CHEMISTRY-1

Redox Reactions

[Set-1]

SECTION-A

1. In which of the following the oxidation state of an underlined atom is same as the number of valence electrons present?

   (i) $Na_2\underline{S}_2O_3$ (ii) $\underline{Cl}O_4^-$ (iii) $H_2\underline{S}O_3$ (iv) $\underline{N}_2O_4$

2. Which of the following reaction involves the change in oxidation state of oxygen?

   (i) $Pb + PbO_2 + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O$

   (ii) $MgO + C \rightarrow Mg + CO_2$

   (iii) $CO_2 + 2H_2O \rightarrow CH_4 + 2O_2$

   (iv) $H_2O + F_2 \rightarrow HF + HOF$

3. Which of the following nitrogen containing species does not undergo disproportionation reaction?

   (i) $HONO_2$ (ii) NO_2^- (iii) HONO (iv) N_2O_4

4. Which of the following is a redox reaction?

   (i) $2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2SO_4 + Na_2Cr_2O_7 + H_2O$

   (ii) $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

   (iii) $4BCl_3 + 3LiAlH_4 \rightarrow 2B_2H_6 + 3LiCl + 3AlCl_3$

   (iv) $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

5. **Match the following:**

Column-I	**Column-II**
A. H_2S	1. Peroxide linkage
B. $H_2S_2O_8$	2. Highest oxidation state
C. H_2SO_3	3. Only act as a reducing agent
D. $H_2S_2O_7$	4. Can undergo disproportionation reaction

	A	**B**	**C**	**D**
(i)	(3, 4)	1	3	2
(ii)	4	2	3	2
(iii)	3	1	4	2
(iv)	3	(1, 2)	4	2

Assertion-Reason type Questions:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true and R is not the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

6. A: In OF_2 the oxidation state of oxygen is –2.

   R: Fluorine always show –1 oxidation state

7. A: Nitrogen has five electrons in its valence shell.

   R: Nitrogen shows a range of oxidation states from –5 to +5.

Passage based questions:

Sometime we come across with certain compounds in which the oxidation number of a particular element in the compound is in fraction. The idea of fractional oxidation number is unconvincing because electrons are never shared/transferred in fraction.

Actually this fractional oxidation state is the average oxidation state of the element under examination and the element for whom fractional oxidation state is realised is present in different oxidation states. The idea of fractional oxidation state should be taken with care and the reality is revealed only by the structures. However, the oxidation states may be in fraction as in O_2^+ and O_2^- where it is $+\frac{1}{2}$ and $-\frac{1}{2}$ respectively.

8. In which of the following species, the central atom has an average fractional oxidation state?

   (i) $Na_2S_4O_6$ (ii) Mn_3O_4 (iii) Fe_3O_4 (iv) All of these

9. In the molecule, C_3O_2, carbon suboxide, the oxidation state of the three carbon atoms respectively is

   (i) +2, 0, –2 (ii) +2, 0, +2 (iii) 0, 0, +2 (iv) 0, +2, 0

10. In which of the following oxides, oxygen is not in the –2 oxidation state?

    (i) BaO_2 (ii) KO_2 (iii) O_2F_2 (iv) None of these

SECTION-B

11. The Mn^{3+} ion is unstable in solution and undergoes disproportionation to give Mn^{2+}, MnO_2 and H^+ ion, write a balanced ionic equation for the reaction.

12. Calculate the oxidation state of each carbon atom in ethanoic acid, CH_3COOH.

OR

Calculate the oxidation state of the underlined atom in each of the following ions:

(i) $\underline{Cr}_2O_7^{2-}$ (ii) $\underline{Al}(SO_4)_2^-$

13. What are disproportionation reactions? Give one example. What are the condtions under which the substance will disproportionate?

14. Using ion-electron method, write the balanced ionic equation for the reaction of potassium dichromate $(Cr_2O_7^{2-})$ with sodium sulphite (SO_3^{2-}) in an acid solution to give chromium (III) ion and sulphate ion.

OR

Permanganate ion, MnO_4^- is basic solution oxidises iodide ion, I^- to I_2 and itself reduced to form manganese (IV) oxide, MnO_2. Write a balanced ionic equation using ion-electron method.

15. (i) Why do the following reactions proceeds differently?

$$Pb_3O_4 + 8HCl \longrightarrow PbCl_2 + Cl_2 + 4H_2O \text{ and } Pb_3O_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + PbO_2 + 2H_2O$$

(ii) Arrange the following in order of increasing oxidation state of chlorine

$$ClO_3^-,\ NaCl,\ Ca(OCl)_2,\ HClO_4$$

(iii) Balance the following redox reaction

$$P_4 + OH^- \longrightarrow PH_3 + H_2PO_2^-$$

OR

(i) Fluorine reacts with ice and result in the change

$$H_2O(s) + F_2(g) \longrightarrow HF(g) + HOF(g)$$

Justify that this reaction is a redox reaction. Also, write the oxidizing agent and reducing agent.

(ii) Which of the following reaction involves change in oxidation state of sulphur?

(a) $2SO_4^{2-} \longrightarrow S_2O_8^{2-} + 2e^-$

(b) $Na_2SO_3 + S \longrightarrow Na_2S_2O_3$

(iii) Balance the redox reaction using ion-electron method:

$$Cl_2O_7 + H_2O_2 \longrightarrow ClO_2^- + O_2 + H^+$$

