DPP - Daily Practice Problems

Chapter-wise Sheets

Date : | Start Time : | End Time :

CHEMISTRY CC08

SYLLABUS : Redox Reactions

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. The brown ring complex is formulated as $[Fe(H_2O)_5 NO]SO_4$. The oxidation number of iron is
(a) 1 (b) 2
(c) 3 (d) 0

2. In which of the following reactions, there is no change in valency ?
(a) $4KClO_3 \rightarrow 3KClO_4 + KCl$
(b) $SO_2 + 2H_2S \rightarrow 2H_2O + 3S$
(c) $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$
(d) $2BaO + O_2 \rightarrow 2BaO_2$

3. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is:
(a) +3 (b) +2
(c) +6 (d) +4

4. In which of the following pairs, there is greatest difference in the oxidation number of the underlined elements ?
(a) $\underline{N}O_2$ and $\underline{N}_2O_4$ (b) $\underline{P}_2O_5$ and $\underline{P}_4O_{10}$
(c) $\underline{N}_2O$ and $\underline{N}O$ (d) $\underline{S}O_2$ and $\underline{S}O_3$

5. A compound of Xe and F is found to have 53.5% of Xe. What is oxidation number of Xe in this compound ?
(a) –4 (b) 0
(c) +4 (d) +6

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ

Space for Rough Work

6. Atomic number of an element is 22. The highest O.S. exhibited by it in its compounds is
(a) 1 (b) 2
(c) 3 (d) 4

7. The reaction in which hydrogen peroxide acts as a reducing agent is
(a) $PbS+4H_2O_2 \rightarrow PbSO_4+4H_2O$
(b) $2KI+H_2O_2 \rightarrow 2KOH+I_2$
(c) $2FeSO_4+H_2SO_4+H_2O_2 \rightarrow Fe_2(SO_4)_3+2H_2O$
(d) $Ag_2O+H_2O_2 \rightarrow 2Ag+H_2O+O_2$

8. Of the following reactions, only one is a redox reaction. Identify it
(a) $Ca(OH)_2+2HCl \rightarrow CaCl_2+2H_2O$
(b) $BaCl_2+MgSO_4 \rightarrow BaSO_4+MgCl_2$
(c) $2S_2O_7^{2-}+2H_2O \rightarrow 4SO_4^{2-}+4H^+$
(d) $Cu_2S+2FeO \rightarrow 2Cu+2Fe+SO_2$

9. Arrange the following in the order of their decreasing electrode potentials : Mg, K, Ba and Ca
(a) K > Ca > Ba > Mg (b) Ba > Ca > K > Mg
(c) Ca > Mg > K > Ba (d) Mg > Ca > Ba > K

10. Which of the following statements are correct concerning redox properties?
(i) A metal M for which E° for the half life reaction $M^{n+}+ne^- \rightleftharpoons M$ is very negative will be a good reducing agent.
(ii) The oxidizing power of the halogens decreases from chlorine to iodine.
(iii) The reducing power of hydrogen halides increases from hydrogen chloride to hydrogen iodide
(a) (i), (ii) and (iii) (b) (i) and (ii)
(c) (i) only (d) (ii) and (iii)

11. A negative $E^\bullet$ means that redox couple is a ___A___ than the H^+/H_2 couple

A positive $E^\bullet$ means that the redox couple is a ___B___ than H^+/H_2 couple
(a) A = stronger reducing agent
B = weaker reducing agent
(b) A = stronger oxidising agent
B = weaker oxidising agent
(c) A = weaker oxidising agent
B = stronger oxidising agent
(d) Both (a) and (c)

12. If equal volume of reactants are used, then no. of moles of $KMnO_4$ (moles per litre) used in acidic medium required to completely oxidise 0.5 M $FeSO_3$?
(a) 0.3 (b) 0.1
(c) 0.2 (d) 0.4

13. If rod of a metal (x) is put in a metal ion solution which is blue in colour , solution turn colourless. The metal rod and solution respectively are?
(a) Zinc and Cu(II) (b) Zinc and Ni(II)
(c) Aluminium and Cu(II) (d) Both (a) and (c)

14. In the reaction between SO_2 and O_3 the equivalent weight of sulphur in product is
(a) the same as its molecular weight
(b) half of the molecular weight
(c) one-third of the molecular weight
(d) one-fourth of the molecular weight

15. When $KMnO_4$ reacts with acidified $FeSO_4$
(a) $FeSO_4$ is oxidised and $KMnO_4$ is reduced
(b) only $KMnO_4$ is oxidised
(c) only $FeSO_4$ is oxidised
(d) None of these

16. Consider the following reaction :
$$xMnO_4^- + yC_2O_4^{2-} + zH^+ \rightarrow xMn^{2+} + 2yCO_2 + \frac{z}{2}H_2O$$
The value's of x, y and z in the reaction are, respectively :
(a) 5, 2 and 16 (b) 2, 5 and 8
(c) 2, 5 and 16 (d) 5, 2 and 8

17. When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from :
(a) zero to +1 and zero to –5
(b) zero to –1 and zero to +5
(c) zero to –1 and zero to +3
(d) zero to +1 and zero to –3

RESPONSE GRID					
	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ
	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ
	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ			

Space for Rough Work

18. Oxidation state for nitrogen is incorrectly given for compound oxidation state
(a) $[Co(NH_3)_5Cl]Cl_2$ 0
(b) NH_2OH –1
(c) $(N_2H_5)_2SO_4$ –2
(d) Mg_3N_2 –3

19. Standard electrode potentials of redox couples A^{2+}/A, B^{2+}/B, C^{2+}/C and D^{2+}/D are 0.3V, – 0.5V, –0.75V and 0.9V respectively. Which of these is best oxidising agent and reducing agent respectively–
(a) D^{2+}/D and B^{2+}/B (b) B^{2+}/B and D^{2+}/D
(c) D^{2+}/D and C^{2+}/C (d) C^{2+}/C and D^{2+}/D

20. MnO_4^{2-} (1 mole) in neutral aqueous medium disproportionates to
(a) 2/3 mole of MnO_4^- and 1/3 mole of MnO_2
(b) 1/3 mole of MnO_4^- and 2/3 mole of MnO_2
(c) 1/3 mole of Mn_2O_7 and 1/3 mole of MnO_2
(d) 2/3 mole of Mn_2O_7 and 1/3 mole of MnO_2

21. In the standardization of $Na_2S_2O_3$ using $K_2Cr_2O_7$ by iodometry, the equivalent weight of $K_2Cr_2O_7$ is
(a) (molecular weight)/2 (b) (molecular weight)/6
(c) (molecular weight)/3 (d) same as molecular weight

22. The species that undergoes disproportionation in an alkaline medium are
(a) Cl_2 (b) MnO_4^{2-}
(c) NO_2 (d) All of these

23. One mole of N_2H_4 loses 10 moles of electrons to form a new compound y. Assuming that all nitrogen appear in the new compound, what is the oxidation state of nitrogen in y (There is no change in the oxidation state of hydrogen)
(a) –1 (b) –3
(c) +3 (d) +5

24. Phosphorus, sulphur and chlorine undergo disproportion in the ...A... medium.
Here, A refers to
(a) acidic (b) alkaline
(c) neutral (d) Both (a) and (b)

25. In which of the following compounds oxygen has highest oxidation state and in which it has lowest oxidation state?
OF_2, H_2O_2, KO_2, O_2F_2
(a) Highest = KO_2, lowest = H_2O_2
(b) Highest = OF_2, lowest = H_2O_2
(c) Highest = OF_2, lowest = KO_2
(d) Highest = KO_2, lowest = H_2O_2

26. The most powerful oxidizing agent from the following is
(a) H_3BO_3 (b) HPO_3
(c) H_3PO_4 (d) H_2SO_4

27. When SO_2 is passed through acidified solution of potassium dichromate, then chromium sulphate is formed. The change in valency of chromium is
(a) +4 to +2 (b) +5 to +3
(c) +6 to +3 (d) +7 to +2

28. Standard reduction potentials of the half reactions are given below :
$F_2(g) + 2e^- \rightarrow 2F^-(aq)$; $E^\circ = +2.85$ V
$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$; $E^\circ = +1.36$ V $Br_2(l) + 2e^- \rightarrow 2Br^-(aq)$; $E^\circ = +1.06$ V $I_2(s) + 2e^- \rightarrow 2I^-(aq)$; $E^\bullet = +0.53$V
The strongest oxidising and reducing agents respectively are :
(a) F_2 and I^- (b) Br_2 and Cl^-
(c) Cl_2 and Br^- (d) Cl_2 and I_2

29. A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y^- and 1 M Z^- at 25°C. If the reduction potential is Z > Y > X, then
(a) Y will oxidise X and not Z
(b) Y will oxidise Z and not X
(c) Y will oxidise both X and Z
(d) Y will reduce both X and Z

30. The violent reaction between sodium and water is an example of
(a) Reduction (b) Oxidation
(c) Redox reaction (d) Neutralization reaction

31. The equivalent weight of Mohr's salt, $FeSO_4(NH_4)_2SO_4.6H_2O$ is equal to
(a) its molecular weight
(b) its atomic weight
(c) half-its molecular weight
(d) one-third its molecular weight

RESPONSE GRID					
	18. ⓐ ⓑ ⓒ ⓓ	19. ⓐ ⓑ ⓒ ⓓ	20. ⓐ ⓑ ⓒ ⓓ	21. ⓐ ⓑ ⓒ ⓓ	22. ⓐ ⓑ ⓒ ⓓ
	23. ⓐ ⓑ ⓒ ⓓ	24. ⓐ ⓑ ⓒ ⓓ	25. ⓐ ⓑ ⓒ ⓓ	26. ⓐ ⓑ ⓒ ⓓ	27. ⓐ ⓑ ⓒ ⓓ
	28. ⓐ ⓑ ⓒ ⓓ	29. ⓐ ⓑ ⓒ ⓓ	30. ⓐ ⓑ ⓒ ⓓ	31. ⓐ ⓑ ⓒ ⓓ	

Space for Rough Work

32. The set of numerical coefficients that balances the equation
$K_2CrO_4 + HCl \rightarrow K_2Cr_2O_7 + KCl + H_2O$
(a) 1, 1, 2, 2, 1 (b) 2, 2, 1, 1, 1
(c) 2, 1, 1, 2, 1 (d) 2, 2, 1, 2, 1

33. Thiosulphate reacts differently with iodine and bromine in the reactions given below:
$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$
$S_2O_3^{2-} + Br_2 + 5H_2O \rightarrow 2SO_4^{2-} + 2Br^- + 10H^+$
Which of the following statements justifies the above dual behaviour of thiosulphate?
(a) Bromine is a stronger oxidant than iodine.
(b) Bromine is a weaker oxidant than iodine.
(c) Thiosulphate undergoes oxidation by bromine and reduction by iodine in these reactions.
(d) Bromine undergoes oxidation and iodine undergoes reduction in these reactions.

34. The chemical that undergoes self oxidation and self reduction in the same reaction is
(a) benzyl alcohol (b) acetone
(c) formaldehyde (d) acetic acid

35. The oxidation number of an element in a compound is evaluated on the basis of certian rules. Which of the following rules is not correct in this respect?
(a) The oxidation number of hydrogen is always + 1.
(b) The algebraic sum of all the oxidation numbers in a compound is zero.
(c) An element in the free or the uncombined state bears oxidation number zero.
(d) In all its compounds, the oxidation nunber of fluorine is – 1.

36. Zn gives H_2 gas with H_2SO_4 and HCl but not with HNO_3 because
(a) Zn acts as an oxidising agent when it reacts with HNO_3
(b) HNO_3 is weaker acid than H_2SO_4 and HCl
(c) In electrochemical series, Zn is above hydrogen
(d) NO_3^- is reduced in preference to hydronium ion

37. Which of the following elements does not show disproportionation tendency?
(a) Cl (b) Br
(c) F (d) I

38. The oxidation number of sulphur in S_8, S_2F_2, H_2S respectively, are
(a) 0, +1 and –2 (b +2, +1 and –2
(c) 0, +1 and +2 (d) –2, +1 and –2

39. Stronger is oxidising agent, more is:
(a) standard reduction potential of that species
(b) the tendency to get it self oxidised
(c) the tendency to lose electrons by that species
(d) standard oxidation potential of that species

40. Which of the following statement(s) is/are correct for the given reaction?
$2HgCl_2(aq) + SnCl_2(aq) \rightarrow Hg_2Cl_2(s) + SnCl_4(aq)$
(i) Mercuric chloride is reduced to Hg_2Cl_2
(ii) Stannous chloride is oxidised to stannic chloride
(iii) $HgCl_2$ is oxidised to Hg_2Cl_2
(iv) It is an example of redox reaction
(a) (i), (ii) and (iv) (b) (i) and (ii)
(c) (iii) and (iv) (d) (iii) only

41. The standard reduction potentials for Cu^{2+}/Cu; Zn^{2+}/Zn; Li^+/Li; Ag^+/Ag and H^+/H_2 are + 0.34 V, – 0.762 V, – 3.05 V, + 0.80 V and 0.00 V respectively. Choose the strongest reducing agent among the following
(a) Zn (b) H_2
(c) Ag (d) Li

42. In the disproportionation reaction
$3\,HClO_3 \rightarrow HClO_4 + Cl_2 + 2O_2 + H_2O$, the equivalent mass of the oxidizing agent is (molar mass of $HClO_3 = 84.45$)
(a) 16.89 (b) 32.22
(c) 84.45 (d) 28.15

43. Which of the following behaves as both oxidising and reducing agents ?
(a) H_2SO_4 (b) SO_2
(c) H_2O (d) HNO_3

44. Which of the following statement(s) is/are correct ?
(i) Oxidation state of carbon in C_3H_4 is –(4/3).
(ii) Electrons are never shared in fraction.
(a) (i)and(ii) (b) Only(i)
(c) Only(ii) (d) Neither (i) nor (ii)

45. In the reaction shown below, oxidation state of the carbon in reactant and product are (*i*) and (*ii*) respectively? Is the given reaction a redox reaction?
$Na_2CO_3(aq) + HCl(aq) \longrightarrow Na^{\oplus}(aq) + Cl^-(aq) + H_2O(\ell) + CO_2(g)$
(a) (i) 6, (ii) 4, yes (b) (i) 6, (ii) 6, No
(c) (i) 4, (ii) 4, No (d) (i) 4, (ii) 4, yes

RESPONSE GRID					
	32. ⓐⓑⓒⓓ	**33.** ⓐⓑⓒⓓ	**34.** ⓐⓑⓒⓓ	**35.** ⓐⓑⓒⓓ	**36.** ⓐⓑⓒⓓ
	37. ⓐⓑⓒⓓ	**38.** ⓐⓑⓒⓓ	**39.** ⓐⓑⓒⓓ	**40.** ⓐⓑⓒⓓ	**41.** ⓐⓑⓒⓓ
	42. ⓐⓑⓒⓓ	**43.** ⓐⓑⓒⓓ	**44.** ⓐⓑⓒⓓ	**45.** ⓐⓑⓒⓓ	

Space for Rough Work

1. **(a)** $[Fe(H_2O)_5NO]SO_4$
Let O.N. of Fe be x then,
$1\times(x)+5\times(0)+1\times(+1)+1\times(-2)=0 \quad \therefore x=+1$

2. **(c)** In $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$ all atoms are present in the same O.S. in reactants and products.

3. **(a)** $Cr_2O_7^{2-} + 6I^- + 14H^+ \longrightarrow 2Cr^{3+} + 3I_2 + 7H_2O$
+3 oxidation state of Cr.

4. **(d)** O.N. of N in NO_2 and N_2O_4 is +4
$\therefore$ difference is zero.
O.N. of P in P_2O_5 and P_4O_{10} is +5
$\therefore$ difference is zero
O.N. of N in N_2O is +1 and in NO is +2. The difference is 1
O.N. of S in SO_2 is +4 and in SO_3 is +6. The difference is +2.

5. **(d)** Xe = 53.5% $\therefore$ F = 46.5%
Relative number of atoms Xe

$$= \frac{53.5}{131.2} = 0.4 \text{ and } F = \frac{46.5}{19} = 2.4$$

Simple ratio Xe = 1 and F = 6
$\therefore$ Molecular formula is XeF_6
O.N. of Xe is +6.

6. **(d)** The element is Ti (At. no. 22). Electronic configuration is $1s^2, 2s^2p^6, 3s^2p^6d^2, 4s^2$, the energy level of 3d and 4s is very close. It can exhibit +4 oxidation state (Ti^{4+}).

7. **(d)** In Ag_2O, O.N. of Ag is +1 and in Ag the O.N. is 0. There is gain of electrons, hence H_2O_2 act as a reducing agent.

8. **(d)** In redox reaction oxidation and reduction take place simultaneoushy. $Cu_2S + 2FeO \rightarrow 2Cu + 2Fe + SO_2$.
O.N. of Cu changes from +1 to 0 (reduction) and O.N. of S changes from -2 to +4 (oxidation).

9. **(d)** Order of decreasing electrode potentials of Mg, K, Ba and Ca is
Mg > Ca > Ba > K
It can be explained by their standard reduction potentials.

$E^\circ_{K^+|K} = -2.925$

$E_{Ba^{2+}|Ba} = -2.90$

$E^\circ_{Ca^{2+}|Ca} = -2.87$

$E^\circ_{Mg^{2+}|Mg} = -2.37$

Highly negative value of E°_{red} shows the least value of electrode potential.

10. **(a)** (i) $Mn^{n+} + ne^- \rightleftharpoons M$, for this reaction, high negative value of E° indicates lower reduction potential, that means M will be a good reducing agent.

Stronger reducing agent $\Rightarrow$ Easy to oxidise
$\Downarrow$
Lower reduction potential $\Leftarrow$ higher oxidation potential

(ii)

Element	F	Cl	Br	I
Reduction potential (E°volt)	+2.87	+1.36	+1.06	+0.54

As reduction potential decreases from fluorine to iodine, oxidising nature also decreases from fluorine to iodine.

(iii) The size of halide ions increases from F^- to I^-. The bigger ion can loose electron easily. Hence the reducing nature increases from HF to HI.

11. **(d)** Negative $E^\circ \Rightarrow$ Stronger reducing agent or weaker oxidising agent
Positive $E^\circ \Rightarrow$ Weaker reducing agent or stronger oxidising agent.

12. **(a)** Both Fe(II) and S(IV) in SO_3^{2-} can be oxidised to Fe (III) and $(SO_4)^{2-}$ respectively hence $(3/5)\times0.5 = 0.3$ mol/litre.

$$\left[MnO_4^- + 5e^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O\right]\times\frac{3}{5}$$

$$Fe^{2+} \longrightarrow Fe^{3+} + e^-$$

$$SO_3^{2-} \longrightarrow SO_4^{2-} + 2e^-$$

$$\frac{3}{5}MnO_4^- + \frac{24}{5}H^+ + Fe^{2+} + SO_3^{2-} \longrightarrow 3/5\,Mn^{2+} + 12/5H_2O + Fe^{3+} + SO_4^{2-}$$

13. **(d)** Reduction potential of Cu(II) is greater than that of Zn(II) and Al(III) thus can be easily replaced by these ions. Moreover solution of copper is blue in color.

14. **(b)** $3SO_2 + O_3 \rightarrow 3SO_3$
O.N. of S changes from +4 to +6. Two electron change
$\therefore$ Eq. Wt = M/2. (molecular wt. = M)

15. **(a)** $2\overset{+7}{K}Mn\overset{}{O_4} + 3H_2SO_4 \rightarrow K_2SO_4 + 2\overset{+2}{Mn}SO_4 + 3H_2O + 5O$

$$2\overset{+2}{Fe}SO_4 + H_2SO_4 + O \rightarrow \overset{+3}{Fe_2}(SO_4)_3 + H_2O$$

O.N. of Mn changes from +7 to+2 (Reduction)

O.N. of Fe changes from +2 to +3 (Oxidation)

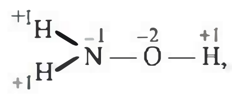
16. (c) On balancing the given equations, we get

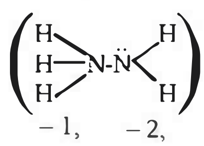
$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

So, $x = 2, y = 5$ & $z = 16$

17. (b) On reaction with hot and concentrated alkali a mixture of chloride and chlorate is formed

$$3Cl_2 + 6\,NaOH(excess) \xrightarrow{Hot} 5Na\overset{-1}{Cl} + Na\overset{+5}{Cl}O_3 + 3H_2O$$

18. (a) $[Co(NH_3)_5Cl]Cl_2$, 
-3

 , Mg_3N_2

-1, -2, -3

19. (c) The redox couple with maximum reduction potential will be best oxidising agent and with minimum reduction potential will be best reducing agent.

20. (a) $3MnO_4^{2-} + 2H_2O \rightarrow MnO_2 + 2MnO_4^- + 4OH^-$

or $MnO_4^{2-} + \frac{2}{3}H_2O \rightarrow \frac{1}{3}MnO_2 + \frac{2}{3}MnO_4^- + \frac{4}{3}OH^-$

21. (b) In iodometry, $K_2Cr_2O_7$ liberates I_2 from iodides (NaI or KI) which is titrated with $Na_2S_2O_3$ solution.

$$K_2Cr_2O_7 + I^- + H^+ \longrightarrow Cr^{3+} + I_2$$

Here, one mole of $K_2Cr_2O_7$ accepts 6 mole of electrons.

$\therefore$ Equivalent weight $= \frac{\text{molecular weight}}{6}$

22. (d) $\overset{0}{Cl}_2 + 2\,NaOH \rightarrow Na\overset{-1}{Cl} + Na\overset{+1}{Cl}O + H_2O$

$3\overset{+6}{Mn}O_4^{2-} + 2H_2O \rightarrow 2\overset{+7}{Mn}O_4^- + \overset{+4}{Mn}O_2 + 4OH^-$

$2\overset{+4}{N}O_2 + H_2O \rightarrow H\overset{+5}{N}O_3 + H\overset{+3}{N}O_2$

All undergo disproportionation.

23. (c) $\overset{-4}{N_2}\overset{+4}{H_4} \xrightarrow{\text{loss of }10e^-} N_2^{+6}(y);$

O.N. of N changes from -2 to+3

24. (b) Phosphorus, sulphur and chlorine disproportionate in the alkaline medium.

25. (c) Oxidation number of oxygen in $OF_2 = +2$ and in $KO_2 = \frac{-1}{2}$.

26. (d) In H_2SO_4, sulphur is in highest oxidation state (+6). Hence H_2SO_4 will be strongest oxidising agent.

27. (c) $K_2Cr_2O_7 + 3SO_2 + 4H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 3SO_3 + 4H_2O$

O.N. of chromium changes from +6 to +3

28. (a) Higher the value of reduction potential higher will be the oxidising power whereas the lower the value of reduction potential higher will be the reducing power.

29. (a) More the reduction potential, more will be the oxidising power.

30. (c) The violent reaction between sodium and water is an example of redox reaction :

$$2\overset{0}{Na} + 2\overset{+1}{H_2}O \longrightarrow 2Na\overset{+1}{O}H + \overset{0}{H_2}$$
(Oxd. state)

In this reaction, sodium (Na) is oxidised to NaOH while H_2O is reduced to H_2.

31. (a) $FeSO_4$ is oxidised to $Fe_2(SO_4)_3$, change in O.N. of Fe is by 1. Hence equivalent weight of Mohr's salt is M/1 = M.

32. (d) $2K_2CrO_4 + 2HCl \rightarrow K_2Cr_2O_7 + 2KCl + H_2O$

Coefficients are 2, 2, 1, 2, 1

33. (a)

34. (c) In Cannizzaro's reaction

$$2HCHO + KOH \rightarrow CH_3OH + HCOOK$$

formaldehyde is getting reduced as well as oxidised.

35. (a)

36. (a) Zinc gives H_2 gas with dil H_2SO_4/HCl but not with HNO_3 because in HNO_3, NO_3^- ion is reduced and give NH_4NO_3, N_2O, NO and NO_2 (based upon the concentration of HNO_3)

$[Zn + \underset{\text{(nearly 6\%)}}{2HNO_3} \longrightarrow Zn(NO_3)_2 + 2H] \times 4$

$HNO_3 + 8H \longrightarrow NH_3 + 3H_2O$

$NH_3 + HNO_3 \longrightarrow NH_4NO_3$

$4Zn + 10HNO_3 \longrightarrow 4Zn(NO_3)_2 + NH_4NO_3 + 3H_2O$

Zn is on the top position of hydrogen in electrochemical series. So Zn displaces H_2 from dilute H_2SO_4 and HCl with liberation of H_2.

$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

37. (c)

38. (a) ON of S in $S_8 = 0$

ON of S in $S_2F_2 = +1$

ON of S in $H_2S = -2$

39. (a) More is E°_{RP}, more is the tendency to get itself reduced or more is oxidising power.

40. (a) For statement (iii), $HgCl_2$ is reduced to Hg_2Cl_2

41. (d) More the negative reduction potential, more is the tendency to lose electron. The reducing power increases as the standard reduction potential becomes more and more negative.

Thus, Li is the strongest reducing agent as the standard reduction potential of Li^+/Li is most negative, –3.05 V.

42. (a) $\overset{+5}{ClO_3^-} \longrightarrow \overset{0}{Cl_2}$

$x - 6 = -1 \quad x = 0$

$x = +5 \quad x = 0$ (x = oxidation number)

$$\text{Equivalent mass} = \frac{\text{Molecular mass}}{\text{Oxidation number}} = \frac{84.45}{5} = 16.89$$

43. (b) In SO_2 the O.N. of S can increase and decrease. Hence can behave as reducing and oxidising agent. Oxidation state of S varies from –2 to 6.

44. (a) –(4/3) is the average oxidation state of C in C_3H_4.

45. (c) The redox reaction involve loss or gain of electron(s) i.e. change in oxidation state. Given reaction is not a redox reaction as this reaction involves no change in oxidation state of reactant or product.