P h o t o n
I I T - J E E / M E D I C A L **C l a s s e s**
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Patience perfection prosperity Practice

Redox Reactions

1) **In the reaction** $CuO + NH_3 \rightarrow Cu + N_2 + H_2O$**, 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** $MnO_4^- \rightarrow MnO_2$**, the number of** OH^- **ions involved in the**

   balanced equation is

   1) 4   2) 6   3) 3   4) 2

3) **In the reaction** $Cr_2O_7^{-2} + NO_2^- + H^+ \rightarrow Cr^{+3} + NO_3^- + H_2O$ **the stoichiometric**

   coefficients of $Cr_2O_7^{-2}$, NO_2^- **&** H^+ **respectively are**

   1) 1, 3, 8   2) 1, 4, 8   3) 1, 3, 12   4) 1, 15, 12

4) **In the reaction** $NO_2 + H_2O \rightarrow NO_3^- + 2H^+ + ne^-$**, the value of 'n' is**

   1) 4   2) 3   3) 2   4) 1

5) **Oxidation state of iron is zero in the complex**

   1) $K_4\left[Fe(CN)_6\right]$ 2) $\left[Fe(H_2O)_5\right]SO_4$ 3) $\left[Fe(CO)_5\right]$ 4) $Na_3\left[Fe(CN)_6\right]$

6) **In which of the following pair of species, the central atom exhibits same**
   oxidation state

   1) SO_4^{-2}, SO_3^{-2} 2) CrO_4^{-2}, CrO_5 3) MnO_2, MnO_4^{-2} 4) $Cr_2O_7^{-2}, Cr_2O_3$

7) **In the reaction** $MnO_4^- + C_2O_4^{-2} + H^+ \rightarrow Mn^{+2} + CO_2 + H_2O$ **the coefficients of**

   MnO_4^- , $C_2O_4^{-2}$, Mn^{+2} **&** 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 $Cl_2 \rightarrow ClO_3^-$.

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

10) $x\ Cr(OH)_3 + y\ H_2O_2 + z\ OH^- \rightarrow a\ CrO_4^{-2} + b\ H_2O$. **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) $Cl_2 + 2KI \rightarrow 2KCl + I_2$ 2) $2KClO_3 \rightarrow 2KCl + 3O_2$

   3) $H_2 + Cl_2 \rightarrow 2HCl$ 4) $K_2Cr_2O_7 + 2KOH \rightarrow 2K_2CrO_4 + H_2O$

12) Match the following underlined elements with oxidation numbers.

   List – I   **List – II**

   A) H<u>C</u>N   1) + 7

   B) <u>Cl</u>F$_3$ 2) + 6

   C) H<u>N</u>O$_4$ 3) + 5

   D) <u>Cr</u>O$_5$ 4) + 3

                         5) + 2

Correct match is

	A	B	C	D
1)	5	1	3	2
2)	4	3	1	5
3)	5	4	3	2
4)	3	1	2	4

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 Na_2 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) NH_3 2) H_2S 3) C_6H_6 4) CaH_2

18) **The strong reducing agent is**

   1) HNO_2 2) H_2S 3) H_2SO_3 4) $SnCl_2$

19) **In the reaction** $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

   1) Zn is oxidized in H_2SO_4

   2) Hydrogen is oxidized in H_2SO_4

   3) Sulphur undergoes reduction in H_2SO_4

   4) Sulphur undergoes oxidation in H_2SO_4

20) When Zn is added to CuSO₄ solution, Cu is precipitated. It involves

1) Oxidation of Cu^{+2}

2) Reduction of Cu^{+2}

3) Zn is reduced, Cu is oxidized

4) There is neither oxidation nor reduction

21) Manganate ion is changed to permanganate ion. It is an example of

1) Oxidation

2) Reduction

3) Neither oxidation nor reduction

4) Disproportionation

22) Chlorine gas is passed through hot solution of caustic potash then chlorine in the reaction undergoes

1) Oxidation

2) Reduction

3) Oxidation & Reduction

4) Neither oxidation nor reduction

23) $MnO_4^- + H^+ + S^{-2} \rightarrow Mn^{+2} + H_2O + S$, the number of electrons involved during the above transformation

1) 8

2) 6

3) 10

4) 5

24) The number of moles of oxalate ions oxidized by one mole of MnO_4^- ion is

1) 5

2) $\dfrac{2}{5}$

3) $\dfrac{1}{5}$

4) $\dfrac{5}{2}$

25) For the redox reaction $Cr(OH)_3 + OH^- + IO_3^- \rightarrow CrO_4^{-2} + H_2O + I^-$. The correct coefficients of the reactants for the balanced equation are respectively

1) 1, 5, 1

2) 2, 4, 1

3) 1, 2, 1

4) 2, 6, 2

26)   **List – I**   **List – II**

A) $P_4 \rightarrow H_2PO_2^-$ **I) 2 electrons are involved**

B) $CrO_4^{-2} \rightarrow CrO_5$ **II) 6 electrons are involved**

C) $IO_3^- \rightarrow I^-$ **III) 4 electrons are involved**

D) $Cl_2 \rightarrow ClO_3^-$ **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) $Cr \xrightarrow{OH^-} \left[Cr(OH)_4\right]^-$ **for the balanced oxidation half reaction the number of electrons and 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) $a\ KMnO_4 + b\ H_2SO_4 + c\ FeSO_4 \rightarrow K_2SO_4 + MnSO_4 + Fe_2(SO_4)_3 + H_2O$ **. In this un balanced stoichiometric equation, the values of a, b and c are respectively**

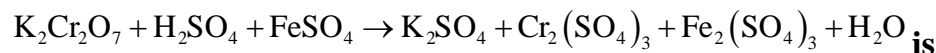1) 2, 8 and 10   2) 1, 4 and 10   3) 2, 10 and 8   4) 2, 8 and 16

30) The number of moles of $_{FeSO4\ In}$ **balanced equation of**

$K_2Cr_2O_7 + H_2SO_4 + FeSO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + Fe_2(SO_4)_3 + H_2O$ **is**

1) 1   2) 7   3) 6   4) 2

31) In the equation $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow Mn^{2+} + CO_2$ **the numbers of moles of H+ ions involved in the balanced equation are**

1) 9   2) 16   3) 6   4) 12

32) In the reaction, $Cl_2 + \overline{O}H \rightarrow C\overline{I} + \overline{O}Cl$ **the number of moles of** $\overline{O}H$ **ions involved in the above equation is**

1) 2   2) 3   3) 4   4) 5

33) In the equation $p\ NH_3 + q\ O_2 \rightarrow r\ H_2O + s\ NO$, the stoichometric coefficient of

which species is 4.

I) NH_3 II) O_2 III) H_2O IV) 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 Fe_3O_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 BaO_2 to BaO, the oxidation number of**

1) Barium increases   2) Oxygen increases

3) Oxygen decreases   4) Barium decreases

36. **Oxidation state of Ni in Ni $(CO)_4$ is**

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

37. **Oxidation state of Fe in K_4 [Fe $(CN)_6$]**

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

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

1) $HClO_4$ 2) $HClO_3$ 3) $HClO_2$ 4) 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) NH_3 2) N_3H 3) N_2H_4 4) NH_2OH

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 NH_3 oxidation state of N is x+3=0, x=-3
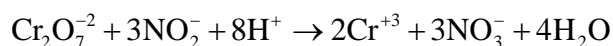
  In elementary state ox, no is zero

2. $MnO_4^- \rightarrow MnO_2$,

  Balancing oxygen $MnO_4^- \rightarrow MnO_2 + 2H_2O$

  Balancing H; $MnO_4^- + 4H_2O \rightarrow MnO_2 + 2H_2O + 4OH^-$

  Balancing charge: $MnO_4^- + 2H_2O + 3e \rightarrow MnO_2 + 4OH^-$

3. The stoichiometric equation is

$$Cr_2O_7^{-2} + 3NO_2^- + 8H^+ \rightarrow 2Cr^{+3} + 3NO_3^- + 4H_2O$$

4. $NO_2 + H_2O \rightarrow NO_3^- + 2H^+ + ne^-$,

  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 CrO_4^{-2} is x+4(-2)=-2, x=+6

        In CrO_5, one normal and 4 peroxy oxygen atoms are present. X+4(-1) + (-2)

  =0, x=+6

7. Balanced equation is $2MnO_4^- + 5C_2O_4^{-2} + 16H^+ \rightarrow 2Mn^{+2} + 10CO_2 + 8H_2O$

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

9. $Cl_2 \rightarrow 2ClO_3^-$

  Balancing oxygen $Cl_2 + 6H_2O \rightarrow 2ClO_3^-$

  Balancing H; $Cl_2 + 6H_2O + 12OH^- \rightarrow 2ClO_3^- + 12H_2O$

Balancing charge: $Cl_2 + 12OH^- + 10e \rightarrow 2ClO_3^- + 6H_2O$

10. Balanced equation is   x $2Cr(OH)_3 + 3 H_2O_2 + 4 OH^- \rightarrow 2 CrO_4^{-2} + 8 H_2O$

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

12. In 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. NH_4NO_2 contains NH_4^+ and NO_2^- ions. In NH_4^+ O.S of N is -3 and in NO_2^- is +3

16. NH_4NO_3 contains NH_4^+ and NO_3^- ions. In NH_4^+ O.S of N is -3 and in 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. $6NaOH + 3Cl_2 \rightarrow 5NaCl + NaClO_3 + 3H_2O$, O.S of changes from 0 to -1 and 0 to +5.

23. $2MnO_4^- + 16H^+ + 5S^{-2} \rightarrow 2Mn^{+2} + 8H_2O + 5S$

   Mn gains 10e and S^{-2} looses 10e

24. $2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 10CO_2 + 8 H_2O$

   As per equation 2moles $KMnO_4$ oxidizes 5 moles of Oxalic acid.

   1mole $KMnO_4$ oxidizes 5/2 moles of Oxalic acid

25. $K_2Cr_2O_7 + H_2SO_4 + FeSO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + Fe_2(SO_4)_3 + H_2O$

26. $2Cr (OH)_3 + 4OH^- + IO_3^- \rightarrow I^- + 2 CrO_4^{-2} + 5H_2O$

27. $Cr \rightarrow [Cr(OH)_4]^-$

Balance oxygen atoms $\quad Cr + 4H_2O \rightarrow \left[Cr(OH)_4 \right]^-$

Balance hydrogen atoms $\quad Cr + 4H_2O + 4OH^- \rightarrow \left[Cr(OH)_4 \right]^- + 4H_2O$

Balance the charge $\quad Cr + 4H_2O + 4OH^- \rightarrow \left[Cr(OH)_4 \right]^- + 4H_2O + 3e^-$

28: The brown ring complex compound is [Fe $(H_2O)_5$ NO] SO_4.

The complex ion is [Fe $(H_2O)_5$ NO] $^{2+}$

Oxidation numbers of H_2O is zero and NO is+1.

Oxidation state of Fe is +1

29. Balanced equation is

$2 \, KMnO_4 + 8 \, H_2SO_4 + 10 \, FeSO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$

30. Balanced equation is

$K_2Cr_2O_7 + 7H_2SO_4 + 6FeSO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 3Fe_2(SO_4)_3 + 7H_2O$
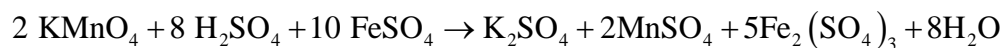
31. $2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

32. $Cl_2 + 2 \, OH^- \rightarrow Cl^- + ClO^- + H_2O$

33. $4 \, NH_3 + 5O_2 \rightarrow 6 \, H_2O + 4 \, NO$

34. Fe_3O_4 is a mixed oxide of FeO and Fe_2O_3. Thus Fe shows +2 and +3 OX. States

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