

CBSE Class 11 Chemistry

Important Questions

Chapter 8

Redox Reactions

1 Marks Questions

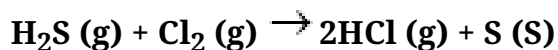
1. Define oxidation reaction?

Ans. Addition of oxygen / electronegative element to a substance or removal of hydrogen / electropositive element from a substance.

2. Define reduction reaction?

Ans. Removal of oxygen / electronegative element from a substance or addition of hydrogen / electropositive element to a substance.

3. In the reactions given below, identify the species undergoing oxidation and reduction.



Ans. H_2S is oxidized because a more electronegative element, Chlorine is added to hydrogen (or more electropositive element hydrogen has been removed from S). Chlorine is reduced due to addition of hydrogen to it.

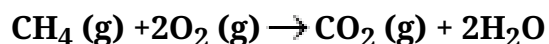
4. What are the most essential conditions that must be satisfied in a redox reaction?

Ans. In a redox reaction, the total number of electrons lost by the reducing agent must be equal to the number of electrons gained by the oxidizing agent.

5. In the reaction $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + 2\text{H}_2\text{O}$ Which species is oxidized?

Ans. HCl is oxidized to Cl_2 .

6. Why the following reaction is an example of oxidation reaction?



Ans. Methane is oxidized owing to the addition of oxygen to it.

7. Define oxidation in terms of electron transfer.

Ans. Oxidation is a process in which loss of electrons takes place.

8. What is meant by reduction?

Ans. Reduction is a process in which gain of electrons take place.

9. Define an oxidizing agent. Name the best reducing agent.

Ans. Oxidising agent is a substance which can gain electrons easily. F_2 is the best oxidizing agent.

10. What is meant by reducing? Name the best reducing agent.

Ans. Reducing agent is a substance which can lose electrons easily. Li is the best reducing agent.

11. What is the oxidation number of Mn in KMnO_4 ?

Ans. Let oxidation number of Mn be x

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

$$x = \underline{\underline{+7}}$$

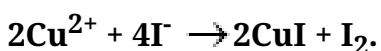
12. What happens to the oxidation number of an element in oxidation?

Ans. It increases.

13. Name one compound in which oxidation number of Cl is + 4.

Ans. ClO₂

14. Indicate the oxidizing and reducing agents in the following reaction :



Ans. Cu²⁺ : Oxidising agent

I⁻: Reducing agent.

15. A metal ion M³⁺ loses 3 electrons. What will be its oxidation number?

Ans. Oxidation number changes from +3 to + 6.

16. Name the different types of redox reaction

Ans. The different types of redox reactions are

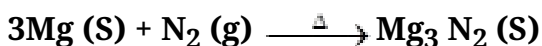
(i) Combination reactions

(ii) Decomposition reactions

(iii) Displacement reactions

(iv) Disproportionation reactions.

17. Identify the type of redox reaction this reaction follows.



Ans. The above equation represents a combination reaction.

18. The displacement reactions of Cl, Br, I using fluorine are not generally carried out in aqueous solution. Give reason.

Ans. Fluorine is so reactive that it can replace chloride bromide and iodide ions in solution and it attacks water and displaces the oxygen of water.

19. Which is the strongest oxidizing agent?

Ans. Fluorine is the strongest oxidizing agent.

20. Why F⁻ ions cannot be converted to F₂ by chemical means?

Ans. F⁻ ions cannot be converted to F₂ by chemical means because fluorine is the strongest oxidizing agent.

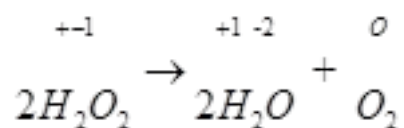
21. Define disproportionation reaction.

Ans. In a disproportionation reaction an element in one oxidation state is simultaneously oxidized and reduced.

22. Identify the reaction

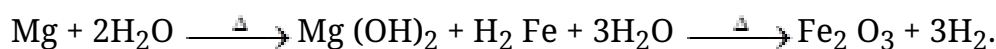


Ans . The decomposition of hydrogen peroxide is an example of disproportionation reaction where oxygen experiences disproportionation reaction.



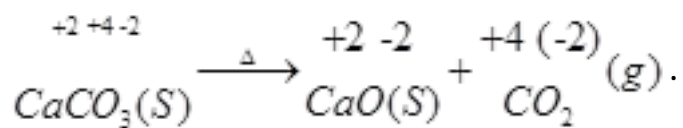
23. Which gas is produced when less reactive metals like Mg and Fe react with steam?

Ans. Less reactive metals such as Mg and Fe react with steam to produce dihydrogen gas

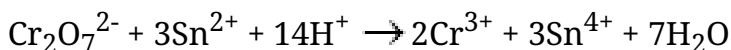
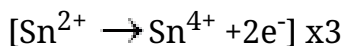
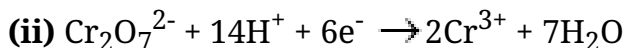
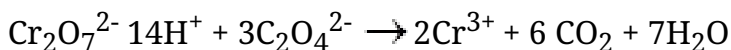
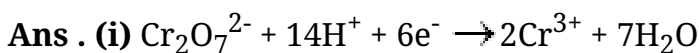
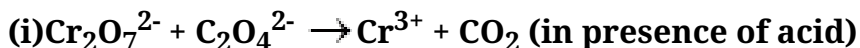


24. All decomposition reactions are not redox reactions. Give reason.

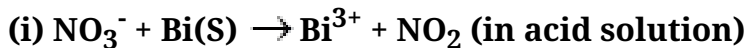
Ans. Decomposition of calcium carbonate is not a redox reaction



25. Complete the following redox reactions and balance the following equations-

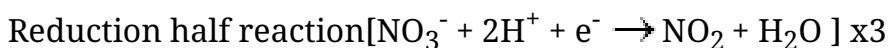


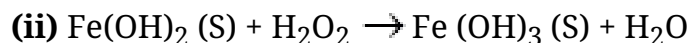
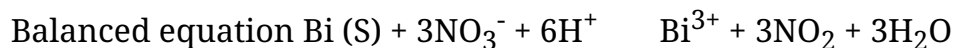
26. Write correctly the balanced half – reaction and the overall equations for the following skeletal equations.



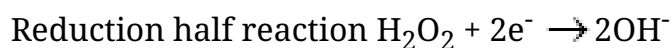
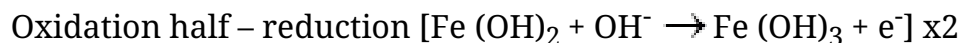
Ans.(i) In this reaction, H^+ ions are available.

Therefore,





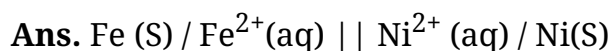
The solution is basic. Therefore, OH^- are involved in the reaction, Then



27. Define half – cell.

Ans. Combination of an electrode and the solution in which it is dipped is called a half – cell.

28. Set up an electrochemical cell for the redox reaction



29. Can we store copper sulphate in an iron vessel?

Ans. We cannot store CuSO_4 in an iron vessel because iron is more reactive than Cu and thus holes will be developed in iron vessel.



30. What is the role of a salt bridge in an electro chemical cell?

Ans. To complete the electric circuit without mixing the two solution of two half cells. It avoids the accumulation of electric charges in two half – cells.

31. Which reaction occurs at cathode in a galvanic cell? sss

Ans . Reduction.

CBSE Class 12 Chemistry

Important Questions

Chapter 8

Redox Reactions

2 Marks Questions

1. Why ClO_4^- does not show disproportionation reaction whereas ClO^- , ClO_2^- , ClO_3^- shows?

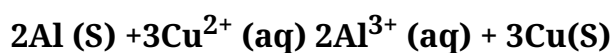
Ans. ClO_4^- does not disproportionate because in this oxoanion chlorine is present in its highest oxidation state that is +7 whereas in ClO^- , ClO_2^- and ClO_3^- , chlorine exists in +1, +3 and +5 respectively.

2. How would you know whether a redox reaction is taking place in an acidic / alkaline or neutral medium?

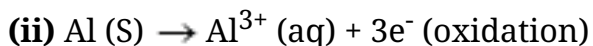
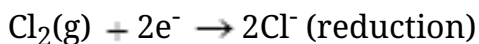
Ans. If H^+ or any acid appears on either side of the chemical equation, the reaction takes place in the acidic solution.

If OH^- or any base, appears on either side of the chemical equation, the solution is basic. If neither H^+ , OH^- nor any acid or base is present in the chemical equation, the solution is neutral.

3. Write the following redox reactions in the oxidation and reduction half reaction reactions in the oxidation and reduction half reactions.



Ans. (i) $\text{K}(\text{s}) \rightarrow \text{K}^+(\text{aq}) + \text{e}^-$ (oxidation)



4. An electrochemical cell is constituted by combining Al electrode ($E^0 = -1.66\text{V}$) and Cu electrode ($E^0 = +0.34\text{V}$). Which of these electrodes will work as cathode and why?

Ans. Since the electrode potential of Cu is higher than that of Al, therefore, Cu has a higher tendency to get reduced and hence Cu electrode acts as a cathode.

5. The E^0 of $\text{Cu}^{2+} / \text{Cu}$ is $+0.34\text{V}$. What does it signify?

Ans. Cu lies below hydrogen in the activity series.

6. If reduction potential of an electrode is 1.28V . What will be its oxidation potential?

Ans. -1.28V .

7. What is the electrode potential of a standard hydrogen electrode?

Ans. Zero.

8. Define a redox couple.

Ans. A redox couple is defined as having together oxidized and reduced forms of a substance taking part in an oxidation and reduction half – reaction.

9. Explain why $3\text{Fe}_3\text{O}_4 \text{ (S)} + 8\text{Al(S)} \rightarrow 9\text{Fe (S)} + 4\text{Al}_2\text{O}_3$. Is an oxidation reaction. ?

Ans. Aluminum is oxidized because oxygen is added to it Ferrous ferric oxide (Fe_3O_4) is reduced because oxygen has been removed from it.

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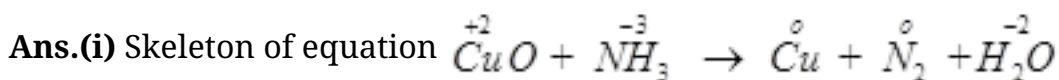
Important Questions

Chapter 8

Redox Reactions

4 Marks Questions

1. Balance the following equations by oxidation number method:

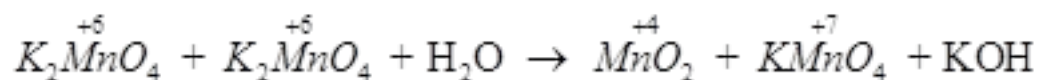


Oxidation number of copper decreases from +2 to 0 and ox no of Nitrogen increases from – 3 to 0.

In order to balance the increase of O.N with decrease of O. N there should be three atoms of copper and two atoms of nitrogen. Hence $3\text{CuO} + 2\text{NH}_3 \rightarrow 3\text{Cu} + \text{N}_2 + \text{H}_2\text{O}$

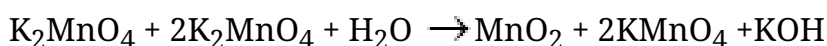
Balancing hydrogen and oxygen atoms we have $3\text{CuO} + 2\text{NH}_3 \rightarrow 3\text{Cu} + \text{N}_2 + 3\text{H}_2\text{O}$

(ii) Writing K_2MnO_4 twice O.N of Mn, we have the skeleton of the equation



O.N of Mn in 1 mol K_2MnO_4 decreases from + 6 to + 4 (MnO_2) and in the other mol increases from +6 to +7 (KMnO_4) i.e. 1 mol acquires two electrons while the other loses 1 electrons .

In order to balance the O. N of Mn, 1 mol. K_2MnO_4 and KMnO_4 are multiplied by 2. Hence



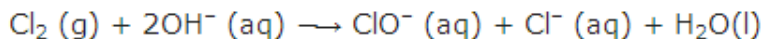
In order to balance the number of K and H atoms KOH is multiplied by 4 and H_2O by 2.



Redox Reaction

Short Answer Type Questions

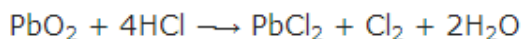
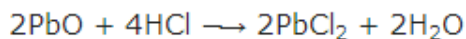
1. The reaction



represents the process of bleaching. Identify and name the species that bleaches the substances due to its oxidising action.

2. MnO_4^{2-} undergoes disproportionation reaction in acidic medium but MnO_4^- does not. Give reason.

3. PbO and PbO_2 react with HCl according to following chemical equations :



Why do these compounds differ in their reactivity?

4. Nitric acid is an oxidising agent and reacts with PbO but it does not react with PbO_2 . Explain why?

5. Write balanced chemical equation for the following reactions:

- (i) Permanganate ion (MnO_4^-) reacts with sulphur dioxide gas in acidic medium to produce Mn^{2+} and hydrogensulphate ion.

(Balance by ion electron method)

- (ii) Reaction of liquid hydrazine (N_2H_4) with chlorate ion (ClO_3^-) in basic medium produces nitric oxide gas and chloride ion in gaseous state.

(Balance by oxidation number method)

- (iii) Dichlorine heptaoxide (Cl_2O_7) in gaseous state combines with an aqueous solution of hydrogen peroxide in acidic medium to give chlorite ion (ClO_2^-) and oxygen gas.

(Balance by ion electron method)

6. Calculate the oxidation number of phosphorus in the following species.

- (a) HPO_3^{2-} and

- (b) PO_4^{3-}

7. Calculate the oxidation number of each sulphur atom in the following compounds:

- (a) $\text{Na}_2\text{S}_2\text{O}_3$
- (b) $\text{Na}_2\text{S}_4\text{O}_6$
- (c) Na_2SO_3
- (d) Na_2SO_4

8. Balance the following equations by the oxidation number method.

- (i) $\text{Fe}^{2+} + \text{H}^+ + \text{Cr}_2\text{O}_7^{2-} \longrightarrow \text{Cr}^{3+} + \text{Fe}^{3+} + \text{H}_2\text{O}$
- (ii) $\text{I}_2 + \text{NO}_3^- \longrightarrow \text{NO}_2 + \text{IO}_3^-$
- (iii) $\text{I}_2 + \text{S}_2\text{O}_3^{2-} \longrightarrow \text{I}^- + \text{S}_4\text{O}_6^{2-}$
- (iv) $\text{MnO}_2 + \text{C}_2\text{O}_4^{2-} \longrightarrow \text{Mn}^{2+} + \text{CO}_2$

9. Identify the redox reactions out of the following reactions and identify the oxidising and reducing agents in them.

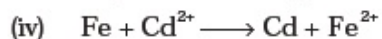
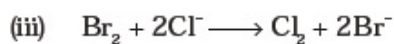
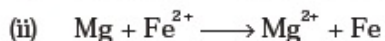
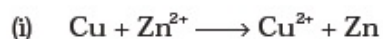
- (i) $3\text{HCl}(\text{aq}) + \text{HNO}_3(\text{aq}) \longrightarrow \text{Cl}_2(\text{g}) + \text{NOCl}(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
- (ii) $\text{HgCl}_2(\text{aq}) + 2\text{KI}(\text{aq}) \longrightarrow \text{HgI}_2(\text{s}) + 2\text{KCl}(\text{aq})$
- (iii) $\text{Fe}_2\text{O}_3(\text{s}) + 3\text{CO}(\text{g}) \xrightarrow{\Delta} 2\text{Fe}(\text{s}) + 3\text{CO}_2(\text{g})$
- (iv) $\text{PCl}_3(\text{l}) + 3\text{H}_2\text{O}(\text{l}) \longrightarrow 3\text{HCl}(\text{aq}) + \text{H}_3\text{PO}_3(\text{aq})$
- (v) $4\text{NH}_3 + 3\text{O}_2(\text{g}) \longrightarrow 2\text{N}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$

10. Balance the following ionic equations

- (i) $\text{Cr}_2\text{O}_7^{2-} + \text{H}^+ + \text{I}^- \longrightarrow \text{Cr}^{3+} + \text{I}_2 + \text{H}_2\text{O}$
- (ii) $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + \text{H}^+ \longrightarrow \text{Cr}^{3+} + \text{Fe}^{3+} + \text{H}_2\text{O}$
- (iii) $\text{MnO}_4^- + \text{SO}_3^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{SO}_4^{2-} + \text{H}_2\text{O}$
- (iv) $\text{MnO}_4^- + \text{H}^+ + \text{Br}^- \longrightarrow \text{Mn}^{2+} + \text{Br}_2 + \text{H}_2\text{O}$

Long Answer Type Questions

1. Explain redox reactions on the basis of electron transfer. Give suitable examples.
2. On the basis of standard electrode potential values, suggest which of the following reactions would take place? (Consult the book for E^\ominus value).



3. Why does fluorine not show disproportionation reaction?
4. Write redox couples involved in the reactions (i) to (iv) given in question 34.
5. Find out the oxidation number of chlorine in the following compounds and arrange them in increasing order of oxidation number of chlorine.
 $\text{NaClO}_4, \text{NaClO}_3, \text{NaClO}, \text{KClO}_2, \text{Cl}_2\text{O}_7, \text{ClO}_3, \text{Cl}_2\text{O}, \text{NaCl}, \text{Cl}_2, \text{ClO}_2$.
Which oxidation state is not present in any of the above compounds?
6. Which method can be used to find out strength of reductant/oxidant in a solution? Explain with an example.