Introduction to Redox and Oxidation Number - Level I

1 The oxidation states of the central atom in the given species are, respectively:
$H_4P_2O_7$ and $H_2S_2O_7$

1.	0 and +6	2.	+3 and +4
3.	+4 and +2	4.	+5 and +6

2 KI_3, $H_2S_4O_6$
The oxidation numbers of iodine and sulphur in the above compounds are, respectively:
1. $\frac{1}{3}$; 4
2. 2.5 ; $\frac{1}{3}$
3. $-\frac{1}{3}$; 2.5
4. 2.5 ; 3

3 The oxidation state of P in HPO_3^{2-} is-

1.	+3	2.	+4
3.	+2	4.	+5

4 MnO_4^{2-} undergoes disproportionation reaction in acidic medium but MnO_4^- does not. It is:

1.	Due to the highest oxidation state of Mn in MnO_4^{2-}
2.	Due to the highest oxidation state of Mn in MnO_4^-
3.	Due to the endothermic nature of the disproportionation reaction.
4.	Due to the exothermic nature of the disproportionation reaction.

5 The reaction that does not represent auto redox or disproportionation is:
1. $Cl_2 + OH^- \rightarrow Cl^- + ClO_3^- + H_2O$
2. $2H_2O_2 \rightarrow H_2O + O_2$
3. $2\,Cu^+ \rightarrow Cu^{2+} + Cu$
4. $(NH_4)_2Cr_2O_7 \rightarrow N_2 + Cr_2\,O_3 + 4H_2O$

6 **Assertion:** In the presentation $E^{\ominus}_{Fe^{3+}/Fe^{2+}}$ and $E^{\ominus}_{Cu^{2+}/Cu}$, Fe^{3+}/Fe^{2+} and Cu^{2+}/Cu are redox couples.
Reason: A redox couple is the combination of the oxidised and reduced forms of a substance involved in an oxidation or reduction half cell.

1. Both the assertion and the reason are true and the reason is the correct explanation of the assertion.
2. Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
3. The assertion is true but the reason is false.
4. The assertion is false but the reason is true.

7 The oxidation number of sulphur and nitrogen in H_2SO_5 and NO_3^- are respectively-

1.	+6, +5	2.	-6, -6
3.	+8, +6	4.	-8, -6

8 Which of the following reactions does not represent a redox change?
1. $CaCO_3 \rightarrow CaO + CO_2$
2. $2H_2 + O_2 \rightarrow 2H_2O$
3. $Na + H_2O \rightarrow NaOH + \frac{1}{2}H_2$
4. $MnCl_3 \rightarrow MnCl_2 + \frac{1}{2}Cl_2$

9 Fluorine reacts with ice as per the following reaction
$H_2O(s) + F_2(g) \rightarrow HF(g) + HOF(g)$
This reaction is a redox reaction because-
1. F_2 is getting oxidized.
2. F_2 is getting reduced.
3. Both (1) and (2)
4. None of the above.

10 Which element exhibits both positive and negative oxidation states?
1. Cs
2. Ne
3. I
4. F

11 The formulas for the following compounds are:
(a) Mercury(II) chloride and (b) Thallium(I) sulphate
1. $HgCl_2$, Tl_2SO_4
2. Hg_2Cl_2, Tl_2SO_4
3. $HgCl_2$, $TlSO_4$
4. $HgCl_2$, Tl_3SO_4

Introduction to Redox and Oxidation Number - Level II

12 Which of the following displays a disproportionation reaction?
(a) $2\,Cu^+ \rightarrow Cu^{2+} + Cu^0$
(b) $3\,MnO_4^{2-} + 4H^+ \rightarrow 2\,MnO_4^- + MnO_2 + 2H_2O$
(c) $2\,KMnO_4 \xrightarrow{\Delta} K_2\,MnO_4 + MnO_2 + O_2$
(d) $2\,MnO_4^- + 3\,Mn^{2+} + 2H_2O \rightarrow 5\,MnO_2 + 4H^{\oplus}$
1. (a) and (d) only
2. (a) and (b) only
3. (a), (b) and (c)
4. (a), (c) and (d)

13 The compound AgF_2 (unstable) acts as a/ an:
1. Oxidising agent.
2. Reducing agent.
3. Both oxidising and reducing agent.
4. Neither oxidising and reducing agent.

14 The oxidation state of two S-atoms in $Na_2\,S_2O_3$ is -
1. +2 and +4
2. +3 and -2
3. +4 and -2
4. +6 and -2

15 The oxidation number and covalency of sulphur in the sulphur molecule (S_8) are respectively:
1. 0, and 2
2. +6, and 8
3. 0, and 8
4. +6, and 2

Balancing of Equations - Level I

16 In the given balanced chemical reaction,

$IO_3^- + aI^- + bH^+ \rightarrow cH_2O + dI_2$
The values of a, b, c, and d respectively are-
1. 5, 6, 3, 3
2. 5, 3, 6, 3
3. 3, 5, 3, 6
4. 5, 6, 5, 5

17 In the equation:
$Cr_2O_7^{2-} + Fe^{2+} + H^+ \rightarrow Cr^{3+} + Fe^{3+} + H_2O$
the coefficients of Fe^{2+} and H^+ are respectively-
1. 6, 7
2. 6, 14
3. 5, 7
4. 5, 14

18 The oxidation state of Cu in $YBa_2\,Cu_3\,O_7$ is - (Yttrium = +3)
1. 3/7
2. 7/3
3. 3
4. 7

19 The balanced equation for the reaction between chlorine and sulphur dioxide in water is-

1.	$Cl_{2(s)} + SO_{2(aq)} + 2H_2O_{(I)} \rightarrow 2Cl^-_{(aq)} + SO_4^{2-}{}_{(aq)} + 4H^+_{(aq)}$
2.	$3Cl_{2(s)} + SO_{2(aq)} + 2H_2O_{(I)} \rightarrow Cl^-_{(aq)} + SO_4^{2-}{}_{(aq)} + 3H^+_{(aq)}$
3.	$Cl_{2(s)} + 3SO_{2(aq)} + H_2O_{(I)} \rightarrow Cl^-_{(aq)} + 2SO_4^{2-}{}_{(aq)} + 4H^+_{(aq)}$
4.	$2Cl_{2(s)} + SO_{2(aq)} + H_2O_{(I)} \rightarrow 2Cl^-_{(aq)} + SO_4^{2-}{}_{(aq)} + 4H^+_{(aq)}$

20 For the redox reaction,
$aMnO_4^- + bC_2\,O_4^{2-} + cH^+ \rightarrow dMn^{2+} + eCO_2 + fH_2\,O$
the correct stoichiometric coefficients of the reactants a, b, and c respectively for the balanced equation are:
1. 16, 5, 2
2. 2, 5, 16
3. 2, 16, 5
4. 5, 16, 2

21 $2\,MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2\,Z + 5O_2 + 8H_2O$. In this reaction Z is :
1. Mn^{2+}
2. Mn^{4+}
3. MnO_2
4. Mn

22 Balance the following reaction and find the values of a, b and g, respectively
$aKMnO_4 + bH_2O_2 + 3H_2SO_4 \rightarrow$
$dMnSO_4 + eK_2SO_4 + fO_2 + gH_2O$
1. 2, 4, 8
2. 2, 5, 8
3. 10, 4, 16
4. 8, 5, 2

23 Balance the following equation and choose the quantity that is the sum of the coefficients of reactants and products :
$\ldots PtCl_4 + \ldots XeF_2 \rightarrow PtF_6 + \ldots . ClF + \ldots Xe$
1. 16
2. 13
3. 18
4. 12

24 The maximum weight of nitric oxide that can be obtained starting only with 10.00 g of ammonia and 20.00 g of oxygen is -
1. 9 g
2. 15 g
3. 12 g
4. 11g

BALANCING OF EQUATIONS - LEVEL II

25 In an alkaline medium ClO_2 oxidize H_2O_2 in O_2 and reduces itself in Cl^- . How many moles of H_2O_2 will be oxidized by one mole of ClO_2?
1. 1.0
2. 1.5
3. 2.5
4. 3.5

26 Which of the following is not an intramolecular redox reaction?
1. $NH_4NO_2 \rightarrow N_2 + 2H_2O$
2. $2Mn_2O_7 \rightarrow 4MnO_2 + 3O_2$
3. $2KClO_3 \rightarrow 2KCl + 3O_2$
4. $2H_2O_2 \rightarrow 2H_2O + O_2$

27 If 10 gm of V_2O_5 is dissolved in acid and is reduced to V^{2+} by zinc metal, how many moles of I_2 could be reduced by the resulting solution if it is further oxidized to VO^{2+} ions?
[Assume no change in state of Zn^{2+}ions] (V = 51, O =16, I = 127) :

1.	0.11 mole of I_2	2.	0.22 mole of I_2
3.	0.055 mole of I_2	4.	0.44 mole of I_2

OXIDIZING & REDUCING AGENTS - LEVEL I

28 The oxidation number of P in $Mg_2P_2O_7$ is -

1.	+3	2.	+2
3.	+5	4.	–3

29 The oxidation number of carbon in C_3O_2 and Mg_2C_3 are respectively:
1. -4/3, +4/3
2. +4/3, -4/3
3. -2/3, +2/3
4. -2/3, +4/3

30 Which of the following arrangements represents the increasing oxidation number of the central atom?
1. CrO_2^-, ClO_3^-, CrO_4^{2-}, MnO_4^-
2. ClO_3^-, CrO_4^{2-}, MnO_4^-, CrO_2^-
3. CrO_2^-, ClO_3^-, MnO_4^-, CrO_4^{2-}
4. CrO_4^{2-}, MnO_4^-, CrO_2^-, ClO_3^-

31 The oxidation number of oxygen in KO_3 and Na_2O_2 is respectively -

1.	3, 2	2.	1, 0
3.	0, 1	4.	-0.33, -1

32 Among the following the correct order of acidity is-
1. $HClO < HClO_2 < HClO_3 < HClO_4$
2. $HClO_2 < HClO < HClO_3 < HClO_4$
3. $HClO_4 < HClO_2 < HClO < HClO_3$
4. $HClO_3 < HClO_4 < HClO_2 < HClO$

33 The oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$, are respectively -
1. +3, +5, +4
2. +5, +3, +4
3. +5, +4, +3
4. +3, +4, +5

34 The correct statement(s) about the given reaction is -

$XeO^{4-}_{6(aq)} + 2F^{-1}{}_{(aq)} + 6H^{+}{}_{(aq)} \rightarrow$

$XeO_{3(g)} + F_{2(g)} + 3H_2O_{(l)}$

1. XeO_6^{4-} oxidises F^-
2. The oxidation number of F increases from -1 to zero
3. XeO_6^{4-} is a stronger oxidizing agent that F^-
4. All of the above.

35 Which of the following elements does not show a disproportionation tendency?
1. Cl
2. Br
3. F
4. I

36 Among the following, identify the species with an atom in +6 oxidation state-
1. MnO_4^-
2. $Cr(CN)_6^{3-}$
3. NiF_6^{2-}
4. CrO_2Cl_2

37 Oxidation number of oxygen in potassium super oxide (KO_2) is-
1. – 2
2. – 1
3. – 1/2
4. – 1/4

38 What is the change in oxidation number of carbon in the following reaction?

$CH_{4(g)} + 4Cl_{2(g)} \rightarrow CCl_{4(l)} + 4HCl_{(g)}$

1. 0 to +4
2. -4 to +4
3. 0 to -4
4. +4 to +4

39 The oxidizing agent and reducing agent in the given reaction are :

$3N_2H_{4(l)} + 4ClO^-_{3(aq)} \rightarrow$

$6NO_{(g)} + 4Cl^-_{(aq)} + 6H_2O_{(l)}$

1. Oxidising agent = N_2H_4; Reducing agent = ClO_3^-
2. Oxidising agent = ClO_3^-; Reducing agent = N_2H_4
3. Oxidising agent = N_2H_4 ; Reducing agent = N_2H_4
4. Oxidising agent = ClO_3^- ; Reducing agent = ClO_3^-

40 The oxidising agent and reducing agent in the given reaction are :

$Cl_2O_{7(g)} + 4H_2O_{2(aq)} + 2OH^-_{(aq)} \rightarrow$

$2ClO^-_{2(aq)} + 4O_{2(g)} + 5H_2O_{(l)}$

1. Oxidizing agent = H_2O_2; Reducing agent = Cl_2O_7
2. Oxidizing agent = Cl_2O_7; Reducing agent = H_2O_2
3. Oxidizing agent = H_2O_2; Reducing agent = H_2O_2
4. None of the above

41 The oxidation number of the atom (in bold) in the following species is given. Identify, which one is incorrectly related?
1. $\mathbf{Cu}_2O$ is -1
2. $\mathbf{Cl}O_3^-$ is $+5$
3. $K_2\mathbf{Cr}_2O_7$ is $+6$
4. $H\mathbf{Au}Cl_4$ is $+3$

42 The incorrect statement regarding the rule to find the oxidation number among the following is-

1.	The oxidation number of hydrogen is always +1.
2.	The algebraic sum of all the oxidation numbers carried by elements in a compound is zero.
3.	An element in its free or uncombined state has an oxidation number of zero.
4.	Generally, in all its compounds, the oxidation number of fluorine is -1.

43 The largest oxidation number exhibited by an element depends on its electronic configuration. With which of the following electronic configurations will the element exhibit the largest oxidation number?
1. $3d^14s^2$
2. $3d^34s^2$
3. $3d^54s^1$
4. $3d^54s^2$

44 The change in oxidation number of chlorine when Cl_2 gas reacts with hot and concentrated sodium hydroxide solution is:
1. Zero to +1 and Zero to -5
2. Zero to -1 and Zero to +5
3. Zero to -1 and Zero to +3
4. Zero to +1 and Zero to -3

45 The oxidation state of Cr in CrO_6 is -
1. -6
2. +12
3. +6
4. +4

46 The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is-
1. -1
2. +1
3. +2
4. +3

47 The oxidation number of S in $H_2S_2O_8$ is -
1. + 2
2. + 4
3. + 6
4. + 7

48 Among the following hydrohalic compounds, the best reductant is -
1. HCl
2. HBr
3. HI
4. HF

49 Sn^{++} loses two electrons in a reaction. The final oxidation number of tin will be-
1. + 2
2. Zero
3. + 4
4. – 2

50 Which is the correct set that can only act as an oxidant?
1. NO_3^-, SO_3, Na
2. Fe^{+3}, NO_3^-, SO_3
3. I^-, Na
4. I^-, NO_3^-

Oxidizing & Reducing Agents - Level II

51 The correct order of N-compounds in its decreasing order of oxidation states is -
1. HNO_3, NO, N_2, NH_4Cl
2. HNO_3 , NO , NH_4Cl , N_2
3. HNO_3 , NH_4Cl , NO , N_2
4. NH_4Cl , N_2 , NO , HNO_3

52 The oxidation number of phosphorous in ATP (adenosine triphosphate) is -

1.	2	2.	3
3.	4	4.	5

53 Which of the following compounds has the highest oxidation number for nitrogen?
1. N_2H_4
2. NH_3
3. N_3H
4. NH_2OH

54 Reducing agent among the following is -

1.	HNO_3	2.	$KMnO_4$
3.	H_2SO_4	4.	$(COOH)_2$

55 Identify the disproportionation reaction
1. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
2. $CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$
3. $2F_2 + 2OH^- \rightarrow 2F^- + OF_2 + H_2O$
4. $2NO_2 + 2OH^- \rightarrow NO_2^- + NO_3^- + H_2O$

56 Nitric acid reacts with PbO but does not react with PbO_2 , because -
1. PbO is a base while PbO_2 is a strong oxidizing reagent
2. PbO is a base while PbO_2 is a weak oxidizing reagent
3. PbO is neutral while PbO_2 is a strong oxidizing reagent
4. PbO is acid while PbO_2 is a strong oxidizing reagent

57 The compound having oxygen in - 1 oxidation state is:-

1.	H_2O	2.	O_2F_2
3.	Na_2O	4.	BaO_2

58 Which of the following does not represent a redox reaction?
1. $Cr_2O_7^{2-} + 2OH^- \rightarrow CrO_4^{2-} + H_2O$
2. $SO_4^{2-} + 2I^- + 2H^+ \rightarrow I_2 + H_2S + H_2O$
3. $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
4. $PCl_5 \rightarrow PCl_3 + Cl_2$

59 In the reactions given below, thiosulphate reacts differently with iodine than with bromine.
$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$
$S_2O_3^{2-} + 2\,Br_2 + 5H_2O \rightarrow 2\,SO_4^{2-} + 2\,Br^- + 10H^+$
Which of the following statements best describes the above dual behaviour of thiosulphate?

1.	Bromine is a stronger oxidant than iodine
2.	Bromine is a weaker oxidant than iodine
3.	Thiosulphate undergoes oxidation by bromine and reduction by iodine in these reactions
4.	Bromine undergoes oxidation and iodine undergoes reduction in these reactions

60 In the given reaction, what is the name of the species that bleaches the substances due to its oxidising action?
$Cl_2(g) + 2OH^-(aq) \rightarrow ClO^-(aq) + Cl^-(aq) + H_2O(l)$
1. ClO^-
2. Cl_2
3. Cl^-
4. Both ClO^- and Cl^-

61 In the conversion, $H_2SO_4 \rightarrow H_2S_2O_8$ which process occurs?
1. Oxidation
2. Reduction
3. Oxidation as well as reduction
4. Neither oxidation nor reduction

Redox Titration & Type of Redox - Level I

62
Given below are two statements:

Assertion (A):	The decomposition of hydrogen peroxide to form water and oxygen is an example of a disproportionation reaction.
Reason (R):	The oxygen of peroxide is in –1 oxidation state and it is converted to zero oxidation state in O_2 and –2 oxidation state in H_2O.

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

63 The oxidising agent and reducing agent in the given reaction are
$5P_{4(s)} + 12H_2O_{(l)} + 12HO^-{}_{(aq)} \rightarrow$
$8\,PH_{3(g)} + 12HPO_2^-{}_{(aq)}$
1. Oxidising agent = P_4; Reducing agent = P_4
2. Oxidising agent = P_4; Reducing agent = H_2O
3. Oxidising agent = H_2O; Reducing agent = P_4
4. None of the above

64 Given below are two statements:

Assertion (A):	In the reaction between potassium permanganate and potassium iodide, permanganate ions act as an oxidising agent.
Reason (R):	The oxidation state of manganese changes from +2 to +7 during the reaction.

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

65 The set of metals that can show disproportionation reaction is -
1. Cu, Na, Li
2. Mg, F, Ne
3. P, Cl, S
4. Mn, Cu, Ga

REDOX TITRATION & TYPE OF REDOX - LEVEL II

66 The number of moles of MnO^-_4 required to oxidise one mole of ferrous oxalate completely in an acidic medium is-
1. 0.6 mole
2. 0.4 mole
3. 7.5 moles
4. 0.2 mole

EMF & ELECTRODE POTENTIAL - LEVEL I

67 Standard reduction potentials of the half-reactions are given below:
$F_{2(g)} + 2e^- \rightarrow 2F^-{}_{(aq)}$; $E^\circ = +2.85\ V$
$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-{}_{(aq)}$; $E^\circ = +1.36\ V$
$Br_{2(g)} + 2e^- \rightarrow 2Br^-{}_{(aq)}$; $E^\circ = +1.06\ V$
$I_{2(g)} + e^- \rightarrow 2I^-{}_{(aq)}$; $E^\circ = +0.53\ V$
The strongest oxidizing and reducing agents, respectively, are:
1. Br_2 *and* Cl^-
2. Cl_2 *and* Br^-
3. Cl_2 *and* I_2
4. F_2 *and* l^-

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

1.	$2Mn^{3+}{}_{(aq)} + 2H_2O_{(l)} \rightarrow MnO_{2(s)} + Mn^{2+}{}_{(aq)} + 4H^+{}_{(aq)}$
2.	$Mn^{3+}{}_{(aq)} + H_2O_{(l)} \rightarrow MnO_{2(s)} + 2Mn^{2+}{}_{(aq)} + 4H^+{}_{(aq)}$
3.	$5Mn^{3+}(aq) + 2H_2O_{(l)} \rightarrow MnO_{2(s)} + 3Mn^{2+}(aq) + 4H^+(aq)$
4.	$2Mn^{3+}{}_{(aq)} + 2H_2O_{(l)} \rightarrow 2MnO_{2(s)} + 2Mn^{2+}{}_{(aq)} + 4H^+{}_{(aq)}$

69 The strongest oxidising agent among the following is -
1. $BrO_3^-/Br^{2+},\ E^o = +1.50$
2. $Fe^{3+}/Fe^{2+},\ E^o = +0.76$
3. $MnO_4^-/Mn^{2+},\ E^o = +1.52$
4. $Cr_2O_7^{2-}/Cr^{3+},\ E^o = +1.33$

70 The correct statement about the given reaction is-
$(CN)_{2(g)} + 2OH^-{}_{(aq)} \rightarrow CN^-{}_{(aq)} + CNO^-{}_{(aq)} + H_2O_{(l)}$

1.	The reaction is an example of a disproportionation reaction
2.	Hydrogen atom gets oxidized
3.	Reaction occurs in acidic medium
4.	None of the above

71 The standard electrode potential (E°) values of Al^{3+}/Al, Ag^+ / Ag, K^+ / K, and Cr^{3+} / Cr are -1.66 V, 0.80 V, -2.93 V, & -0.79 V respectively. The correct decreasing order of the reducing power of the metal is-

1.	Ag > Cr > Al > K	2.	K > Al > Cr > Ag
3.	K > Al > Ag > Cr	4.	Al > K > Ag > Cr

72

(a)	$E^o_{k^+/K} = -2.93\ V; E^o_{Ag^+/Ag} = 0.80\ V$
(b)	$E^o_{Hg^{2+}/Hg} = 0.79\ V; E^o_{Mg^{2+}/Mg} = -2.37\ V$
(c)	$E^o_{Cr^{3+}/Cr} = -0.74\ V$

Based on standard electrode potentials given above, what is the correct arrangement for increasing order of reducing power of elements?
1. Ag < Hg < Cr < Mg < K
2. Ag > Cr > Mg > Hg > K
3. K > Mg < Cr < Hg > Ag
4. K< Mg < Cr < Hg < Ag

73 The correct statement about electrolysis of an aqueous solution of $CuCl_2$ with Pt electrode is-

1.	Cu^{2+} ion reduced at the cathode; Cl^- ion oxidized at the anode
2.	Cu^{2+} ion reduced at the anode; Cl^- ion oxidized at the cathode
3.	Cu^{2+} ion reduced at the cathode; H_2O ion oxidized at the anode
4.	H_2O ion reduced at the cathode; Cl^- ion oxidized at the anode

74 E^{Θ} values of some redox couples are given below. On the basis of these values choose the correct option.

E^{Θ} values : $Br_2 / Br^- = +1.90$

$Ag^+ / Ag(s) = +0.80$

$Cu^{2+} / Cu\left(s\right) = +0.34;$

$I_2(s)/I^- = +0.54$

1. Cu will reduce Br^-
2. Cu will reduce Ag
3. Cu will reduce I^-
4. Cu will reduce Br_2

75 The correct statement about the electrolysis of an aqueous solution of $AgNO_3$ with Pt electrode is:

1.	Pt(s) gets oxidized at cathode whereas Ag + (aq) gets reduced at anode
2.	Ag^+ (aq) gets reduced at cathode and is oxidized at anode
3.	Ag^+ (aq) gets reduced at cathode whereas water is oxidized at anode
4.	Ag (s) gets oxidized at cathode whereas H_2O is oxidised at anode

EMF & ELECTRODE POTENTIAL - LEVEL II

76 A solution contains Fe^{2+}, Fe^{3+} and I^- ions. This solution was treated with iodine at 35°C. E° for Fe^{3+}/Fe^{2+} is +0.77 V and E° for $I_2/2I^-$ = 0.536 V.

The favourable redox reaction is:

1. Fe^{2+} will be oxidized to Fe^{3+}
2. I_2 will be reduced to I^-
3. There will be no redox reaction
4. I^- will be oxidized to I_2

77 $\left[Fe\left(CN\right)_6\right]^{4-} \rightarrow \left[Fe\left(CN\right)_6\right]^{3-} + e^-; E^o = -0.35$ V

$Fe^{2+} \rightarrow Fe^{3+} + e^-; E^o = -0.77$ V

The strongest oxidizing agent in the above equation is:

1. $\left[Fe\left(CN\right)_6\right]^{4-}$
2. Fe^{2+}
3. Fe^{3+}
4. $\left[Fe\left(CN\right)_6\right]^{3-}$

78 Given :

$E^\circ_{Cl_2 / Cl^-} = 1.36$ V, $E^\circ_{Cr^{3+} / Cr} = -0.74$ V

$E^\circ_{Cr_2O_7^{2-} / Cr^{3+}} = 1.33$ V, $E^\circ_{MnO_4^- / Mn^{2+}} = 1.51$ v

Among the following, the strongest reducing agent is :

1. Mn^{2+}
2. Cr^{3+}
3. CI^-
4. Cr

79

Given below are two statements:

Assertion (A):	Among halogens, fluorine is the best oxidant.
Reason (R):	Fluorine is the most electronegative atom.

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

Application of Electrode Potential - Level I

80 The more positive the value of $E^{\ominus}$, the greater is the tendency of the species to get reduced. Using the standard electrode potential of redox couples given below find out which of the following is the strongest oxidising agent.
$E^{\ominus}$ values : $Fe^{3+}/Fe^{2+} = +0.77$
$I_2(s)/I^- = +0.54;$
$Cu^{2+}/Cu = +0.34;$
$Ag^+/Ag = 0.80$ V
1. Fe^{3+}
2. $I_2(s)$
3. Cu^{2+}
4. Ag^+

81 In the given reaction,
$xBrO_3^- + yCr^{+3} + zH_2O \rightarrow Br_2 + CrO_4^{2-} + H^+$
The coefficients x, y, and z are respectively-
1. 6, 10, 11
2. 6, 10, 20
3. 6, 8, 22
4. 6, 10, 22

82 Consider the given data:
$E_{Fe^{3+}/Fe^{2+}} = 0.77; E_{I^-/I_2} = -0.54$
$E_{Ag^+/Ag} = 0.80; E_{Cu/Cu^{2+}} = -0.34$
$E_{Fe^{3+}/Fe^{2+}} = 0.77; E_{Cu/Cu^{2+}} = -0.34$
$E_{Ag/Ag^+} = -0.80; E_{Fe^{3+}/Fe^{2+}} = 0.77$
Using the electrode potential values given above, identify the reaction which is not feasible:

1.	$Fe^{3+}_{(aq)}$ and $I^-_{aq)}$
2.	$Ag^+_{(aq)}$ and $Cu_{(s)}$
3.	$Fe^{3+}_{(aq)}$ and $Cu_{(s)}$
4.	$Ag_{(s)}$ and $Fe^{3+}_{(aq)}$

83 In the following reaction
$Al + Fe_3O_4 \rightarrow Al_2O_3 + Fe$
The total number of electrons transferred will be-
1. 6
2. 8
3. 8/3
4. 24

84 From the following, identify the reaction having the top position in the EMF series (standard reduction potential) according to their electrode potential at 298 K.
1. $Mg^{2+} + 2e^- \rightarrow Mg_{(s)}$
2. $Fe^{2+} + 2e^- \rightarrow Fe_{(s)}$
3. $Au^{3+} + 3e^- \rightarrow Au_{(s)}$
4. $K^+ + 1e^- \rightarrow K_{(s)}$

Application of Electrode Potential - Level II

85 The correct statement about the electrolysis of an aqueous solution of $AgNO_3$ with Ag electrode is-

1.	Ag^+ ion gets oxidised at cathode; Ag(s) is reduced at anode
2.	H_2O gets reduced at cathode; H_2O gets oxidised at anode
3.	Ag^+ ion gets reduced at cathode; H_2O is oxidised at anode
4.	Ag^+ ion gets reduced at cathode; Ag(s) is oxidised at anode

Equivalent Weight - Level I

86 The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in an acidic solution is:
1. $\frac{3}{5}$
2. $\frac{4}{5}$
3. $\frac{2}{5}$
4. 1