
2. OXIDATION AND REDUCTION

SOLUTIONS

TEACHING TASK

JEE MAIN LEVEL QUESTIONS

1. The oxidation number of sulfur is not a whole number in:

- A) Sodium tetrathionate ($\text{Na}_2\text{S}_4\text{O}_6$) B) Sulfur dioxide (SO_2)
C) Sulfur hexafluoride (SF_6) D) Sulfite ion (SO_3^{2-})

Answer:A

Solution: In $\text{Na}_2\text{S}_4\text{O}_6$, sulfur has an average oxidation state of +2.5 (fractional).

Structure: Two central S atoms have 0 oxidation state (S-S bond), while the other two S atoms have +5 (bonded to O).

$$\text{Na}_2\text{S}_4\text{O}_6 = 2(1) + 4\text{S} + 6(-2) = 0$$

$$4\text{S} = 12 - 2$$

$$\text{S} = 10/4 = 2.5$$

2. The oxidation state of nitrogen is maximum in:

- A) Nitrous oxide (N_2O) B) Nitric acid (HNO_3)
C) Ammonium ion (NH_4^+) D) Nitric oxide (NO)

Answer:B

Solution: A) $\text{N}_2\text{O} = 2\text{N} - 2 = 0$

$$2\text{N} = 2 \rightarrow \text{N} = 2/2 = 1$$

B) $\text{HNO}_3 = 1 + \text{N} + 3(-2) = 0 \rightarrow \text{N} = +5$

C) $\text{NH}_4^+ = \text{N} + 4(1) = 1$

$$\text{N} = 1 - 4 = -3$$

D) $\text{NO} = \text{N} - 2 = 0 \rightarrow \text{N} = 2$

3. The oxidation state of oxygen is minimum in:

- A) Potassium superoxide (KO_2) B) Ozone (O_3)
C) Water (H_2O) D) Oxygen difluoride (OF_2)

Answer:C

Solution: A) $\text{KO}_2 = 2(\text{O}) + 1 = 0 \rightarrow 2(\text{O}) = -1 \rightarrow \text{O} = -1/2$.

In superoxides, each oxygen atom has an oxidation state of $-1/2$. This is the lowest oxidation state commonly seen for oxygen.

B) $\text{O}_3 = 0$

C) $\text{H}_2\text{O} = 2(1) + \text{O} = 0 \rightarrow \text{O} = -2$.

D) $\text{OF}_2 = \text{O} + 2(-1) = 0 \rightarrow \text{O} = +2$

4. The highest oxidation number of chlorine is found in:

- A) Sodium hypochlorite (NaOCl) B) Chlorine dioxide (ClO_2)
C) Perchloric acid (HClO_4) D) Dichlorine monoxide (Cl_2O)

Answer:C

Solution: A) $\text{NaOCl} = 1 + (-2) + \text{Cl} = 0 \rightarrow \text{Cl} = 2 - 1 = 1$

B) $\text{ClO}_2 = \text{Cl} + 2(-2) = 0 \rightarrow \text{Cl} = 4$

C) $\text{HClO}_4 = 1 + \text{Cl} + 4(-2) = 0 \rightarrow \text{Cl} = 8 - 1 = +7$
 D) $\text{Cl}_2\text{O} = 2\text{Cl} - 2 = 0 \rightarrow 2\text{Cl} = 2 \rightarrow \text{Cl} = 2/2 = 1$

5. The element that always exhibits an oxidation state of -1 in its compounds is:

- A) Fluorine B) Oxygen C) Bromine D) Nitrogen

Answer:A

Solution: Fluorine is the most electronegative element and always has -1 oxidation state.

6. In which of the following does phosphorus have a fractional oxidation number?

- A) PCl_5 B) H_3PO_3 C) P_4O_{10} D) $\text{Na}_4\text{P}_2\text{O}_7$

Answer:D

Solution: A) $\text{PCl}_5 = \text{P} + 5(-1) = 0 \rightarrow \text{P} = +5$

B) $\text{H}_3\text{PO}_3 = 3(1) + \text{P} + 3(-2) = 0 \rightarrow \text{P} = 6 - 3 = 3$

C) $\text{P}_4\text{O}_{10} = 4\text{P} + 10(-2) = 0 \rightarrow 4\text{P} = 20 \rightarrow \text{P} = 20/4 = 5$

D) $\text{Na}_4\text{P}_2\text{O}_7 = 4(1) + 2\text{P} + 7(-2) = 0 \rightarrow 2\text{P} = 14 - 4 \rightarrow 2\text{P} = 10 \rightarrow \text{P} = 10/2 \rightarrow \text{P} = 5$

Pyrophosphate actually has two nonequivalent P atoms in some representations, where: One P is in +5, another in +4, making the average oxidation state fractional: $\text{Average} = (5+4)/2 = +4.5$

7. Which of the following statements is incorrect?

- A) Oxygen has a -2 oxidation state in most compounds.
 B) In peroxides, oxygen has an oxidation state of -1.
 C) In superoxides, oxygen has an average oxidation state of $-1/2$.
 D) In dioxygen difluoride, oxygen has a -2 oxidation state.

Answer:D

Solution: O_2F_2 : O = +1 (F is -1, total = 0).

Correct statements:

- A) O is -2 in most compounds.
 B) Peroxides (O_2^{2-}): O = -1.
 C) Superoxides (O_2^-): O = $-1/2$.

8. During the conversion of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+} , the oxidation state of chromium:

- A) increases B) decreases C) stays the same D) becomes zero

Answer:B

Solution: $\text{Cr}_2\text{O}_7^{2-} \rightarrow 2\text{Cr} + 7(-2) = -2 \rightarrow 2\text{Cr} = -2 + 14 \rightarrow 2\text{Cr} = 12 \rightarrow \text{Cr} = 12/2 = +6$

In Cr^{3+} , Cr oxidation number = +3

9. In which of the following compounds is the oxidation number of carbon +4?

- A) Methane (CH_4) B) Carbon monoxide (CO)
 C) Carbon dioxide (CO_2) D) Ethanol ($\text{C}_2\text{H}_5\text{OH}$)

Answer:B

Solution: CO_2 : C = +4 (O = -2).

Others:

CH_4 : -4, CO: +2, $\text{C}_2\text{H}_5\text{OH}$: -2 (avg.)

10. If an element in the +2 oxidation state gains one electron, its new oxidation state is:

- A) +3 B) +1 C) 0 D) -1

Answer:B

Solution: Gain of 1 electron reduces oxidation state by 1: $+2 \rightarrow +1$.

11. The oxidation number and covalency of phosphorus in PCl_5 are:

- A) +5 and 3 B) +5 and 5 C) 0 and 3 D) +3 and 3

Answer:B

Solution: PCl_5 : $\text{P} = +5$ ($\text{Cl} = -1$).

Covalency = 5 (5 bonds formed by P).

12. The total oxidation number of carbon atoms in ethanoic acid (CH_3COOH) is:

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

Answer:A

Solution: $\text{CH}_3\text{COOH} = 2\text{C} + 4(-2) - 2 = 0 \rightarrow 2\text{C} = 0 \rightarrow \text{C} = 0$

13. In potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$), the oxidation state of chromium is:

- A) +2 B) +3 C) +6 D) +4

Answer:C

Solution: Let $\text{Cr} = x$.

$\text{K}_2\text{Cr}_2\text{O}_7 = 2(1) + 2x + 7(-2) = 0$

$2x = 14 - 2 \rightarrow x = 12/2 = +6$

14. In the compound sodium hydride (NaH), the oxidation number of hydrogen is:

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

Answer:B

Solution: $\text{NaH} = +1 + \text{H} = 0$

$\text{H} = -1$

15. Which of the following reactions is a redox reaction?

- A) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ B) $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
 C) $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$ D) $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$

Answer:C

Solution: $\text{Zn} (0) \rightarrow \text{Zn}^{2+} (+2)$: Oxidation.

$\text{Cu}^{2+} (+2) \rightarrow \text{Cu} (0)$: Reduction.

JEE ADVANCED LEVEL QUESTIONS**Multi correct answer type:**

16. The oxidation number of manganese is NOT +7 in:

- A) KMnO_4 B) MnO_2 C) MnCl_2 D) Mn_2O_3

Answer:B,C,D

Solution:

A) $\text{KMnO}_4 = 1 + \text{Mn} + 4(-2) = 0$

$\text{Mn} = 8 - 1 = +7$

B) $\text{MnO}_2 = \text{Mn} + 2(-2) = 0 \rightarrow \text{Mn} = 4$

C) $\text{MnCl}_2 = \text{Mn} + 2(-1) = 0 \rightarrow \text{Mn} = 2$

D) $\text{Mn}_2\text{O}_3 = 2\text{Mn} + 3(-2) = 0 \rightarrow \text{Mn} = 6/2 = 3$

17. The reaction $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$ is NOT an example of:

- A) Oxidation B) Reduction C) Redox reaction D) Combination reaction

Answer:D

Solution: A) Oxidation: $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$ (oxidation occurs).

B) Reduction: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ (reduction occurs).

C) Redox reaction:

Both oxidation and reduction occur (Zn is oxidized, Cu^{2+} is reduced).

D) Combination reaction:

Incorrect. This is a single displacement reaction, not a combination (where two reac-

tants form one product).

Statement Type/Assertion and Reason Type:

18. Assertion (A): Oxygen shows an oxidation state of -2 in most of its compounds.
Reason (R): Oxygen is highly electronegative and can gain two electrons to achieve a stable octet.

Answer:A

Solution:Assertion (A) is true because oxygen typically has an oxidation state of -2 (e.g., H_2O , CO_2). Exceptions: -1 in peroxides (O_2^{2-}).
 $-\frac{1}{2}$ in superoxides (O_2^-).

$+1/+2$ in $\text{OF}_2/\text{O}_2\text{F}_2$.

Reason (R) is true and explains (A): Oxygen's high electronegativity allows it to gain 2 electrons (achieving octet), resulting in -2 oxidation state.

- 19.Assertion (A): The oxidation number of hydrogen is -1 in metal hydrides like LiH .
Reason (R): In metal hydrides, hydrogen behaves as a more electronegative element than the metal.

Answer:A

Solution:Assertion (A) is true: In ionic hydrides (e.g., LiH , NaH), hydrogen has -1 oxidation state.

Reason (R) is true and explains (A): Hydrogen is more electronegative than alkali/alkaline earth metals, so it gains 1 electron (forming H^-), resulting in -1 oxidation state.

- 20.Assertion (A): The oxidation number of sulfur in H_2SO_4 is $+6$.

Reason (R): The total oxidation number of all atoms in a neutral compound must equal zero.

Answer:B

Solution:Assertion (A) is true:

Let oxidation state of S = x

$$2(+1)+x+4(-2)=0$$

$$2+x-8=0$$

$$x=+6.$$

Reason (R) is true (neutral compounds have net oxidation number = 0), but it does not explain why S is $+6$. The explanation lies in S's bonding with highly electronegative O (-2).

Comprehension Type

21. In which of the following processes is sulfur oxidized?

A) $\text{S} \rightarrow \text{SO}_2$ B) $\text{SO}_2 \rightarrow \text{S}$ C) $\text{H}_2\text{S} \rightarrow \text{S}$ D) $\text{S} \rightarrow \text{H}_2\text{S}$

Answer:A

Solution:Oxidation means an increase in oxidation number (loss of electrons).

Analyzing sulfur's oxidation state in each option:

A) $\text{S} \rightarrow \text{SO}_2$:

S (elemental form): Oxidation state = 0.

SO_2 : S = $+4$ (O = -2)

$$x+2(-2)=0 \quad ?$$

$$x=+4).$$

Change: $\rightarrow +4$ (Oxidation)

B) $\text{SO}_2 \rightarrow \text{S}$:

SO_2 : S = +4 \rightarrow S: 0.

Change: +4 \rightarrow 0 (Reduction)

C) $\text{H}_2\text{S} \rightarrow \text{S}$:

H_2S : S = -2 (H = +1)

$2(+1) + x = 0$

$x = -2$).

S: 0.

Change: -2 \rightarrow 0 (Oxidation) \rightarrow (But not among the options where sulfur is oxidized to a higher state like in A).

D) $\text{S} \rightarrow \text{H}_2\text{S}$:

S: 0, H_2S : -2.

Change: 0 \rightarrow -2 (Reduction)

22. In the reaction:

$\text{Ca} \rightarrow \text{CaCl}_2$,

the oxidation number of calcium:

A) Increases from 0 to +2 B) Decreases from +2 to 0

C) Does not change D) Increases from +1 to +2

Answer:A

Solution: Calcium (Ca) in elemental form: Oxidation state = 0.

Calcium in CaCl_2 :

Cl = -1

$x + 2(-1) = 0 \rightarrow x = +2$.

Change: 0 \rightarrow +2 (Oxidation).

Conclusion: The oxidation number of calcium increases from 0 to +2 (loses 2 electrons).

Integer Type:

23. The number of electrons involved in the half-reaction of: $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$ is _____.

Answer:1

Solution: The half-reaction shows the conversion of Fe^{2+} to Fe^{3+} .

Oxidation state change: +2 \rightarrow +3 (loss of 1 electron).

Half-reaction: $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + 1e^-$

Thus, 1 electron is involved.

24. The oxidation state of phosphorus in Na_3PO_4 is _____.

Answer:5

Solution: $\text{Na}_3\text{PO}_4 = 3(1) + \text{P} + 4(-2) = 0$

$\text{P} = 8 - 3 = 5$

Matrix Matching Type:

25.

List - I

(Compound)

List - II

(Oxidation no of sulphur)

A) $\text{H}_2\text{S}_2\text{O}_8$

1) + 1

B) H_2S

2) + 2

C) Na_2SO_3

3) + 6

D) S_2Cl_2

4) + 4

5) - 2

6) +7

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

Solution:

A) $\text{H}_2\text{S}_2\text{O}_8 = 2(1) + 2\text{S} + 6(-2) + 2(-1) = 0 \rightarrow 2\text{S} = 14 - 2 \rightarrow 2\text{S} = 12 \rightarrow \text{S} = 12/2 = +6$

B) $\text{H}_2\text{S} = 2(1) + \text{S} = 0 \rightarrow \text{S} = -2$

C) $\text{Na}_2\text{SO}_3 = 2(1) + \text{S} + 3(-2) = 0 \rightarrow \text{S} = 6 - 2 = 4$

D) $\text{S}_2\text{Cl}_2 = 2\text{S} + 2(-1) = 0 \rightarrow 2\text{S} = 2 \rightarrow \text{S} = +1$

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS

1. The oxidation state of chlorine in KClO_3 is:

- A) +3 B) +5 C) +7 D) -1

Answer:B

Solution: $\text{KClO}_3 = 1 + \text{Cl} + 3(-2) = 0$

$\text{Cl} = 6 - 1 = 5$

2. Nitrogen exhibits its lowest oxidation state in:

- A) NH_3 B) N_2O C) NO_2 D) HNO_3

Answer:A

Solution: A) $\text{NH}_3 = \text{N} + 3(1) = 0 \rightarrow \text{N} = -3$

B) $\text{N}_2\text{O} = 2\text{N} + 1(-2) = 0 \rightarrow 2\text{N} = 2 \rightarrow \text{N} = 2/2 = 1$

C) $\text{NO}_2 = \text{N} + 2(-2) = 0 \rightarrow \text{N} = +4$

D) $\text{HNO}_3 = 1 + \text{N} + 3(-2) = 0 \rightarrow \text{N} = 6 - 1 = 5$

3. The oxidation number of carbon in C_2H_2 (ethyne) is:

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

Answer:B

Solution: $\text{C}_2\text{H}_2 = 2\text{C} + 2(1) = 0 \rightarrow 2\text{C} = -2 \rightarrow \text{C} = -2/2 = -1$

4. The oxidation state of oxygen in KO_2 (potassium superoxide) is:

- A) -1 B) -1/2 C) -2 D) 0

Answer:B

Solution: $\text{KO}_2 = 1 + 2x = 0$

$2x = -1 \rightarrow x = -1/2$

5. In KMnO_4 , the oxidation number of manganese is:

- A) +4 B) +6 C) +7 D) +2

Answer:C

Solution: $\text{KMnO}_4 = 1 + \text{Mn} + 4(-2) = 0$

$\text{Mn} = 8 - 1 = +7$

6. Oxidation number of chromium in $\text{Cr}_2\text{O}_7^{2-}$ is:

- A) +6 B) +3 C) +4 D) +2

Answer:A

Solution:

$\text{Cr}_2\text{O}_7^{2-} = 2\text{Cr} + 7(-2) = -2$

$2\text{Cr} = 14 - 2 \rightarrow 2\text{Cr} = 12 \rightarrow \text{Cr} = 12/2 = +6$

7. In NO_3^- , the oxidation number of nitrogen is:

- A) +3 B) +2 C) +5 D) +4

Answer:C

Solution: $\text{NO}_3^- = \text{N} + 3(-2) = -1$

$\text{N} = -1 + 6 = +5$

8. In which of the following does phosphorus have an oxidation state of +3?

- A) PCl_3 B) H_3PO_4 C) PCl_5 D) $\text{H}_4\text{P}_2\text{O}_7$

Answer:A

Solution: PCl_3 : $\text{Cl} = -1$

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

Others:

H_3PO_4 : +5

PCl_5 : +5

$\text{H}_4\text{P}_2\text{O}_7$: +5

9. The oxidation number of hydrogen is negative in:

- A) H_2O B) NH_3 C) CH_4 D) NaH

Answer:D

Solution:

In metal hydrides (e.g., NaH), $\text{H} = -1$.

In other compounds (H_2O , NH_3 , CH_4), $\text{H} = +1$.

10. Which of the following elements shows variable oxidation states?

- A) Neon B) Iron C) Sodium D) Fluorine

Answer:B

Solution: Iron (Fe): Common states = +2, +3 (variable).

Others:

Neon: 0 (inert)

Sodium: +1 (fixed)

Fluorine: -1 (fixed)

JEE MAIN LEVEL QUESTIONS

11. The minimum oxidation state that sulphur can exhibit is:

- A) -1 B) -2 C) 0 D) -3

Answer:B

Solution: Sulfur's lowest oxidation state is -2 (e.g., in H_2S or metal sulfides).

Higher states: 0 (elemental S), +2, +4, +6.

12. What is the oxidation number of carbon in methane (CH_4)?

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

Answer:B

Solution: $\text{CH}_4 = \text{C} + 4(1) = 0$

$\text{C} = -4$

13. In which of the following compounds does oxygen have an oxidation state of -1?

- A) CO_2 B) H_2O C) H_2O_2 D) NaOH

Answer:C

Solution: Peroxides (O_2^{2-}) like H_2O_2 have $\text{O} = -1$.

Others: CO_2 : $\text{O} = -2$

H_2O : $\text{O} = -2$

NaOH: O = -2

14. The oxidation numbers of nitrogen in N_2 , NH_3 , and HNO_3 are respectively:

A) 0, -3, +5 B) -3, 0, +5 C) -3, +3, +5 D) 0, +3, -3

Answer:A

Solution:Oxidation number fo elementary form is Zero, $N_2=0$

$NH_3=N+3(1)=0$

$N=-3$

HNO_3

$1+N+3(-2)=0$

$N=6-1=5$

15. When Br_2 reacts with hot concentrated NaOH, the oxidation numbers of bromine in the products are:

A) -1 and +5 B) 0 and -1 C) -1 and +1 D) +3 and -1

Answer:A

Solution: $3Br_2 + 6NaOH \rightarrow 5NaBr + NaBrO_3 + 3H_2O$

NaBr (Br^-): -1

NaBrO₃ (Br^{5+}): +5

16. The element that always shows an oxidation state of -1 in its compounds is:

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

Answer:C

Solution:Fluorine is the most electronegative element and always -1.

17. In the conversion of MnO_4^- to Mn^{2+} , the oxidation number of manganese:

A) Increases B) Decreases C) Remains the same D) Becomes zero

Answer:B

Solution: $MnO_4^- = Mn+4(-2)=-1$

$Mn= -1+8=7$

$Mn^{2+}:Mn=+2$

Change: +7 \rightarrow +2 (reduction, oxidation number decreases).

18. The oxidation number of nitrogen in NO_2^- (nitrite ion) is:

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

Answer:A

Solution: $NO_2^- = N+2(-2)= -1$

$N=4-1=3$

19. The oxidation number of sulphur in $Na_2S_2O_3$ (sodium thiosulphate) is:

A) +2 B) +6 C) +3 D) a fractional value

Answer:A

Solution: $Na_2S_2O_3 = 2(1)+2S+3(-2)=0$

$2S=6-2 \rightarrow 2S=4 \rightarrow S=4/2=2$

20. The element that shows only one oxidation state in its compounds is:

A) Calcium B) Iron C) Chlorine D) Sulphur

Answer:A

Solution:Calcium always shows +2 (no variable states).

Others:Iron: +2, +3

Chlorine: -1 to +7

Sulfur: -2 to +6

JEE ADVANCED LEVEL QUESTIONS

Multicorrect Answer Type

21. $3\text{Cu} + 8\text{HNO}_3 \rightarrow 3\text{Cu}(\text{NO}_3)_2 + 2\text{NO} + 4\text{H}_2\text{O}$ the correct statement for the reaction is
- A) Cu is oxidized
B) HNO_3 is reduced
C) Cu is reduced
D) Cu acts as reducing agent

Answer: A, B, D

Solution: Oxidation:

$\text{Cu} (0) \rightarrow \text{Cu}^{2+} (+2)$: Loses 2 electrons per Cu atom (Oxidation).

Reduction:

$\text{HNO}_3 (\text{N}^{5+}) \rightarrow \text{NO} (\text{N}^{2+})$: Gains 3 electrons per N atom (Reduction).

Roles:

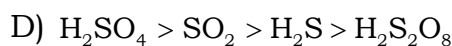
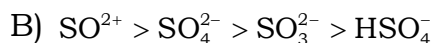
Cu is oxidized and acts as the reducing agent.

HNO_3 is reduced and acts as the oxidizing agent.

Incorrect Option:

C) Cu is reduced: False (Cu is oxidized).

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



Answer: C

Solution: Compound Oxidation State of S

$\text{H}_2\text{S}_2\text{O}_7$ (Disulfuric acid) $\rightarrow +6$ (each S)

$\text{Na}_2\text{S}_2\text{O}_6$ (Sodium dithionate) $\rightarrow +5$ (each S)

SO_4^{2-} (Sulfate ion) $\rightarrow +6$

SO_4^{2-} (Sulfate) $\rightarrow +6$

SO_3^{2-} (Sulfite) $\rightarrow +4$

HSO_4^- (Bisulfate) $\rightarrow +6$

H_2SO_5 (Peroxymonosulfuric acid) $\rightarrow +6$ (with peroxide)

H_2SO_3 (Sulfurous acid) $\rightarrow +4$

SCl_2 (Sulfur dichloride) $\rightarrow +2$

H_2S (Hydrogen sulfide) $\rightarrow -2$

$\text{H}_2\text{S}_2\text{O}_6$ (Dithionic acid) $\rightarrow +5$ (each S)

Correct Option: C) $\text{H}_2\text{SO}_5 > \text{H}_2\text{SO}_3 > \text{SCl}_2 > \text{H}_2\text{S}$

Order: $+6 > +4 > +2 > -2$

Statement Type/Assertion and Reason Type:

23. Assertion (A): The reaction between zinc and copper(II) sulphate is a redox reaction.

Reason (R): Zinc loses electrons and gets oxidized while copper ions gain electrons and get reduced.

Answer:A

Solution:Verify Assertion (A):

The reaction is: $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$

$\text{Zn} (0) \rightarrow \text{Zn}^{2+} (+2)$: Oxidation (loss of 2 electrons).

$\text{Cu}^{2+} (+2) \rightarrow \text{Cu} (0)$: Reduction (gain of 2 electrons).

Conclusion: It is a redox reaction (both oxidation and reduction occur).

Assertion (A) is TRUE.

Verify Reason (R):

Zinc is oxidized (loses electrons). Copper ions (Cu^{2+}) are reduced (gain electrons).

Reason (R) correctly explains (A).

Comprehension Type:

24. The atom undergoing oxidation is:

A) Mg B) Ag C) N D) NO_3^-

Answer:A

Solution:In the reaction: $\text{Mg} + 2\text{AgNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + 2\text{Ag}$

Oxidation:

$\text{Mg} (0) \rightarrow \text{Mg}^{2+} (+2)$: Loses 2 electrons (Oxidation).

Reduction:

$\text{Ag}^+ (+1) \rightarrow \text{Ag} (0)$: Gains 1 electron per Ag^+ ion (Reduction).

25. Which of the following undergoes reduction?

A) Mg B) Ag^+ C) O_2 D) $\text{Mg}(\text{NO}_3)_2$

Answer:B

Solution:Reduction involves gaining electrons.

In the reaction:

Ag^+ ions (from AgNO_3) gain electrons to form Ag (silver metal).

Integer Type

26. The oxidation number of phosphorus in elemental white phosphorus (P_4) is _____

Answer:0

Solution:Elemental forms of any atom (e.g., P_4 , O_2 , S_8) always have an oxidation state of 0 because they are in their pure, uncombined state.

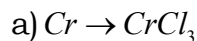
27. What is the oxidation number of sulfur in the ion SO_3^{2-} ?

Answer:4

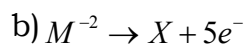
Solution: SO_3^{2-}

$\text{S} + 3(-2) = -2$

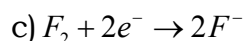
$\text{S} = -2 + 6 = 4$

Matrix Matching Type**28. Answer: a-2, b-1, c-4, d-3****Solution:****Column - I****Column - I**

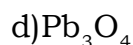
2) Cr is oxidised

Oxidation state change: Cr (0) \rightarrow Cr³⁺ (+3).Conclusion: Cr loses electrons \rightarrow Oxidised.1) X = M³

Initial oxidation state of M = -2.

After losing 5 electrons: X = M³

4) F is reduced

Fluorine (F₂) gains electrons \rightarrow Reduction.

3) Good oxidising agent

29. Answer: a-3, 5, b-4, c-2, d-1, 5**Solution:****Column - I****Column - II**

a) Oxidation

3) $Zn \rightarrow Zn^{2+} + 2e^{-}$ (Zinc loses 2 electrons)5) $Mg \rightarrow Mg^{+2} + 2e^{-}$ (Magnesium loses 2 electrons).

b) Reduction

4) $Cl + e^{-} \longrightarrow Cl^{-}$ (Chlorine gains 1

electron)

2) F (Fluorine is the strongest oxidizing

c) Oxidant

1) Ca (Calcium readily loses 2 electrons).

agent, readily gains electrons).

5) $Mg \rightarrow Mg^{+2} + 2e^{-}$ (Magnesium loses 2 electrons)

d) Reductant

KEY

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