JEE MAIN ANSWER KEY & SOLUTIONS

SUBJECT :- CHEMISTRY
CLASS :- 11th **PAPER CODE :- CWT-8**
CHAPTER :- REDOX REACTION

ANSWER KEY

1.	(B)	**2.**	(C)	**3.**	(A)	**4.**	(D)	**5.**	(D)	**6.**	(C)	**7.**	(A)
8.	(A)	**9.**	(D)	**10.**	(C)	**11.**	(D)	**12.**	(A)	**13.**	(A)	**14.**	(A)
15.	(B)	**16.**	(D)	**17.**	(B)	**18.**	(C)	**19.**	(B)	**20.**	(C)	**21.**	6
22.	24	**23.**	630	**24.**	27	**25.**	1	**26.**	0	**27.**	1	**28.**	8
29.	4	**30.**	3										

SOLUTIONS

1. (B)

Sol. O.N. of N in HNO_2 is + 3
Max. O.N. of N is + 5
Min. O.N. of N is - 3
Thus O.N. of N in HNO_2 can show an increase or decrease as the case may be. That is why HNO_2 acts as oxidant and reductant both. O.N. of N in HNO_3 is + 5, Hence it can act only as an oxidant.

2. (C)

Sol. In the reaction $P_2O_5 \rightarrow H_4P_2O_7$
The O.N. of P in P_2O_5 is
2x + 5 (–2) = 0 or x = +5
The O.N. of P in $H_4P_2O_7$ is
4 (+1) + 2 (x) +7 (–2) = 0
2x = 10 or x = +5
Since there is no change in O.N. of P, hence the above reaction is neither oxidation nor reduction.

3. (A)

Sol. In the above reaction $C_2O_4^{-2}$ acts as a reductant because it is oxidised to CO_2 as :

$C_2O_4^{-2} \rightarrow 2CO_2 + 2e^-$ (oxidation)

$C_2O_4^{-2}$ reduces MnO_4^- to Mn^{+2} ion in solution.

4. (D)

Sol. The O.N. of S are shown below along with the compounds

S_8. $S_2O_8^{-2}$. $S_2O_3^{-2}$, $S_4O_6^{-2}$,

0 +6 +2 +2.5

Hence the order of increasing O.N. of S is

$S_8 < S_2O_3^{-2} < S_4O_6^{-2} < S_2O_8^{-2}$

5. (D)

Sol. The balanced redox reaction given above can be written as :

$10FeC_2O_4 + 6KMnO_4 + 24H_2SO_4 \rightarrow 5Fe_2(SO_4)3 + 20CO_2 + 6\ MnSO_4 + 3\ K_2SO_4 + 24H_2O$

so the value of x = 6 and y = 6

6. (C)

Sol. The correctly balanced half reaction is – $Cr_2O_7^{-2} + 14H^+ \rightarrow 2Cr^{+3} + 7H_2O - 6e^-$ It is a reduction half reaction in balancing the equation by ion – electron method.

7. (A)

Sol. N_A no of electron will be removed by

$\frac{6.023\times10^{23}}{2.25\times10^{23}}\times16g$ of metal M

= 42.83 g of metal M

$\therefore$ equivalent weight of metal is 42.83

8. (A)

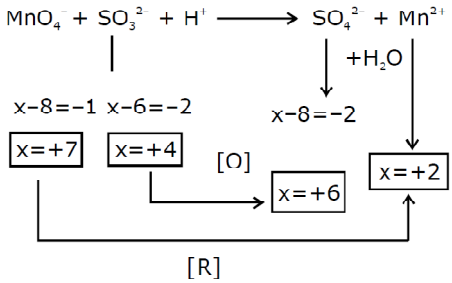
Sol. $H_2 + Br_2 \rightarrow 2HBr$
$H_2 = 0$
$Br_2 = 0$, [Homogeneous compound = 0]
HBr : x – 1 = 0 = x = +1
HBr : 1 + x = 0, x = –1
0 0 (R) + 1 –1
H_2 + Br_2 $\rightarrow$ 2H B r

9. (D)

Sol. Oxidation is addition of oxygen and removal of hydrogen. It also means addition of electronegative element and removal of some electropositve element.

10. (C)

Sol.



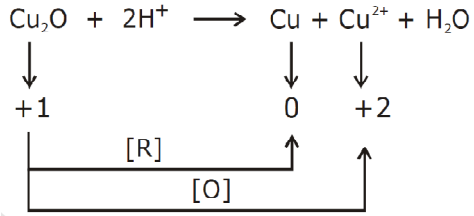
Mn is reduced & SO_3^{2-} is oxidised.

11. (D)

Sol. All the above, because all the compound a r e neutral and carbonyl is also a neutral ligand so oxidation of metal should be zero.

12. (A)

Sol.



Oxidation & Reduction at one compound disproportionation is a specific type of redox reaction in which an element from a reaction under goes both oxidation & reduction to form two different produces.

13. (A)

Sol. $K_2Cr_2O_7 + XH_2SO_4 + YSO_2 \rightarrow K_2SO_4 + Cr_2(SO_7)_3 + ZH_2O$

$X = 1, \quad Y = 3, \quad Z = 1$

14. (A)

Sol. $Cu + 4\ HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$

15. (B)

Sol. $5BiO_3^- + 14H^+ 2Mn^{2+} \longrightarrow 5Bi^{3+} + 7H_2O + 2MnO_4^-$

This is the balanced equation.

16. (D)

Sol. NH_3 : 17 $\quad N_2 = 14$

$\frac{M}{17-14} = \frac{M}{3} = \frac{17}{3}$

17. (B)

Sol. $H_2O_2 + MnO_4^- \longrightarrow Mn^{+2} + O_2$

$\left(\frac{1.2}{34} \times 2\right)$ meq $\quad$ (1.5 × 5)meq

(limiting reagent)

m moles of $O_2 = \frac{1.2 \times 2}{34} \times \frac{1}{2} = \frac{1.2}{34}$ m mol

mass of $O_2 = \frac{1.2}{34} \times 32$ mg

= 1.12 mg

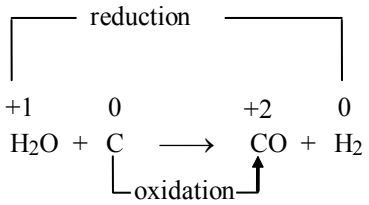
18. (C)

Sol. $Cu + H_2SO_4 \rightarrow CuO + H_2O + SO_2$ (H_2SO_4 act as oxidant)

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ (H_2SO_4 act as acid)

19. (B)

Sol.



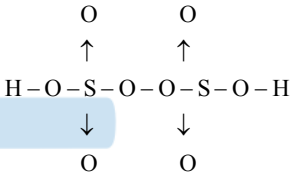
$\therefore$ H_2O is the oxidising agent. C is the reducing agent.

20. (C)

Sol. Cl atom is oxidized ($Cl^{1+} \rightarrow Cl^{5+} + 4e$) as well as Cl atom is reduced ($Cl^{1+} + 2e \rightarrow Cl^-$). Such reactions are called auto redox or disproportionation reactions.

21. 6

Sol. In $H_2S_2O_8$, two O atoms form peroxide linkage i.e.



$2 \times 1 + 2a + 6(-2) + 2(-1) = 0$

$\therefore \ a = +6$

Thus the O.N. of S in $H_2S_2O_8$ is $+6$

22. 24

Sol. $2Al^\circ \rightarrow Al_2^{+3} + 6e^-$ ..... (A)

$8e^- + Fe_3^{+8/3} \rightarrow 3Fe^\circ$ ..... (B)

Multiplying Eq. (A) by 4 and Eq. (B) by 3, then on addition

$8Al^\circ \rightarrow 4Al_2^{+3} + 24e^-$

$24e^- + 3Fe^{+8/3} \rightarrow 9Fe^\circ$

$8Al^\circ + 3Fe_3^{+8/3} \rightarrow 9Fe^\circ + 4Al_2^{+3}$

or $8Al + 3Fe_3O_4 \rightarrow 4Al_2O_3 + 9Fe$

Therefore, it is clear that total no. of electrons transferred during change = 24

23. 630

Sol. The equivalent weight of $P_4 = \frac{31 \times 4}{5 \times 4} = \frac{31}{5}$

$\therefore \quad 62\text{g } P_4 = \frac{62 \times 5}{31}$ equivalent of P_4 = 10 equivalent of P_4

The equivalent weight of $HNO_3 = \frac{\text{Mol.wt}}{1} = \frac{63}{1}$

$\therefore$ the wt. of HNO3 required

= 10 × 63 = 630 g

24. 27

Sol. Let, the molecular formula of the chloride is MCl_x and atomic weight of the element is a

$$\therefore 9x + x \times 35.5 = \times 2\left(E = a / x\right)$$

$$x = \frac{58.5 \times 2}{44.5} = 2.63$$

The nearest whole no. of 2.63 = 3

$\therefore$ approximate atomic weight of the element

$$= 9 \times 3 = 27$$

25. 1

Sol.

$$\underset{+2}{Ba}\left(\underset{-1}{H_2PO_2}\right)2$$

$$2 + x - 4 = -1$$

$$x = +1$$

26. 0

Sol. $Ni(CO)_4$

$x + 0 \times 4 = 0$

$x = 0$

27. 1

Sol. NH_2OH

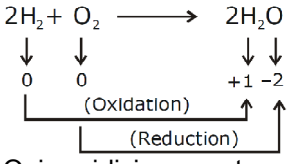
$x + 2(+1) + (-2) + (+1) = 0$

$x + 2 - 2 + 1 = 0$

$x = -1$

28. 8

Sol.



O_2 is oxidising agent

Equivalent weight

$$= \frac{\text{Molecular weight}}{\text{n - factor}}$$

Equivalent weight of $O_2 = \frac{32}{4} = 8$

29. 4

Sol. $HNO_2 + H_3O^+ e^- \rightarrow NO + 2H_2O$; $E^\circ = 0.99$ V

$NO_3^- + 3H_3O^+ + 2e^- \rightarrow HNO_2 + 4H_2O$; $E^\circ = 0.94$ V

By doubling the first equation and adding the reverse the second, one obtains

$3HNO_2 \rightarrow 2NO + NO_3^- + H_3O^+$; $E^\circ = 0.05$ V

$\log K = \frac{2.303RT}{nFE^\circ} = 0.6 \therefore K = 4$

30. 3

Sol. $[Co(CN)_6]^{3-}$

$x - 1 \times 6 = -3$

$x = +3$