Class :- IX

IIT Foundation Plus

5. Concept of Redox Reactions

Teaching Task

JEE Mains Level Questions

Q1) Ans :- D

Solution :-

1) $IF_3 \rightarrow I + 3(-1) = 0 \Rightarrow I = +3$.

2) $IF_5 \rightarrow I + 5(-1) = 0 \Rightarrow I = +5$

3) $IF_7 \rightarrow I + 7(-1) = 0 \Rightarrow I = +7$

4) $KI_3 \rightarrow +1 + 3I = 0 \Rightarrow I = -\frac{1}{3}$.

Q2) Ans :- C

Solution :- $K + Cl \rightarrow KCl$

Potassium gets oxidized and chlorine gets reduced. So it is an redox reaction

Q3) Ans :- B

Solution :- $\overset{+7}{KMnO_4} \longrightarrow K_2\overset{+6}{MnO_4}$

The given reaction is an example of reduction half reaction

Q4) Ans :- A

Solution :- $PbS + H_2O_2 \rightarrow PbSO_4 + 4H_2O$.

PbS undergoes oxidation

Q5) Ans:- A

Solution:- $\overset{+4}{MnO_2} + 4\overset{-1}{HCl} \rightarrow \overset{+2}{MnCl_2} + \overset{0}{Cl_2} + 2H_2O$

Oxidizing agent (or oxidant) is the specie that reduced itself and oxidizes another chemical specie.

Q6) Ans:- C

Solution:- $\overset{0}{P_4} + 3OH^- + 3H_2O \rightarrow 3\overset{-3}{H_2PO_2^-} + \overset{+1}{PH_3}$

Phosphorus undergoes reduction from P_4 to PH_3 and undergoes oxidation when it forms from $H_2PO_2^-$ to P_4.

Q7) Ans:- C

Solution:- $2\overset{-1}{H_2O_2} \rightarrow 2\overset{-2}{H_2O} + \overset{0}{O_2}$.

So the oxygen undergo both oxidation & reduction reaction.

∴ Decomposition reaction of H_2O_2 is a disproportion reaction

Q8) Ans:- D

Solution:- $\overset{+2}{SnCl_2} + \overset{+2}{HgCl_2} \rightarrow \overset{+4}{SnCl_4} + \overset{0}{Hg}$.

$\overset{+2}{SnCl_2} \rightarrow \overset{+4}{SnCl_4} \rightarrow$ Oxidation.

$\overset{+2}{HgCl_2} \rightarrow \overset{0}{Hg} \rightarrow$ Reduction

Q9) Ans:- B

Solution:- $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$

$BaO_2 \rightarrow BaSO_4$: Ba remains +2

O_2^{2-} in $BaO_2 \rightarrow H_2O_2$ (Oxygen remains −1)

No change in oxidation state.

Q10) Ans:- A

Solution:- $2CuI \rightarrow Cu + CuI_2$

Oxidation State of Cu in CuI

In CuI, Cu is in +1 oxidation state
In Cu, Cu is 0 oxidation state } Reduction

In CuI_2, Cu is in the +2 oxidation state

Oxidation

Q11) Ans:- C

Solution:- $Zn + I_2 \rightarrow ZnI_2$

0 0 +2

Iodine (I_2) goes from 0 to −1, meaning it gains electron (reduction)

In ZnI_2, Zn has oxidation state from 0 to +2

Zn, Oxidation

Q12) Ans:- C

Solution:- $CrO_4^{2-} \rightarrow Cr_2O_7^{2-}$

(+6) (+6)

Chromium oxidation state remains +6 in both CrO_4^{2-} and $Cr_2O_7^{2-}$

It is not a oxidation & reduction reaction.

Q13) Ans:- D

Solution:- Formation of Nitrogen oxide (NO) from N_2 and O_2 by lightning

$$N_2 + O_2 \rightarrow 2NO$$

Nitrogen (N_2) is oxidized to NO & O_2 is reduced.

Q14) Ans:- B

Solution:- Metallic Iron (Fe) loses electrons to form Fe^{3+}, meaning it undergoes oxidation.

Q15) Ans:- D

Solution:- $Cl_2 + KOH \rightarrow KCl + KOCl + H_2O$

(-1) (+1)

Q16) Ans:- C, D

$2Mn^{+3} + 2H_2O \rightarrow MnO_2 + Mn^{+2} + 4H^+$

Solution:- $2\,C_6H_5CHO \xrightarrow{NaOH} C_6H_5CH_2OH + C_6H_5COONa$

This is a cannizzaro's reaction taking place

C_6H_5CHO is oxidised to $C_6H_5COO^-$ as well as reduced to $C_6H_5CH_2OH$

Q17) Ans:- B

Solution:- $CrO_5 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + H_2O + O_2$

CrO_5 :- In this one oxygen oxidation state is '-2' & four oxygen $\rightarrow$ '-1'

$Cr + 1(-2) + 4(-1) = 0 \Rightarrow Cr = +6.$

$Cr_2(SO_4)_3$:- $2Cr + 3(-2) = 0$

$2Cr = 6, \quad Cr = +3$

Change in oxidation state for one Cr atom is $6 - 3 = 3$.

∴ For each mole of Cr reduced, 3 moles of electrons are needed.

Q18) Ans:- C

Solution:- No. of e^- transferred in each case = change in oxidation state

$KMnO_4 \rightarrow +1 + Mn + 4(-2) = 0 \Rightarrow Mn = +7$

$MnO_4^{2-} \rightarrow Mn + 4(-2) = -2 \Rightarrow Mn = +6.$

$KMnO_4 \rightarrow MnO_4^{2-} \rightarrow 7 - 6 = 1\ e^-$ transferred.
(+7 → +6)

$MnO_2 \rightarrow Mn + 2(-2) = 0 \Rightarrow Mn = +4$

$KMnO_4 \rightarrow MnO_2 \Rightarrow 7 - 4 = 3\ e^-$ transferred

$Mn_2O_3 \rightarrow 2Mn + 3(-2) = 0 \Rightarrow Mn = 3$, [$7 - 3 = 4e^-$ transferred]

$Mn^{2+} \rightarrow 7 - 2 = 5\ e^-$ transferred.

Q19) Ans:- C.

Solution:- $Cl_2 \rightarrow Cl^- + ClO_3^-$

0 −1 +5

Chloride ion (Cl^-) → Oxidation state = −1 (Reduction)

Chlorate ion (ClO_3^-) → oxidation.

In this reaction both oxidation & reduction take place. So it is called as disproportion reaction.

Q20) Ans:- D

Solution:-

1) $P_4 + OH^- \rightarrow PH_3 + H_2PO_2^-$ → Disproportion.

0 −3 +1

2) $S + OH^- \rightarrow S^{-2} + S_2O_3^{2-} + H_2O$ → Disproportion.

0 −2 +2

3) $Cl_2 + OH^- \rightarrow ClO^- + Cl^- + H_2O$ → Disproportion

0 +1 −1

4) $F_2 + OH^- \rightarrow F^- + OF_2 + H_2O$ → not Disproportion

0 −1

Fluorine is undergoes reduction in both cases.

Q21) Ans:- D.

Solution:- $HI \propto I_2 \propto ICl \propto HIO_4$

$-1 \quad 0 \quad +1 \quad +7$

Q22) Ans:- A

Solution:- $2MnO_4^- + 16H^+ + 5C_2O_4^{-2} \rightarrow 2Mn^{+2} + 8H_2O + 10CO_2$

$+7 \qquad +3 \qquad 2 \qquad 4$

MnO_4^- is the oxidizing agent since it gets reduced.

Q23) Ans:- B

Solution:- $2KMnO_4 + 16HCl \rightarrow 5Cl_2 + 2MnCl_2 + 2KCl + 8H_2O$

$+7 \qquad +2$

$KMnO_4 \rightarrow MnCl_2 \rightarrow$ Reduction.

$+7 \qquad +2$

Cl in HCl $\rightarrow -1$ to Cl in $Cl_2 \rightarrow 0$ (oxidation).

$\therefore MnCl_2$ is the reduction product

Q24) Ans:- A

Solution:- $XZn + NO_3^- + YH^+ \rightarrow XZn^{2+} + NH_4^+ + ZH_2O$

$0 \rightarrow 3$ (↓)

$Z = 3.$

$XZn + NO_3^- + YH^+ \rightarrow XZn^{2+} + NH_4^+ + 3H_2O$

$H \rightarrow 10, SO_4 = 10.$

$XZn + NO_3^- + 10H^+ \rightarrow XZn^{2+} + NH_4^+ + 3H_2O$

$10^+ \& 1^- = 9^+$ $\quad X$(positive^{+2}) + 1 positive

$4^+ (+2) + 1 = 9.$

$X = 4$

Q25) Ans:- C

Solution:- $NO_3^- + 4H^+ + e^- \rightarrow 2H_2O + NO$

$-1 + 4 + 3e^-$

In this equation, all atoms are balance charge add $3e^-$ to L.H.S we have

$NO_3^- + 4H^+ + 3e^- \rightarrow 2H_2O + NO$

JEE Advanced Level Questions

Q26) Ans:- b, c

Solution:- a) $FeCr_2O_4$

$+2 + 2Cr + 4(-2) = 0 \Rightarrow 2Cr = 6$

$Cr = +3$

b) $KCrO_3Cl$

$+1 + Cr + 3(-2) + (-1) = 0$ ✓

$Cr = +6$

c) $CrO_5 \rightarrow$ 4 peroxides are there.

$x + 4(-1) - 2 = 0 \Rightarrow x = +6.$

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

$x + 4(-1) = -1 \Rightarrow x = -1 + 4 \Rightarrow x = +3$

Q27) Ans:- a, b, c, d

Solution:- a) $HCHO \rightarrow (+1) + x + 1 - 2 = 0$

b) $CH_2Cl_2 \rightarrow x + 2 - 2 = 0$

c) $C_6H_{12}O_6 \rightarrow 6x + 12 - 12 = 0$

d) $C_{12}H_{22}O_{11} \rightarrow 12x + 22 - 22 = 0$

Q28) Ans:- b, d.

Solution:-

a) $Mg + N_2 \rightarrow Mg_3N_2$

0 0

In Mg_3N_2:- Mg forms Mg^{+2} (+2) } Redox reaction
N form N^{3-} (-3) }

b) $K_4[Fe(CN)_6] + H_2SO_4 + H_2O \rightarrow K_2SO_4 + CO + FeSO_4 + (NH_4)_2SO_4$

+2 +2

No change → Not a redox reaction

c) $I_2 + 3Cl_2 \rightarrow ICl_3$ } Redox Reaction

0 0 +3 -1

d) $CuSO_4 + NH_3 \rightarrow [Cu(NH_3)_4]SO_4$

+2 +2

Not a redox reaction

Q29) Ans:- a, d.

Solution:- a) $NaIO_3 + NaHSO_3 \rightarrow NaHSO_4 + Na_2SO_4 + I_2 + H_2O$

+5 +4 +6 0

→ Redox

b) $FeCl_3 + K_4[Fe(CN)_6] \rightarrow KCl + Fe_4[(Fe(CN)_6]_3$

3 +2 +1 +2 → Not redox.

c) $AgCl + Na_2S_2O_3 \rightarrow Na_3[Ag(S_2O_3)_2] + NaCl$.

+1 +1 → Not redox.

d) $NaBiO_3 + MnSO_4 + HNO_3 \rightarrow HMnO_4 + Bi(NO_3)_3 + NaNO_3 + Na_2SO_4 + H_2O$

+5 +2 +7 +3

Redox reaction.

Q30) Ans:- A

Solution:- $2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{-2} + 2I^-$

(0 under I_2; -1 under $2I^-$)

Q31) Ans:- C

Solution:- Nitrous acid (HNO_2)

Nitrogen $\rightarrow +3$.

It can act as an oxidizing agent by getting reduced to NH_3 (−3) or N_2 (0).

→ It can act as a reducing agent by getting oxidized to NO_3^- (Oxidation state +5)

Q32) Ans:- C

Solution:- $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$

(0 under P_4; +3 under NaH_2PO_2; −3 under PH_3)

Both oxidation & reduction takes place so it is called as disproportion reaction.

Q33) Ans:- C

Solution:-

1) $FeSO_4 \rightarrow x + 6 + 4(-2) = 0 \Rightarrow x = +2$

2) $K_4[Fe(CN)_6] \rightarrow 4 + x - 6 = 0 \Rightarrow x = +2$

3) $Fe(CO)_5 \rightarrow CO \rightarrow$ Carbonyl

$Fe \rightarrow 0$ with Carbonyl group

4) $FeO \rightarrow x - 2 = 0 \Rightarrow x = +2$

Q34) Ans:- B

Solution:- CrO_5

$Cr - 2 + 4(-1) = 0$ [1 normal oxide, 4 peroxide]

$Cr = +6$.

Matrix Matching

Q35) Ans:- A) 3 B) 5 C) 4 D) 1

Solution:-

A) $H_2S_2O_8 \rightarrow 2x + 2(1) + 6(-2) + 2(-1) \rightarrow 3) +6$

$2x = 12 \Rightarrow x = +6$

B) $H_2S \rightarrow 2(1) + S = 0 \Rightarrow S = -2 \rightarrow 5) -2$

C) $Na_2SO_3 \rightarrow 2(1) + S + 3(-2) = 0 \Rightarrow S = 4 \rightarrow 4) +4$

D) $S_2Cl_2 \rightarrow 2S + 2(1) = 0$

$2S = +2$ → 1) 1

$S = 1$

Q36) Ans:- A

Solution:-

A) $\underset{+1\ -2}{Na_2O_2} + \underset{+1\ -2}{H_2SO_4} \rightarrow \underset{+1\ +6\ -2}{Na_2SO_4} + \underset{+1\ -2}{H_2O_2} \rightarrow 3)$ Non-Redox reaction

B) $\underset{0}{H_2} + \underset{0}{Cl_2} \rightarrow \underset{+1\ -1}{2HCl}$ → 1) Redox Reaction

C) $\underset{+3}{Cr(OH)_3} \rightarrow \underset{+6}{CrO_4^{-2}}$ → 2) Oxidation reaction

D) $\underset{+1}{IO_3^-} \rightarrow \underset{-1}{I^-}$ → 4) Reduction reaction

Integer Type

Q37) Ans:- 6

Solution:- $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$

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

Oxidation state of Cr is decreasing from +6 to +3 per atom, one Cr atom gaining $3e^-$, then 2 Cr atoms gain $\underline{6e^-}$.

Q38) Ans:- 1

Solution:- $Ba(H_2PO_2)_2$

$$2 + 2[2 + P + 2(-2)] = 0$$

$$2 + 2[P - 2] = 0 \Rightarrow 2 + 2P - 4 = 0$$

$$2P = 2$$

$$P = +1$$

Learners Task

Q1) Ans:- A

Solution:- Oxidation number of elemental form of S_8 is zero.

Q2) Ans:- C

Solution:- N_3H

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

$$N = -1/3.$$

Q3) Ans:- C

Solution:- $C + H_2O$

$C + 2(1) - 2 = 0$

$C = 0$

Q4) Ans:- A

Solution:- Carbonyl group, oxidation number = 0

$Ni(CO)_4$

$Ni + 4(0) = 0$

$Ni = 0$

Q5) Ans:- C

Solution:- $K_4[Fe(CN)_6]$

$4(1) + Fe + 6(-1) = 0$

$Fe = +2$

Q6) Ans:- B

Solution:- OF_2

Valency of oxygen = 2

Oxidation state of oxygen is

$x + 2(-1) = 0 \Rightarrow x = +2$

Q7) Ans:- B

Solution:- 1) $HClO_4 \rightarrow +1 + x + 4(-2) = 0 \Rightarrow x = +7$

2) $HClO_3 \rightarrow 1 + x - 6 = 0 \Rightarrow x = +5$

3) $HClO_2 \rightarrow 1 + x - 4 = 0 \Rightarrow x = +3.$

4) $HCl \rightarrow 1 + x = 0 \Rightarrow x = -1.$

Q8) Ans:- C

Solution:- In its elemental form, all elements commonly exhibit an oxidation state of zero.

Q9) Ans:- A

Solution:- The maximum oxidation state that Fluorine exhibits is -1

Q10) Ans:- C

Solution:- Fluorine always exhibit a negative oxidation state in its compounds.

Q11) Ans:- B

Solution:- Minimum oxidation state of Nitrogen is '-3'.

Q12) Ans:- D

Solution:- $K_2Cr_2O_7$

Cr:- $2(1) + 2Cr + 7(-2) = 0$

$2Cr - 12 = 0 \Rightarrow 2Cr = 12 \Rightarrow Cr = +6.$

In K_2CrO_4, $2(1) + Cr + 4(-2) = 0 \Rightarrow Cr - 6 = 0$

$Cr = +6.$

K remains $+1$ (No change)

Cr remains $+6$ (No change)

O remains -2 (No change)

No element changes its oxidation state, this is not a redox reaction

Q13) Ans:- C

Solution:- HN_3

$1+3N=0$

$3N=-1 \Rightarrow N=-1/3.$

Q14) Ans:- B.

Solution:- CO_2

$C+2(-2)=0 \Rightarrow C=+4.$

Q15) Ans:- C

Solution:- 1) $H_2O \rightarrow 2(1)+x=0 \Rightarrow x=-2$

2) $H_2O_2 \rightarrow 2(1)+2x=0 \Rightarrow 2x=-2 \Rightarrow x=-1$

3) $OF_2 \rightarrow x+2(-1)=0 \Rightarrow x=+2$ ✓

4) $H_2SO_4 \rightarrow 2+6+4x=0 \Rightarrow 4x=-8=-2$

Q16) Ans:- A

Solution:- In $S_8 \rightarrow$ Oxidation state $= 0$

$S_2F_2 \Rightarrow 2S+2(-1)=0 \Rightarrow 2S=2 \Rightarrow S=1.$

$H_2S \Rightarrow 2(1)+S=0 \Rightarrow S=-2$

Q17) Ans:- D

Solution:- $CrO_4^{-2} \rightarrow Cr_2O_7^{2-}$

CrO_4^{-2}

$Cr+4(-2)=-2 \Rightarrow Cr=6$

$Cr_2O_7^{2-}$

$2Cr+7(-2)=-2 \Rightarrow 2Cr=-2+14$

No change $2Cr=12 \Rightarrow Cr=6$

Q18) Ans:- C

Solution:- Glucose $C_6H_{12}O_6$

$6x + 12 + 6(-2) = 0$

$6x = 0 \Rightarrow x = 0$

Q19) Ans:- B

Solution:- Lost of electrons means oxidation, so in manganex if it lost three electrons means it undergo oxidation and therefore oxidation state is increased to '+6'

Q20) Ans:- C

Solution:- S_8 oxidation state is zero.

~~state~~ is increased to +6

Q20) Ans:- C

Solution:- S_8 oxidation state is zero.

S_8 exists in crown like structure in which each sulphur atom is attached to 2 other sulphur atoms. Therefore the covalency of S_8 is 2

Q21) Ans:- A

Solution:- Acetaldehyde → CH_3CHO.

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

$2x = -2$

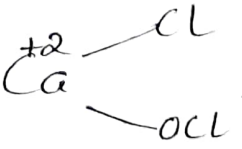
Q22) Ans:- C

Solution:- $CaOCl_2$

Cl^- : oxidation state = -1

OCl^- → $-2 + Cl = -1$

$Cl = -1 + 2 = +1$



(Q23) Ans:- D

Solution:- $H_2S_2O_7$

$2(1)+2S+7(-2)=0$

$2S-12=0 \Rightarrow 2S=12$

$S=+6$

(Q24) Ans:- A

Solution:- Almalgam are not compounds.

→ There is no chemical combination & chemical reaction b/w mercy and sodium in sodium amalgam.

→ Hence the oxidation state of mercury and sodium are zero

(Q25) Ans:- D

Solution:- $2KOH + Cl_2 \longrightarrow KCl + KOCl + H_2O$

$KCl \rightarrow 1+Cl=0 \Rightarrow Cl=-1.$

$KOCl \rightarrow 1+(-2)+Cl=0 \Rightarrow Cl=+1$

(Q26) Ans:- C

Solution:- $Na_2S_4O_6$

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

$4S+2-12=0$

$4S=10$

$S=\frac{10}{4}^{5}2=\frac{5}{2}$

Q27) Ans:- C

Solution:-

1) $PH_3 \rightarrow P+3(1)=0 \Rightarrow P=-3.$

2) $H_3PO_3 \rightarrow 3+P+3(-2)=0 \Rightarrow P-3=0 \Rightarrow P=+3.$

3) $Ca_3(PO_4)_2 \rightarrow 3(2)+2[P+4(-2)]=0$

$6+2P-16=0 \Rightarrow 2P-10=0$

$2P=10$

$P=+5$ ✓

4) $H_3PO_2 \rightarrow 3+P+2(-2)=0$

$P-1=0 \Rightarrow P=+1.$

JEE Main Level Questions

Q28) Ans:- A

Solution:- $[Fe(H_2O)_5NO]SO_4$

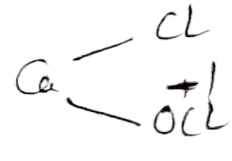
$NO \rightarrow 1$, $SO_4 \rightarrow -2$, $H_2O \rightarrow 0$

$Fe+5(0)+1+(-2)=0$

$Fe-1=0 \Rightarrow Fe=+1$

Q29) Ans:- B

Solution:- $Ca(OH)_2 + \underset{0}{Cl_2} \rightarrow CaOCl_2 + H_2O$



$OCl \rightarrow -2+Cl=-1 \Rightarrow Cl=+1.$

In $CaOCl_2$, one cl $\rightarrow -1$, another $Cl \rightarrow +1$.

Here Cl oxidation change from zero to -1

&

zero to $+1$

Q30) Ans:- C

Solution:- $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

When copper is added to silver nitrate solution, silver is precipitated due to oxidation of copper & reduction of silver

Q31) Ans:- C

Solution:- $\overset{0}{I_2} + 2\overset{+5}{KClO_3} \rightarrow 2\overset{+5}{KIO_3} + \overset{0}{Cl_2}$

I_2 → Undergoes oxidation → Reducing agent

$KClO_3$ → Undergoes reduction → Oxidising agent

Iodine displaces chlorine

Q32) Ans:- A

Solution:- $Na_2[Fe(CN)_5NO]$

$2(1) + Fe + 5(-1) + 1 = 0$

$Fe - 2 = 0 \Rightarrow Fe = +2$

Q33) Ans:- C

Solution:- 1) $\overset{V=0}{VO^{-2}} \rightarrow \overset{V=3}{V_2O_3}$ → Change in oxidation state

2) $\overset{0}{Na} \rightarrow \overset{1}{Na^+}$ → Change in oxidation state

3) $\overset{+6}{CrO_4^{2-}} \rightarrow \overset{+6}{Cr_2O_7^{2-}}$ → No change in oxidation state

4) $\overset{2}{Zn^{2+}} \rightarrow \overset{0}{Zn}$ → Change in oxidation state

Q34) Ans:- A

Solution:- Reaction in which single compound breaks down into smaller compounds is decomposition reaction.

$$AB \rightarrow A + B.$$

$$2HgO \rightarrow 2Hg + O_2$$

Q35) Ans:- D

Solution:- $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

double displacement reaction.

Q36) Ans:- D

Solution:- When halogens react with NaOH, it is a disproportion reaction.

$$6NaOH + 3Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$$

Q37) Ans:- A

Solution:- A reaction in which a more electropositive metal displaces a less electropositive metal is called metal displacement reaction

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu.$$

Q38) Ans:- B

Solution:- $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu.$

Zn acts as reducing agent because it undergo oxidation

Q39) Ans:- D

Solution:- $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

$\quad 0 \quad\quad +1 \quad\quad\quad 0 \quad\quad +2$

Redox reaction

Q40) Ans:- C

Solution:- $2NaOH + 2F_2 \rightarrow 2NaF + OF_2 + H_2O$.

This reaction is redox reaction but not dispropor-tion reaction.

Q41) Ans:- B

Solution:- $3Mg + N_2 \rightarrow Mg_3N_2$

$\quad 0 \quad\quad\quad\quad +2$

Mg oxidised

Q42) Ans:- C

Solution:- Oxidation power of halogen is,

$F_2 > Cl_2 > Br_2 > I_2$

No other halogen can oxidize F^- to F_2. So it is not possible to prepare F_2 by oxidation of F^-.

It is prepared by electrolytic oxidation of ion using fused KHF_2

Q43) Ans:- A

Solution:- $2H_2O_2 \rightarrow 2H_2O + O_2$

Same element oxygen undergoes both oxidation & reduction. Hence it is a disproportion reaction

JEE Advanced Level Questions

Q44) Ans:- a, b, c.

Solution:-

→ Peroxomonosulphuric acid (Caro's acid)

$H_2SO_5 \rightarrow 2(1)+S+3(-2)+2(-1)=0$

$S-6=0 \Rightarrow S=+6.$

→ Peroxodisulphuric acid (Marshall's acid)

$H_2S_2O_8 \rightarrow 2(1)+2S+6(-2)+2(-1)=0$

$2+2S-12-2=0$

$2S=12-6 \Rightarrow S=+6.$

→ Pyrosulphuric acid (Oleum) → $H_2S_2O_7$

$2(1)+2S+7(-2)=0$

$2+2S-14=0$

$2S=12-6 \Rightarrow S=+6.$

→ Sodium thiosulphate (Hypo)

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

$2S=4$

Q45) Ans:- a, c

Solution:-

c) $H_2SO_5 > H_2SO_3 > S_2Cl_2 > H_2S$

$+6 \quad +4 \quad +2 \quad -2$

a) $H_2S_2O_4 > NaS_4O_6 > Na_2S_2O_3 > S_8$

$+6 \quad 2.5 \quad 2 \quad 0$

Q46) Ans:- A

Solution:- Fluorine's high electronegativity & its seven valen electrons lead to it always exhibiting a '−1' oxidation state in its compounds

Q47) Ans:- B.

Solution:- A & R are correct, R is not a proper explanation of A.

Stoichiometry relies on the law of conservation of mass, and redox reactions involves simultaneous oxidation and reduction, but these concepts are distinct

Q48) Ans:- C

Solution:- Initial oxidation number is +3

It losing $3e^-$ so the final oxidation number = 3+3 = +6

Q49) Ans:- B

Solution:- $H_2O_2 \rightarrow H_2O + O_2$

$-1 \quad -2 \quad 0$

H_2O_2 undergoes both oxidation & reduction

Matrix Matching

Q50) Ans:- A) 5 B) 2 C) 1 D) 3.

Solution:-

A) +3 → 5) Nitrite ion (NO_2^-)

$x+2(-2)=-1 \Rightarrow x=-1+4=3.$

B) +1 → 2) Nitrous oxide (N_2O)

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

C) 0 → D) Nitrogen

D) +5 → 3) Nitrate ion (NO_3^-)

$x+3(-2)=-1$

$x=-1+6=+5$

Q51) Ans:- A) 4 B) 1 C) 2 D. 3

Solution:-

A) NH_3 → 4) Reductant

B) $KMnO_4$ → 1) Oxidant

C) SO_2 → 2) Both oxidant & reductant

D) He → 3) Neither oxidant nor reductant

Integer Type

Q52) Ans:- +7

Solution:- $KMnO_4 \Rightarrow +1+x+4(-2)=0$

$x=+7$

Q53) Ans:- +6.

Solution:- $S_2O_8^{2-} \rightarrow 2S+6(-2)+2(-1)=-2$

$2S=-2+12 \Rightarrow 2S=12$

$S=+6$

5. REDOX REACTIONS OXIDATION AND REDUCTION KEY

TEACHING TASK									
JEE MAINS&ADVANCED LEVEL QUESTIONS									
1	2	3	4	5	6	7	8	9	10
D	C	B	A	A	C	C	D	B	A
11	12	13	14	15	16	17	18	19	20
C	C	D	B	D	C,D	B	C	C	D
21	22	23	24	25	26	27	28	29	30
D	A	B	A	C	B,C	A,B,C,D	B,D	A,D	A
31	32	33	34	35		36	37	38	
C	C	C	B	A-3,B-5,C-4,D-1		A	6	1	
LEARNERS TASK									
1	2	3	4	5	6	7	8	9	10
A	C	C	A	C	B	B	C	A	C
11	12	13	14	15	16	17	18	19	20
B	D	C	B	C	A	D	C	B	C
21	22	23	24	25	26	27	28	29	30
A	C	D	A	D	C	C	A	B	C
31	32	33	34	35	36	37	38	39	40
C	A	C	A	D	D	A	B	D	C
41	42	43	44	45	46	47	48	49	
B	C	A	A,B,C	A,C	A	B	C	B	
50		51		52	53				
A-5,B-2,C-1,D-3		A-4,B-1,C-2,D-3		7	6				