation States:

Carbon in CH_3COOH: Remains +3 (carboxyl C) and -3 (methyl C).

Carbon in C_2H_5OH : Remains -2 (alcohol C).

No change in oxidation states occurs.

B) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Type of Reaction: Neutralization (acid-base reaction).

Oxidation States:

Na remains +1, O remains -2, H remains +1, S remains +6.

No change in oxidation states.

C) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

Type of Reaction: Single displacement (metal replacement).

Oxidation States:

Zn: Changes from 0 (elemental) to +2 (in $ZnSO_4$) $\rightarrow$ Oxidized.

Cu: Changes from +2 (in $CuSO_4$) to 0 (elemental) $\rightarrow$ Reduced.

Conclusion: Redox reaction (Zn is oxidized, Cu is reduced).

D) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

Type of Reaction: Double displacement (precipitation).

Oxidation States:

Na remains +1, Cl remains -1, Ag remains +1, N remains +5, O remains -2.

No change in oxidation states.

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

16. The oxidation number of Cr = +6 in

A) $FeCr_2O_4$ B) $KCrO_3Cl$ C) CrO_5 D) $[Cr(OH)_4]^-$

Answer:B,C

Solution: A) $FeCr_2O_4$

Oxidation states:Fe: Typically +2 or +3.

O: -2 (each).

Let Cr = x.

Equation for Fe^{2+}: +2 + 2x + 4(-2) = 0 $\rightarrow$ 2 + 2x - 8 = 0 $\rightarrow$ 2x = 6 $\rightarrow$ x = +3.

B) $KCrO_3Cl$

Oxidation states:

K: +1, Cl: -1, O: -2 (each).

Let Cr = x.

Equation: +1 + x + 3(-2) + (-1) = 0 $\rightarrow$1 + x - 6 - 1 = 0 $\rightarrow$ x = +6.

C) CrO_5

K: +1, Cl: -1, O: -2 (each).

Let Cr = x.

Equation: +1 + x + 5(-2) + (-1) = 0 $\rightarrow$ 1 + x - 10 - 1 = 0 $\rightarrow$ x = +10.
Actually CrO_5 has 4 peroxo O (–1 each) and 1 O (–2): total O = 4(–1) + 1(–2) = –6 $\rightarrow$ x – 6 = 0 $\rightarrow$ x = +6

D) $[Cr(OH)_4]^-$

Oxidation states:
OH: -1 (each).
Let Cr = x.
Equation: x + 4(-1) = -1 $\rightarrow$ x - 4 = -1 $\rightarrow$ x = +3.

17. The reaction $Cu_2O \rightarrow CuO + Cu$ is an example of

A) Oxidation B) Reduction C) redox reaction D) Decomposition

Answer:C,D

Solution:Assign Oxidation States:
In Cu_2O: Each Cu: +1 (since O is -2, and total charge is 0: 2(+1) + (-2) = 0).
In Cu (metal): 0 (elemental form).
In CuO: Cu: +2, O: -2.
Identify Changes in Oxidation States:
Cu in Cu_2O (+1) changes to:
Cu (0): Reduction (gain of electrons, oxidation state decreases from +1 to 0).
CuO (+2): Oxidation (loss of electrons, oxidation state increases from +1 to +2).
Thus it's redox (C) and also disproportionation (a type of redox).
It's also decomposition (D) of a compound into two different substances.

18. In which of the following process nitrogen is reduced ?

A) $NH_4^+ \longrightarrow N_2$ B) $NO_3^- \longrightarrow NO$ C) $NO_2 \longrightarrow NO_2^-$ D) $NO_3^- \longrightarrow NH_4^+$

Answer:B,C,D

Solution:A) $NH_4^+ \longrightarrow N_2$

$NH_4^+ \rightarrow$ -3
N_2: N = 0 (elemental form).
Change: -3 $\rightarrow$ 0 (oxidation, not reduction)

B) $NO_3^- \longrightarrow NO$

NO_3^-: N = +5 (O is -2, total charge = -1: x + 3(-2) = -1 $\rightarrow$ x = +5).
NO: N = +2 (O is -2: x + (-2) = 0 $\rightarrow$ x = +2).
Change: +5 $\rightarrow$ +2 (Decrease by 3).
Conclusion: Reduction (correct).

C) $NO_2 \longrightarrow NO_2^-$

Oxidation state of N in NO_2: +4
Oxidation state of N in NO_2^- :+3
Change: +4 $\rightarrow$ +3 (Decrease by 1).
Conclusion: Reduction (correct).

D) $NO_3^- \longrightarrow NH_4^+$

Oxidation state of N in NO_3^- =+5
Oxidation state of N in NH_4^+: -3

Change: +5 → -3 (reduction, as the oxidation state decreases)

Statement Type/Assertion and Reason Type:

19. **Assertion (A)** : Fluorine always exhibit an oxidation state of -1 in its compounds
Reason (R) : Fluorine has maximum electronegativity and it contain seven electron in its valence shell

Answer:A

Solution:Assertion (A) is true because fluorine, being the most electronegative element, always gains one electron to achieve a stable octet, resulting in an oxidation state of -1 in all its compounds.
Reason (R) is also true because fluorine's high electronegativity (highest among all elements) and its need for one more electron to complete its valence shell (7 valence electrons) explain why it always attains a -1 oxidation state.

20. **Statement I** : Oxidation number of Cl atom is zero in Cl_2
Statement II : Oxidation number of homoatomic molecule is taken as Zero

Answer:A

Solution:Statement I is true because in Cl_2 (a diatomic molecule of the same element), the shared electrons are equally distributed, resulting in an oxidation state of 0 for each Cl atom.
Statement II is also true because, by definition, the oxidation number of any element in its pure form (including homoatomic molecules like Cl_2, O_2, N_2, etc.) is always zero.

Comprehension Type

Oxidation number (or oxidation state) is a concept in chemistry used to repre sent the apparent charge of an atom in a compound. It's a hypothetical charge as signed to an atom based on a set of rules and assumptions, and it is a use ful tool for balancing redox reactions.

Oxidation and reduction are two fundamental processes in chemistry that often occur together in what is known as a redox (reduction-oxidation) reaction. These processes involve the transfer of electrons between chemical species.

21. Which of the following process nitrogen is oxidised

A) $NH_4^+ \rightarrow N_2$ B) $NO_3^- \rightarrow NO$ C) $NO_2 \rightarrow NO_2^-$ D) $NO_3^- \rightarrow NH_4^+$

Answer:A

Solution:Solution:A) $NH_4^+ \longrightarrow N_2$

$NH_4^+ \rightarrow$ -3
N_2: N = 0 (elemental form).
Change: -3 → 0 (oxidation, not reduction)

B) $NO_3^- \longrightarrow NO$

NO_3^-: N = +5 (O is -2, total charge = -1: x + 3(-2) = -1 → x = +5).
NO: N = +2 (O is -2: x + (-2) = 0 → x = +2).

Change: +5 → +2 (Decrease by 3).
Conclusion: Reduction (correct).

C) $NO_2 \longrightarrow NO_2^-$

Oxidation state of N in NO_2: +4
Oxidation state of N in NO_2^- :+3
Change: +4 → +3 (Decrease by 1).
Conclusion: Reduction (correct).

D) $NO_3^- \longrightarrow NH_4^+$

Oxidation state of N in NO_3^- =+5
Oxidation state of N in NH_4^+: -3
Change: +5 → -3 (reduction, as the oxidation state decreases)

22. In the reaction $2BaO_2 \rightarrow 2BaO + O_2$ the oxidation number of Barium

A) Decreases from +4 to +2 B) Decreases from +2 to 0
C) Increases from -4 to -2 D) Does not change

Answer:D

Solution: $2BaO_2 \rightarrow 2BaO + O_2$

In BaO_2 (barium peroxide), oxygen is in the -1 oxidation state (peroxide ion, O_2^{2-})
Since there are two oxygens each at -1, the total negative charge is -2, so barium must be +2.
In BaO, oxygen is in the usual -2 oxidation state (oxide ion), so barium is still +2.

Matrix Matching Type:

23.

List - I (Compound)	**List - II** (Oxidation no of sulphur)
A) $H_2S_2O_8$	3) + 6
B) H_2S	5) -2
C) Na_2SO_3	4) + 4
D) $S_2C\ell_2$	1) + 1

Answer:A-3,B-5,C-4,D-1
Solution:

A) $H_2S_2O_8$
2(H)+2(S)+8(O)=0
Substitute known values:
2(+1)+2x+[2(-1)+6(-2)]=0
Simplify:2+2x+(-2-12)=0
2+2x-14=0
x=+6

B) H_2S
2(1)+S=0
S=-2

C) Na_2SO_3
2(1)+S+3(-2)=0

S=+4

D) $S_2C\ell_2$

2S+2(-1)=0

2S=2

S=+1

Integer Type:

24. The number of electrons involved in the half-reaction $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$ is ____

Answer:6

Solution:Balance the half-reaction for $Cr_2O_7^{2-}$

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$$

Chromium goes from +6(in $Cr_2O_7^{2-}$) to +3 (in Cr^{3+})

Total electrons transferred: 6 (to balance the charge).

For $2Cr^{3+}$:No change in oxidation state, so 0 electrons are involved.

Conclusion:

The half-reaction involves 6 electrons.

25. The oxidation state of phosphorus in $Ba(H_2PO_2)_2$ is _____

Answer:1

Solution:The compound $Ba(H_2PO_2)_2$

1 Ba atom: +2

4 H atoms: 4 × (+1) = +4

4 O atoms: 4 × (-2) = -8

2 P atoms: 2x

Total charge on the compound is 0 (neutral): 2+4-8+2x=0

2x-2=0 $\rightarrow$ x=+1

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS

1. The oxidation state of sulphur in $Na_2S_4O_6$ is

A) 3/2 B) 2/3 C) 5/2 D) 2/5

Answer:C

Solution: $Na_2S_4O_6$

2(1)+4S+6(-2)=0

4S-10=0

4S=10

S=10/4=5/2

2. Phosphorous exhibits highest oxidation state in

A) PH_3 B) H_3PO_3 C) $Ca_3(POD)2$ D) H_3PO_2

Answer:C

Solution: A) PH_3: -3
B) H_3PO_3: +3
C) $Ca_3(PO_4)_2$: +5 (highest)
D) H_3PO_2: +1.

3. Oxidation state of 'S' in S_8 molecule is
A) 0 B) +2 C) +4 D) +6

Answer:A

Solution: In elemental form (S_8), the oxidation state is 0.

4. Oxidation state of N in N3H is
A) +1/3 B) +3 C) –1/3 D) –1

Answer:C

Solution:Let the oxidation state of N be
3x+1=0
3x=-1
x=- 1/3

5. Oxidation number of C in CH_2O is
A) –2 B) +2 C) 0 D) 4

Answer:C

Solution: x+2(+1)+(-2)=0
x=0.

6. Oxidation state of Fe in K4[Fe(CN)6]
A) +6 B) +4 C) +2 D) +5

Answer:C

Solution: $K_4[Fe(CN)_6]$
CN^- has -1 charge.
4(+1)+x+6(-1)=0
x=+2.

7. Oxidation number and valency of oxygen in OF_2 are
A) +1,2 B) +2, 2 C) +1, 1 D) +2, 1

Answer:B

Solution: OF_2 oxidation number
x+2(-1)=0
x=+2
Valency = 2 (forms 2 bonds).

8. In which of the following the oxidation state of chlorine is +5 ?
A) $HClO_4$ B) $HClO_3$ C) $HClO_2$ D) HCl

Answer:B

Solution:A) $HClO_4$: +7
B) $HClO_3$: +5 (correct)
C) $HClO_2$: +3
D) HCl: -1.

9. All elements commonly exhibit an oxidation state of
A) +1 B) –1 C) zero D) +2

Answer:C

Solution:All elements in their free state (e.g., O_2, Na, S_8) have 0 oxidation state.

10. The maximum oxidation state that fluorine exhibits is

A) –1 B) zero C) +1 D) +2

Answer:A

Solution:Fluorine is the most electronegative element and only exhibits -1

JEE MAIN LEVEL QUESTIONS

11. The minimum oxidation state that nitrogen exhibits is

A) –2 B) –3 C) –4 D) –5

Answer:B

Solution:Nitrogen's lowest oxidation state is –3 (e.g., in NH_3 or metal nitrides like Li_3N).

12. What is the oxidation state of carbon in carbondioxide?

A) +2 B) +4 C) +6 D) +1

Answer:B

Solution:Oxygen is –2 each.

$x+2(-2)=0 \rightarrow x=+4$.

13. In which of the following compounds oxygen exhibits an oxidations state of +2?

A) H_2O B) H_2O_2 C) OF_2 D) H_2SO_4

Answer:C

Solution:A) H_2O: –2

B) H_2O_2: –1 (peroxide)

C) OF_2: +2 (fluorine is –1, so oxygen is +2)

D) H_2SO_4: –2.

14. The oxidation number of sulphur in S_8, S_2F_2 and H_2S are

A) 0, + 1 and - 2 B) +2, +1 and - 2 C) 0, +1 and + 2 D) -2, + 1 and - 2

Answer:A

Solution:S_8 (elemental sulfur): 0

S_2F_2: Fluorine is –1, so sulfur is +1.

H_2S: Hydrogen is +1, so sulfur is –2.

15. Chlorine is passed into dilute, cold KOH solution. What are the oxidation numbers of chlorine in the products formed?

A) –1, +5 B) –1, +3 C) +1, +7 D) +1, –1

Answer:D

Solution:The reaction produces KClO (hypochlorite, Cl = +1) and KCl (chloride, Cl = –1).

16. The element that always exhibits a negative oxidation state in its compounds is

A) Nitrogen B) Oxygen C) Fluorine D) Chlorine

Answer:C

Solution:Fluorine is the most electronegative element and always has –1 in compounds.

17. In the conversion of $K_2Cr_2O_7$ to K_2CrO_4 the oxidation number of the following

changes

A) K B) Cr C) Oxygen D) None

Answer:D

Solution:In $K_2Cr_2O_7$, Cr is +6.

In K2CrO4, Cr is still +6.

No change occurs (trick question!). Correct answer is D) None.

18. The oxidation number of 'N' in HN_3 is

A) +1/3 B) 0 C) –1/3 D) 1

Answer:C

Solution:Let oxidation state of N be x.

$1+3x=0 \rightarrow x=-1/3$

19. Oxidation number of sulphur in oleum ($H_2S_2O_7$) is

A) +4 B) +2 C) –2 D) +6

Answer:D

Solution:Structure: HO–SO2–O–SO2–OH (each S bonded to 4 O atoms).

Calculation: $2(+1)+2x+7(-2)=0 \rightarrow x=+6$.

20. The element which has only one oxidation state in its compounds is

A) Hydrogen B) Oxygen C) Nitrogen D) Fluorine

Answer:D

Solution:Fluorine is always –1 (no exceptions).

JEE ADVANCED LEVEL QUESTIONS

Multicorrect Answer Type

21. $3Cu+8HNO_3 \rightarrow 3Cu(NO_3)_2+2NO+4H_2O$ the correct statement for the reaction is

A) *Cu* is oxidized B) HNO_3 is reduced

C) *Cu* is reduced D) *Cu* acts as reducting agent

Answer:A,B,D

Solution:A) Cu is oxidized $\rightarrow$ Correct (Oxidation state changes from 0 to +2).

B) HNO_3 is reduced $\rightarrow$ Correct (Nitrogen's oxidation state changes from +5 (in HNO_3) to +2 (in NO)).

D) Cu acts as a reducing agent $\rightarrow$ Correct (Since Cu is oxidized, it donates electrons, making it a reducing agent).

22. Which of the following have been arranged in order of decreasing oxidation number of Sulphur?

A) $H_2S_2O_7 > Na_2S_4O_6 > Na_2S_2O_3 > S_8$ B) $SO^{2+} > SO_4^{2-} > SO_3^{2-} > HSO_4^-$

C) $H_2SO_5 > H_2SO_3 > SCl_2 > H_2S$ D) $H_2SO_4 > SO_2 > H_2S > H_2S_2O_8$

Answer:A,C

Solution:Oxidation Numbers of S in Given Compounds:

A)$H_2S_2O_7$(Disulfuric acid):$2(+1)+2x+7(-2)=0 \rightarrow x=+6$

$Na_2S_4O_6$:$2(1)+4S+6(-2)=0 \rightarrow 4S=10 \rightarrow S=10/4 \rightarrow S=2.5$

$Na_2S_2O_3$:$2(1)+2S+3(-2)=0 \rightarrow 2S=4 \rightarrow S=2$

S_8 :S=0

Order: $+6>2.5>2>0 \rightarrow$ Correct decreasing order.

B)SO^{2+}

$S+(-2)=2 \rightarrow S=4$
SO_4^{2-} :$x+4(-2)=-2 \rightarrow x=+6$
SO_3^{2-} : $x+3(-2)=-2 \rightarrow x=+4$
HSO_4^- : $+1+x+4(-2)=-1 \rightarrow x=+6$
Order: +4,+6,+4,+6 $\rightarrow$ Not in decreasing order.
C)H_2SO_5: $2(1)+x+5(-2)=0 \rightarrow x=+8$
H_2SO_3 : $2(+1)+x+3(-2)=0 \rightarrow x=+4$
SCl_2 : $x+2(-1)=0 \rightarrow x=+2$
H_2S : $2(+1)+x=0 \rightarrow x=-2$
Order: +8>+4>+2>-2 $\rightarrow$ Correct decreasing order.
D)H_2SO_4: $x=+6$
SO_2: $x+2(-2)=0 \rightarrow x=+4$
H_2S : $x=-2$
$H_2S_2O_8$: $2(1)+2x+8(-2)=0 \rightarrow 2x=14 \rightarrow x=+7$
Order: +6,+4,-2,+7 $\rightarrow$ Not in decreasing order.

Statement Type/Assertion and Reason Type:

23. **Assertion (A)** : $Zn_{(s)} + CuSO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + Cu_{(s)}$ is an redox reaction.
Reason (R) : A reaction in which oxidation and reduction takes place simultaneously is called redox reaction.

Answer:A

Solution: $Zn_{(s)} + CuSO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + Cu_{(s)}$
Oxidation: Zn (Zinc) loses electrons $\rightarrow Zn \rightarrow Zn^{2+} + 2e^-$
Reduction:Cu^{2+}(from $CuSO_4$) gains electrons:$Cu^{2+} + 2e^- \rightarrow Cu$
Since both oxidation and reduction occur simultaneously, this is indeed a redox reaction.

Comprehension Type:

Removal of electron(s) from atom (or) an ion is called oxidation (or) increase in the oxidation number is called oxidation. Addition of electron(s) to an atom or an ion is called reduction (or) decrease in the oxidation number is called reduction.

Example: $\overset{0}{Zn} + \overset{+2}{Cu}SO_4 \rightarrow \overset{+2}{Zn}SO_4 + \overset{0}{Cu}$

24. The atom under going oxidation is:
A) Zn B) Cu C) S D) $CuSO_4$

Answer:A

Solution: $\overset{0}{Zn} + \overset{+2}{Cu}SO_4 \rightarrow \overset{+2}{Zn}SO_4 + \overset{0}{Cu}$
Oxidation: Zn (Zinc) loses electrons $\rightarrow Zn \rightarrow Zn^{2+} + 2e^-$

25. Which of the following undergoes reduction?
A) Zn B) Cu^{+2} C) O D) $CuSO_4$

Answer:B

Solution:Reduction:Cu^{2+}(from $CuSO_4$) gains electrons:$Cu^{2+} + 2e^- \rightarrow Cu$

Matrix Matching Type

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

Solution:

Column - I	**Column - I**
a) $Cr \rightarrow CrCl_3$	2) Cr is oxidised
b) $M^{-2} \rightarrow X + 5e^-$	1) X = M^3
c) $F_2 + 2e^- \rightarrow 2F^-$	4) F is reduced
d) Pb_3O_4	`3) Good oxidising agent

27.**Answer:a-3,5,b-4,c-2,d-1**

Solution:

Column - I	**Column - II**
a) Oxidation	3) $Zn \longrightarrow Zn^{+2} + 2e^-$,5) $Mg \rightarrow Mg^{2+} + 2e^-$
b) Reduction	4) $C\ell + e^- \longrightarrow C\ell^-$
c) Oxidant	2)F
d) Reductant	1) Ca

Integer Type

28. The oxidation number of carbon in diamond is _____

Answer:0

Solution:Diamond is a pure, elemental form of carbon (C).

In all elemental forms (including diamond, graphite, and C_{60}), the oxidation number of an uncombined atom is 0.

29. What is the oxidation number of chlorine in ClO_3^- is _____

Answer:5

Solution:ClO_3^-

Cl+3(-2)=-1

Cl=-1+6=+5

KEY

			TEACHING TASK							
1	2	3	4	5	6	7	8	9	10	
D	C	B	C	C	A	A	D	C	B	
11	12	13	14	15	16	17	18	19	20	
C	A	C	A	C	B,C	C,D	B,C,D	A	A	
21	22		23		24	25				
A	D	A-3,B-5,C-4,D-1			6	1				
			LEARNERS TASK							
		Conceptual Understanding Questions								
1	2	3	4	5	6	7	8	9	10	
C	C	A	C	C	C	B	B	C	A	
			JEE MAIN LEVEL QUESTIONS							
11	12	13	14	15	16	17	18	19	20	
B	B	C	A	D	C	D	C	D	D	
		JEE ADVANCED LEVEL QUESTIONS								
21	22	23	24	25		26		27		
A,B,D	A,C	A	A	B	a-2, b-1, c-4, d-3		a-3,5,b-4,c-2,d-1			
28	29									
0	5									