

## Redox Reactions

- 1) In the reaction  $\text{CuO} + \text{NH}_3 \rightarrow \text{Cu} + \text{N}_2 + \text{H}_2\text{O}$ , the oxidation number of 'N' changes from
- 1) - 2 to 0                      2) 0 to + 2                      3) - 3 to + 2                      4) - 3 to 0
- 2) In the reaction  $\text{MnO}_4^- \rightarrow \text{MnO}_2$ , the number of  $\text{OH}^-$  ions involved in the balanced equation is
- 1) 4                                      2) 6                                      3) 3                                      4) 2
- 3) In the reaction  $\text{Cr}_2\text{O}_7^{2-} + \text{NO}_2^- + \text{H}^+ \rightarrow \text{Cr}^{+3} + \text{NO}_3^- + \text{H}_2\text{O}$  the stoichiometric coefficients of  $\text{Cr}_2\text{O}_7^{2-}$ ,  $\text{NO}_2^-$  &  $\text{H}^+$  respectively are
- 1) 1, 3, 8                              2) 1, 4, 8                              3) 1, 3, 12                              4) 1, 15, 12
- 4) In the reaction  $\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{NO}_3^- + 2\text{H}^+ + \text{ne}^-$ , the value of 'n' is
- 1) 4                                      2) 3                                      3) 2                                      4) 1
- 5) Oxidation state of iron is zero in the complex
- 1)  $\text{K}_4[\text{Fe}(\text{CN})_6]$                       2)  $[\text{Fe}(\text{H}_2\text{O})_5]\text{SO}_4$                       3)  $[\text{Fe}(\text{CO})_5]$                       4)  $\text{Na}_3[\text{Fe}(\text{CN})_6]$
- 6) In which of the following pair of species, the central atom exhibits same oxidation state
- 1)  $\text{SO}_4^{2-}, \text{SO}_3^{2-}$                       2)  $\text{CrO}_4^{2-}, \text{CrO}_5$                       3)  $\text{MnO}_2, \text{MnO}_4^{2-}$                       4)  $\text{Cr}_2\text{O}_7^{2-}, \text{Cr}_2\text{O}_3$
- 7) In the reaction  $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow \text{Mn}^{+2} + \text{CO}_2 + \text{H}_2\text{O}$  the coefficients of  $\text{MnO}_4^-$ ,  $\text{C}_2\text{O}_4^{2-}$ ,  $\text{Mn}^{+2}$  &  $\text{CO}_2$  are respectively
- 1) 1, 5, 1, 10                              2) 2, 5, 2, 10                              3) 2, 3, 2, 6                              4) 1, 6, 1, 12
- 8) The element which exhibits only one oxidation state in its compounds is
- 1) Cs                                      2) Cl                                      3) P                                      4) Mn

9) The number of electrons required to balance the following half reaction in basic medium is  $\text{Cl}_2 \rightarrow \text{ClO}_3^-$ .

- 1) 6                                      2) 8                                      3) 10                                      4) 12

10)  $x \text{Cr}(\text{OH})_3 + y \text{H}_2\text{O}_2 + z \text{OH}^- \rightarrow a \text{CrO}_4^{2-} + b \text{H}_2\text{O}$ . The coefficients x, y & z in the above equation are

- 1) 1, 2, 3                                      2) 2, 2, 3                                      3) 2, 3, 4                                      4) 3, 2, 4

11) Which is not redox reaction among the following?

- 1)  $\text{Cl}_2 + 2\text{KI} \rightarrow 2\text{KCl} + \text{I}_2$                                       2)  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$   
 3)  $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$                                       4)  $\text{K}_2\text{Cr}_2\text{O}_7 + 2\text{KOH} \rightarrow 2\text{K}_2\text{CrO}_4 + \text{H}_2\text{O}$

12) Match the following underlined elements with oxidation numbers.

**List – I**

**List – II**

A) HCN                                      1) + 7

B) ClF<sub>3</sub>                                      2) + 6

C) HNO<sub>4</sub>                                      3) + 5

D) CrO<sub>5</sub>                                      4) + 3

5) + 2

**Correct match is**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
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1)	5	1	3	2
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2)	4	3	1	5
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3)	5	4	3	2
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4)	3	1	2	4
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13) Which of the following is correct?

I) Oxidants reduce themselves.

II) Reduction involves de electro nation.

III) Reductants oxidise others.

Correct combination is

1) All are correct.

2) I and II are correct.

3) II and III are correct.

4) I and III are correct.

14) The oxidation number of sodium in  $\text{Na}_2\text{Hg}$  is

1) + 1

2) + 2

3) + 3

4) Zero

15) Oxidation numbers of nitrogen in Ammonium nitrite are respectively

1) + 3, + 5

2) - 3, + 3

3) + 5, - 3

4) + 3, - 5

16) Oxidation number of nitrogen in Ammonium nitrate are respectively

1) +3, +5

2) - 3, + 3

3) - 3, +5

4) +3, - 5

17) In which of the following hydrogen exhibits negative oxidation state

1)  $\text{NH}_3$

2)  $\text{H}_2\text{S}$

3)  $\text{C}_6\text{H}_6$

4)  $\text{CaH}_2$

18) The strong reducing agent is

1)  $\text{HNO}_2$

2)  $\text{H}_2\text{S}$

3)  $\text{H}_2\text{SO}_3$

4)  $\text{SnCl}_2$

19) In the reaction  $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$

1) Zn is oxidized in  $\text{H}_2\text{SO}_4$

2) Hydrogen is oxidized in  $\text{H}_2\text{SO}_4$

3) Sulphur undergoes reduction in  $\text{H}_2\text{SO}_4$

4) Sulphur undergoes oxidation in  $\text{H}_2\text{SO}_4$



D)  $\text{Cl}_2 \rightarrow \text{ClO}_3^-$       IV) 10 electrons are involved

V) No electrons are involved

The correct match is

1) A – III, B – V, C – II, D – IV

2) A – IV, B – I, C – V, D – II

3) A – I, B – II, C – III, D – IV

4) A – II, B – III, C – IV, D – V

27)  $\text{Cr} \xrightarrow{\text{OH}^-} [\text{Cr}(\text{OH})_4]^-$  for the balanced oxidation half reaction the number of electrons and  $\text{OH}^-$  ions required respectively

1) 4, 4

2) 4, 3

3) 3, 4

4) 2, 2

28) The oxidation number of iron in the brown ring complex is

1) + 3

2) + 2

3) + 4

4) +1

29)  $a \text{KMnO}_4 + b \text{H}_2\text{SO}_4 + c \text{FeSO}_4 \rightarrow \text{K}_2\text{SO}_4 + \text{MnSO}_4 + \text{Fe}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$ . In this unbalanced stoichiometric equation, the values of a, b and c are respectively

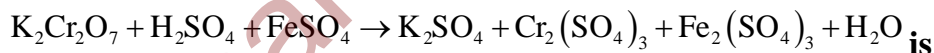
1) 2, 8 and 10

2) 1, 4 and 10

3) 2, 10 and 8

4) 2, 8 and 16

30) The number of moles of  $\text{FeSO}_4$  in balanced equation of



1) 1

2) 7

3) 6

4) 2

31) In the equation  $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \rightarrow \text{Mn}^{2+} + \text{CO}_2$  the numbers of moles of  $\text{H}^+$  ions involved in the balanced equation are

1) 9

2) 16

3) 6

4) 12

32) In the reaction,  $\text{Cl}_2 + \text{OH}^- \rightarrow \text{Cl}^- + \text{OCl}^-$  the number of moles of  $\text{OH}^-$  ions involved in the above equation is

1) 2

2) 3

3) 4

4) 5

**33) In the equation  $p \text{NH}_3 + q \text{O}_2 \rightarrow r \text{H}_2\text{O} + s \text{NO}$ , the stoichiometric coefficient of which species is 4.**

- I)  $\text{NH}_3$                       II)  $\text{O}_2$                       III)  $\text{H}_2\text{O}$                       IV)  $\text{NO}$

**The correct answer is**

- 1) I, II and III              2) I and IV              3) II, III and IV              4) II and III

**34) Assertion: (A): The oxidation state of Iron in  $\text{Fe}_3\text{O}_4$  is +3.**

**Reason: (R): Fe always shows +3 in all its compounds.**

- 1) Both A and R are true, R is correct explanation of A.  
2) Both A and R are true, R is not the correct explanation of A.  
3) A is true but R is false.  
4) Both A and R are false.

**35) In the conversion of  $\text{BaO}_2$  to  $\text{BaO}$ , the oxidation number of**

- 1) Barium increases                      2) Oxygen increases  
3) Oxygen decreases                      4) Barium decreases

**36. Oxidation state of Ni in  $\text{Ni}(\text{CO})_4$  is**

- 1) 0                      2) 4                      3) 8                      4) 2

**37. Oxidation state of Fe in  $\text{K}_4[\text{Fe}(\text{CN})_6]$**

- 1) +6                      2) +4                      3) +2                      4) +5

**38. In which of the following the oxidation state of chlorine is +5?**

- 1)  $\text{HClO}_4$                       2)  $\text{HClO}_3$                       3)  $\text{HClO}_2$                       4)  $\text{HCl}$

39. All elements commonly exhibit an oxidation state of

- 1) +1                      2) -1                      3) Zero                      4) +2

40. The maximum oxidation state that fluorine exhibits is

- 1) -1                      2) Zero                      3) +1                      4) +2

41. The element that always exhibits a negative oxidation state in its compounds is

- 1) Nitrogen                      2) Oxygen                      3) Fluorine                      4) Chlorine

42) The oxidation number of Nitrogen is fractional in

- 1)  $\text{NH}_3$                       2)  $\text{N}_3\text{H}$                       3)  $\text{N}_2\text{H}_4$                       4)  $\text{NH}_2\text{OH}$

**KEY**

1)4      2)1      3) 1      4) 4      5) 3      6) 2      7)2      8) 1      9) 3      10) 3

11)4      12)3      13)2      14)4      15)2      16) 3      17)4      18)2      19) 1      20)2

21) 1      22)3      23)3      24)4      25)2      26)1      27)2      28) 4      29) 1      30) 3

31)2      32)1      33) 2      34)4      35)3      36) 1      37) 3      38) 2      39) 3      40)2

41) 3      42)2

## HINTS

1. In  $\text{NH}_3$  oxidation state of N is  $x+3=0$ ,  $x=-3$

In elementary state ox, no is zero

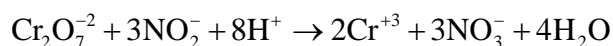
2.  $\text{MnO}_4^- \rightarrow \text{MnO}_2$ ,

Balancing oxygen  $\text{MnO}_4^- \rightarrow \text{MnO}_2 + 2\text{H}_2\text{O}$

Balancing H;  $\text{MnO}_4^- + 4\text{H}_2\text{O} \rightarrow \text{MnO}_2 + 2\text{H}_2\text{O} + 4\text{OH}^-$

Balancing charge:  $\text{MnO}_4^- + 2\text{H}_2\text{O} + 3\text{e}^- \rightarrow \text{MnO}_2 + 4\text{OH}^-$

3. The stoichiometric equation is



4.  $\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{NO}_3^- + 2\text{H}^+ + \text{ne}^-$ ,

Total charge in reactants side=0

Total charge in products side= $-1+2=+1$ . Hence  $n=1$

5. Ox. state of metal in metal carbonyl is zero.

6. O.s of Cr in  $\text{CrO}_4^{2-}$  is  $x+4(-2)=-2$ ,  $x=+6$

In  $\text{CrO}_5$ , one normal and 4 peroxy oxygen atoms are present.  $X+4(-1) + (-2) = 0$ ,  $x=+6$

7. Balanced equation is  $2\text{MnO}_4^- + 5\text{C}_2\text{O}_4^{2-} + 16\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 10\text{CO}_2 + 8\text{H}_2\text{O}$

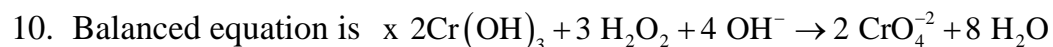
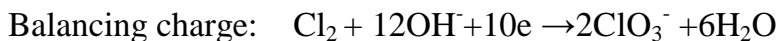
8. Elements of IA always show +1 in their compounds.

9.  $\text{Cl}_2 \rightarrow 2\text{ClO}_3^-$

Balancing oxygen  $\text{Cl}_2 + 6\text{H}_2\text{O} \rightarrow 2\text{ClO}_3^-$

Balancing H;  $\text{Cl}_2 + 6\text{H}_2\text{O} + 12\text{OH}^- \rightarrow 2\text{ClO}_3^- + 12\text{H}_2\text{O}$





11. Ox. S of Cr is same (+6) in both sides.

12. In  $\text{HNO}_4$ , two peroxy O atoms present.

$$+1 + X + 2(-2) + 2(-1) = 0, X = +5$$

14. O.S of metal in an alloy is zero.

15.  $\text{NH}_4\text{NO}_2$  contains  $\text{NH}_4^+$  and  $\text{NO}_2^-$  ions. In  $\text{NH}_4^+$  O.S of N is -3 and in  $\text{NO}_2^-$  is +3

16.  $\text{NH}_4\text{NO}_3$  contains  $\text{NH}_4^+$  and  $\text{NO}_3^-$  ions. In  $\text{NH}_4^+$  O.S of N is -3 and in  $\text{NO}_3^-$  is +5.

17. 'H' shows +ve oxidation state in metallic hydrides.

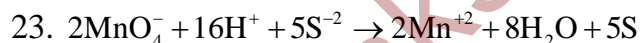
18. As 'S' is in its lowest oxidation state.

19. O.S of Zn increases from 0 to +2.

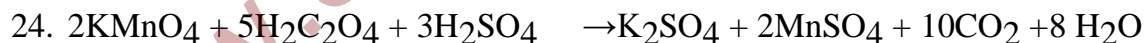
20. O.S of Cu decreases from +2 to 0.

21. O.S of Mn increases from +6 to +7.

22.  $6\text{NaOH} + 3\text{Cl}_2 \rightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$ , O.S of changes from 0 to -1 and 0 to +5.

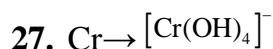
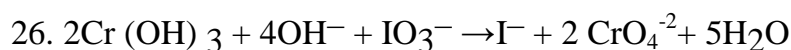
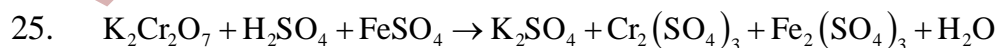


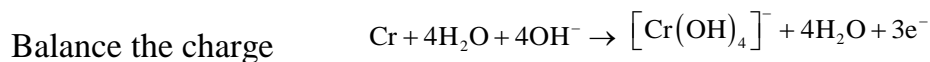
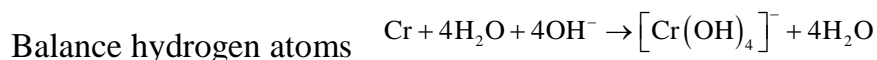
Mn gains 10e and  $\text{S}^{2-}$  loses 10e



As per equation 2moles  $\text{KMnO}_4$  oxidizes 5 moles of Oxalic acid.

1mole  $\text{KMnO}_4$  oxidizes  $5/2$  moles of Oxalic acid





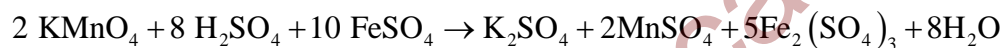
28: The brown ring complex compound is  $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]\text{SO}_4$ .

The complex ion is  $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$

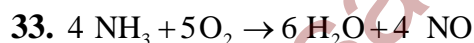
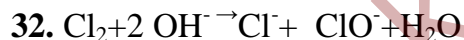
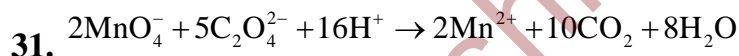
Oxidation numbers of  $\text{H}_2\text{O}$  is zero and  $\text{NO}$  is +1.

Oxidation state of  $\text{Fe}$  is +1

29. Balanced equation is



30. Balanced equation is



34.  $\text{Fe}_3\text{O}_4$  is a mixed oxide of  $\text{FeO}$  and  $\text{Fe}_2\text{O}_3$ . Thus  $\text{Fe}$  shows +2 and +3 OX. States

35. OX.ST of oxygen decreases from -1 to -2.