

Chapter 8. Redox Reactions

- Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidizing behaviour?
 - $\text{Cu} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
 - $\text{S} + 2\text{H}_2\text{SO}_4 \rightarrow 3\text{SO}_2 + 2\text{H}_2\text{O}$
 - $\text{C} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + 2\text{SO}_2 + 2\text{H}_2\text{O}$
 - $\text{CaF}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{HF}$

(NEET-II 2016)
- The pair of compounds that can exist together is
 - $\text{FeCl}_3, \text{SnCl}_2$
 - $\text{HgCl}_2, \text{SnCl}_2$
 - $\text{FeCl}_2, \text{SnCl}_2$
 - FeCl_3, KI

(2014)
- (I) $\text{H}_2\text{O}_2 + \text{O}_3 \longrightarrow \text{H}_2\text{O} + 2\text{O}_2$
 (II) $\text{H}_2\text{O}_2 + \text{Ag}_2\text{O} \longrightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$
 Role of hydrogen peroxide in the above reactions is respectively
 - oxidizing in (I) and reducing in (II)
 - reducing in (I) and oxidizing in (II)
 - reducing in (I) and (II)
 - oxidizing in (I) and (II)

(2014)
- In acidic medium, H_2O_2 changes $\text{Cr}_2\text{O}_7^{2-}$ to CrO_5 which has two (—O—O—) bonds. Oxidation state of Cr in CrO_5 is
 - +5
 - +3
 - +6
 - 10

(2014)
- When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from
 - zero to +1 and zero to -5
 - zero to -1 and zero to +5
 - zero to -1 and zero to +3
 - zero to +1 and zero to -3

(2012)
- A mixture of potassium chlorate, oxalic acid and sulphuric acid is heated. During the reaction which element undergoes maximum change in the oxidation number?
 - S
 - H
 - Cl
 - C

(2012)
- Oxidation numbers of P in PO_4^{3-} , of S in SO_4^{2-} and that of Cr in $\text{Cr}_2\text{O}_7^{2-}$ are respectively
 - +3, +6 and +5
 - +5, +3 and +6
 - 3, +6 and +6
 - +5, +6 and +6

(2009)
- Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be
 - 7.5 moles
 - 0.2 moles
 - 0.6 moles
 - 0.4 moles.

(2008)
- Which is the best description of the behaviour of bromine in the reaction given below?
 $\text{H}_2\text{O} + \text{Br}_2 \rightarrow \text{HOBr} + \text{HBr}$
 - Proton acceptor only
 - Both oxidised and reduced
 - Oxidised only
 - Reduced only

(2004)
- The oxidation states of sulphur in the anions SO_3^{2-} , $\text{S}_2\text{O}_4^{2-}$ and $\text{S}_2\text{O}_6^{2-}$ follow the order
 - $\text{S}_2\text{O}_4^{2-} < \text{SO}_3^{2-} < \text{S}_2\text{O}_6^{2-}$
 - $\text{SO}_3^{2-} < \text{S}_2\text{O}_4^{2-} < \text{S}_2\text{O}_6^{2-}$
 - $\text{S}_2\text{O}_4^{2-} < \text{S}_2\text{O}_6^{2-} < \text{SO}_3^{2-}$
 - $\text{S}_2\text{O}_6^{2-} < \text{S}_2\text{O}_4^{2-} < \text{SO}_3^{2-}$

(2003)
- Oxidation state of Fe in Fe_3O_4 is
 - $\frac{5}{4}$
 - $\frac{4}{5}$
 - $\frac{3}{2}$
 - $\frac{8}{3}$

(1999)

12. Which of the following is redox reaction?
(a) Evaporation of H₂O
(b) Both oxidation and reduction
(c) H₂SO₄ with NaOH
(d) In atmosphere O₃ from O₂ by lighting.
(1997)
13. The oxide, which cannot act as a reducing agent is
(a) CO₂ (b) ClO₂
(c) NO₂ (d) SO₂ (1995)
14. Which substance is serving as a reducing agent in the following reaction?
 $14\text{H}^+ + \text{Cr}_2\text{O}_7^{2-} + 3\text{Ni} \rightarrow 7\text{H}_2\text{O} + 2\text{Cr}^{3+} + 3\text{Ni}^{2+}$
(a) H⁺ (b) Cr₂O₇²⁻
(c) H₂O (d) Ni (1994)
15. The oxidation state of I in H₄IO₆⁻ is
(a) +1 (b) -1
(c) +7 (d) +5 (1994)

Answer Key

1. (d) 2. (c) 3. (c) 4. (c) 5. (b) 6. (c) 7. (d) 8. (d) 9. (b) 10. (a)
11. (d) 12. (b) 13. (a) 14. (d) 15. (c)
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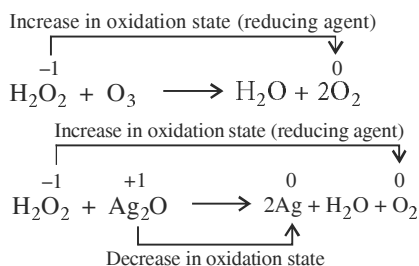
EXPLANATIONS



Here, the oxidation state of every atom remains the same so, it is not a redox reaction.

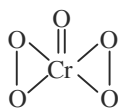
2. **(c)** : Both FeCl_2 and SnCl_2 are reducing agents with low oxidation numbers.

3. **(c)** :



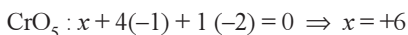
H_2O_2 acts as reducing agent in all those reactions in which O_2 is evolved.

4. **(c)** : CrO_5 has butterfly structure having two peroxo bonds.

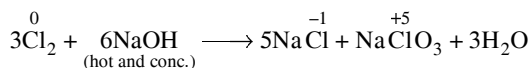


Peroxo oxygen has -1 oxidation state.

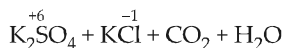
Let oxidation state of Cr be 'x'



5. **(b)** :



This is an example of disproportionation reaction and oxidation state of chlorine changes from 0 to -1 and $+5$.



Maximum change in oxidation number of chlorine, i.e., from $+5$ to -1 .

7. **(d)** : Let oxidation number of P in PO_4^{3-} be x.

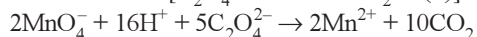
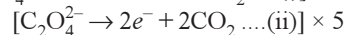
$$\therefore x + 4(-2) = -3 \Rightarrow x = +5$$

Let oxidation number of S in SO_4^{2-} be y.

$$\therefore y + 4(-2) = -2 \Rightarrow y = +6$$

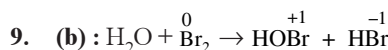
Let oxidation number of Cr in $\text{Cr}_2\text{O}_7^{2-}$ be z.

$$\therefore 2z + 7(-2) = -2 \Rightarrow z = +6$$

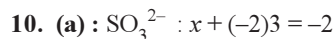


2 moles of MnO_4^- required to oxidise 5 moles of oxalate.

\therefore Number of moles of MnO_4^- required to oxidise 1 mole of oxalate = $2/5 = 0.4$



In the above reaction the oxidation number of Br_2 increases from zero (in Br_2) to $+1$ (in HOBr) and decreases from zero (in Br_2) to -1 (in HBr). Thus Br_2 is oxidised as well as reduced and hence it is a redox reaction.



$$\text{or } x - 6 = -2 \text{ or } x = +4$$

$$\text{S}_2\text{O}_4^{2-} : 2x + (-2)4 = -2$$

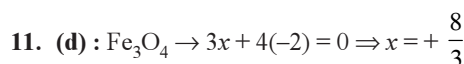
$$\text{or } 2x - 8 = -2 \text{ or } 2x = +6 \therefore x = +3$$

$$\text{S}_2\text{O}_6^{2-} : 2x + (-2)6 = -2$$

$$\text{or } 2x - 12 = -2 \text{ or } 2x = +10 \therefore x = +5$$

Oxidation states follow the order:

$$\text{S}_2\text{O}_4^{2-} < \text{SO}_3^{2-} < \text{S}_2\text{O}_6^{2-}$$



12. **(b)** : Redox reactions are those chemical reactions which involve transfer of electrons from one chemical species to another.

13. **(a)** : Since carbon is in maximum state of $+4$, therefore carbon dioxide (CO_2) cannot act as a reducing agent.

14. **(d)** : Since the oxidation number of Ni increases from 0 to 2, therefore it acts as a reducing agent.

15. **(c)** : Let x = Oxidation state of I. Since oxidation state of H = $+1$ and oxidation state of O = -2 , therefore for H_4IO_6^- , we get

$$(4 \times 1) + x + (6 \times -2) = -1$$

$$\text{or } x = +7$$

