ANSWERS

I. Multiple Choice Questions (Type-I)

1. (iv) 2. (iv) 3. (iv) 4. (iv) 5. (i) 6. (i)
7. (ii) 8. (i) 9. (iv) 10. (iv) 11. (iii)

II. Multiple Choice Questions (Type-II)

12. (i), (iv) 13. (iii), (iv) 14. (iii), (iv)
15. (iii), (iv) 16. (i), (ii)

III. Short Answer Type

17. Hypochlorite ion

18. In MnO_4^-, Mn is in the highest oxidation state i.e. +7. Therefore, it does not undergo disproportionation. MnO_4^{2-} undergoes disproportionation as follows :

$$3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$$

19. $2PbO + 4HCl \longrightarrow 2PbCl_2 + 2H_2O$ (Acid base reaction)

$PbO_2 + 4HCl \longrightarrow PbCl_2 + Cl_2 + 2H_2O$ (Redox reaction)

(***Hint :*** Note the oxidation number of lead in the oxides)

20. PbO is a basic oxide and simple acid base reaction takes place between PbO and HNO_3. On the other hand in PbO_2 lead is in + 4 oxidation state and cannot be oxidised further. Therefore no reaction takes place. Thus, PbO_2 is passive, only PbO reacts with HNO_3.

$2PbO + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + 2H_2O$ (Acid base reaction)

22. (a) +3, (b) +5

23. (a) +2 (b) +5, 0, 0, +5 (c) +4 (d) +6

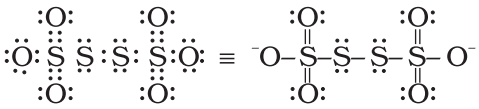
Justification :

Write Lewis structure of each ion then assign electron pair shared between atoms of different electronegativity to more electronegative atom and distribute the electron pair shared between atoms of same element equally. Now count the number of electrons possessed by each atom. Find out the difference in number of electrons possessed by neutral atom and that possessed by atom in the compound. This difference is the oxidation number. If atom present in the compound possesses more electrons than the neutral atom, the oxidation

number is negative. If it possesses less electrons then oxidation number is positive.

(i) Lewis structure of $S_2O_4^{2-}$ can be written as follows :

Electron pair shared between sulphur and oxygen is assigned to oxygen atoms because of more electronegativity of oxygen. Thus each sulphur atom is deficient of two electrons with respect to neutral sulphur atom hence, each sulphur atom is in +2 oxidation state. Each oxygen atom gets two excess electrons hence, it is in –2 oxidation state. Lewis structure of $S_4O_6^{2-}$ can be written as follows :



To find out oxidation state of each atom we distribute electrons of electron pair shared between two sulphur atoms equally (i.e. one electron is assigned to each sulphur atom). Both the electrons of electron pair shared between sulphur and oxygen atom are assigned to oxygen as oxygen is more electronegative. Thus we find that each of the central sulphur atoms obtain six electrons. This number is same as that in the outer shell of neutral sulphur atom hence oxidation state of central sulphur atoms is zero. Each of the sulphur atoms attached to oxygen atoms obtain only one electron as its share. This number is less by five electrons in comparison to the neutral sulphur atom. So, outer sulphur atoms are in +5 oxidation state. Therefore average oxidation state of sulphur atoms is :

$$\frac{5+0+0+5}{4} = \frac{10}{4} = 2.5$$

By using the formula we obtain average oxidation state of the particular type of atoms. Real oxidation state can be obtained only by writing the complete structural formula. Similarly we can see that each oxygen atom is in – 2 oxidation state.

In the same way one can find out the oxidation state of each atom in SO_3^{2-} and SO_4^{2-} ions. Oxidation state of metal atoms will be +1 as these will lose one electron in each case.

IV. Matching Type

27. (i)→(d) (ii)→(e) (iii)→(c) (iv)→(a)

28. (i)→(e) (ii)→(d) (iii)→(c) (iv)→(b) (v)→(f)

V. Assertion and Reason Type

29. (ii) 30. (iii) 31. (i) 32. (ii)