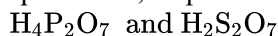


## INTRODUCTION TO REDOX AND OXIDATION NUMBER - LEVEL I

**1** The oxidation states of the central atom in the given species are, respectively:



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

**2**  $\text{KI}_3$ ,  $\text{H}_2\text{S}_4\text{O}_6$

The oxidation numbers of iodine and sulphur in the above compounds are, respectively:

- $\frac{1}{3}$  ; 4
- 2.5 ;  $\frac{1}{3}$
- $-\frac{1}{3}$  ; 2.5
- 2.5 ; 3

**3** The oxidation state of P in  $\text{HPO}_3^{2-}$  is-

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

**4**  $\text{MnO}_4^{2-}$  undergoes disproportionation reaction in acidic medium but  $\text{MnO}_4^-$  does not. It is:

1.	Due to the highest oxidation state of Mn in $\text{MnO}_4^{2-}$
2.	Due to the highest oxidation state of Mn in $\text{MnO}_4^-$
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:

- $\text{Cl}_2 + \text{OH}^- \rightarrow \text{Cl}^- + \text{ClO}_3^- + \text{H}_2\text{O}$
- $2\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$
- $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}$
- $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{N}_2 + \text{Cr}_2\text{O}_3 + 4\text{H}_2\text{O}$

**6 Assertion:** In the presentation  $\text{E}_{\text{Fe}^{3+}/\text{Fe}^{2+}}^\ominus$  and  $\text{E}_{\text{Cu}^{2+}/\text{Cu}}^\ominus$ ,  $\text{Fe}^{3+}/\text{Fe}^{2+}$  and  $\text{Cu}^{2+}/\text{Cu}$  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.

- Both the assertion and the reason are true and the reason is the correct explanation of the assertion.
- Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
- The assertion is true but the reason is false.
- The assertion is false but the reason is true.

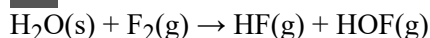
**7** The oxidation number of sulphur and nitrogen in  $\text{H}_2\text{SO}_5$  and  $\text{NO}_3^-$  are respectively-

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

**8** Which of the following reactions does not represent a redox change?

- $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \frac{1}{2}\text{H}_2$
- $\text{MnCl}_3 \rightarrow \text{MnCl}_2 + \frac{1}{2}\text{Cl}_2$

**9** Fluorine reacts with ice as per the following reaction



This reaction is a redox reaction because-

- $\text{F}_2$  is getting oxidized.
- $\text{F}_2$  is getting reduced.
- Both (1) and (2)
- None of the above.

**10** Which element exhibits both positive and negative oxidation states?

- Cs
- Ne
- I
- F

**11** The formulas for the following compounds are:

(a) Mercury(II) chloride and (b) Thallium(I) sulphate

- $\text{HgCl}_2$ ,  $\text{Tl}_2\text{SO}_4$
- $\text{Hg}_2\text{Cl}_2$ ,  $\text{Tl}_2\text{SO}_4$
- $\text{HgCl}_2$ ,  $\text{TlSO}_4$
- $\text{HgCl}_2$ ,  $\text{Tl}_3\text{SO}_4$

## INTRODUCTION TO REDOX AND OXIDATION NUMBER - LEVEL II

**12** Which of the following displays a disproportionation reaction?

- (a)  $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}^0$   
 (b)  $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$

- (c)  $2\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$   
 (d)  $2\text{MnO}_4^- + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \rightarrow 5\text{MnO}_2 + 4\text{H}^+$

1. (a) and (d) only  
 2. (a) and (b) only  
 3. (a), (b) and (c)  
 4. (a), (c) and (d)

**13** The compound  $\text{AgF}_2$  (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  $\text{Na}_2\text{S}_2\text{O}_3$  is -

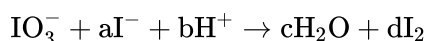
1. +2 and +4  
 2. +3 and -2  
 3. +4 and -2  
 4. +6 and -2

**15** The oxidation number and covalency of sulphur in the sulphur molecule ( $\text{S}_8$ ) are respectively:

1. 0, and 2  
 2. +6, and 8  
 3. 0, and 8  
 4. +6, and 2

## BALANCING OF EQUATIONS - LEVEL I

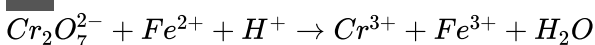
**16** In the given balanced chemical reaction,



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:



the coefficients of  $\text{Fe}^{2+}$  and  $\text{H}^+$  are respectively-

1. 6, 7  
 2. 6, 14  
 3. 5, 7  
 4. 5, 14

**18** The oxidation state of Cu in  $\text{YBa}_2\text{Cu}_3\text{O}_7$  is -

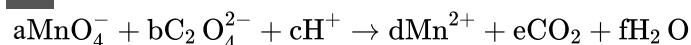
(Yttrium = +3)

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.	$\text{Cl}_{2(\text{s})} + \text{SO}_{2(\text{aq})} + 2\text{H}_2\text{O}_{(\text{l})} \rightarrow 2\text{Cl}^-_{(\text{aq})} + \text{SO}_4^{2-}_{(\text{aq})} + 4\text{H}^+_{(\text{aq})}$
2.	$3\text{Cl}_{2(\text{s})} + \text{SO}_{2(\text{aq})} + 2\text{H}_2\text{O}_{(\text{l})} \rightarrow \text{Cl}^-_{(\text{aq})} + \text{SO}_4^{2-}_{(\text{aq})} + 3\text{H}^+_{(\text{aq})}$
3.	$\text{Cl}_{2(\text{s})} + 3\text{SO}_{2(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{Cl}^-_{(\text{aq})} + 2\text{SO}_4^{2-}_{(\text{aq})} + 4\text{H}^+_{(\text{aq})}$
4.	$2\text{Cl}_{2(\text{s})} + \text{SO}_{2(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow 2\text{Cl}^-_{(\text{aq})} + \text{SO}_4^{2-}_{(\text{aq})} + 4\text{H}^+_{(\text{aq})}$

**20** For the redox reaction,



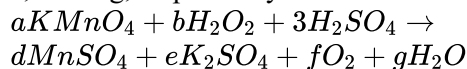
the correct stoichiometric coefficients of the reactants a, b, and c respectively for the balanced equation are:

1. 16, 5, 2  
 2. 2, 5, 16  
 3. 2, 16, 5  
 4. 5, 16, 2

**21**  $2\text{MnO}_4^- + 5\text{H}_2\text{O}_2 + 6\text{H}^+ \rightarrow 2\text{Z} + 5\text{O}_2 + 8\text{H}_2\text{O}$ . In this reaction Z is :

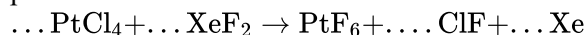
1.  $\text{Mn}^{2+}$   
 2.  $\text{Mn}^{4+}$   
 3.  $\text{MnO}_2$   
 4. Mn

**22** Balance the following reaction and find the values of a, b and g, respectively



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 :



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

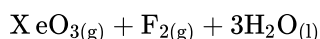
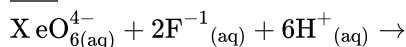
**32** Among the following the correct order of acidity is-

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  $\text{H}_4\text{P}_2\text{O}_5$ ,  $\text{H}_4\text{P}_2\text{O}_6$ ,  $\text{H}_4\text{P}_2\text{O}_7$ , 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 -



1.  $\text{XeO}_6^{4-}$  oxidises  $\text{F}^{-}$
2. The oxidation number of F increases from -1 to zero
3.  $\text{XeO}_6^{4-}$  is a stronger oxidizing agent than  $\text{F}^{-}$
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

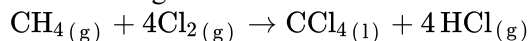
**36** Among the following, identify the species with an atom in +6 oxidation state-

1.  $\text{MnO}_4^{-}$
2.  $\text{Cr}(\text{CN})_6^{3-}$
3.  $\text{NiF}_6^{2-}$
4.  $\text{CrO}_2\text{Cl}_2$

**37** Oxidation number of oxygen in potassium superoxide ( $\text{KO}_2$ ) is-

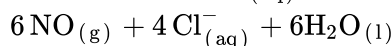
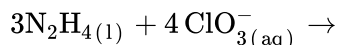
1. -2
2. -1
3. -1/2
4. -1/4

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



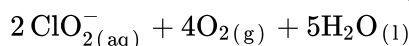
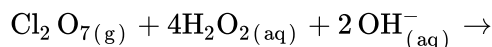
1. 0 to +4
2. -4 to +4
3. 0 to -4
4. +4 to +4

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



1. Oxidising agent =  $\text{N}_2\text{H}_4$ ; Reducing agent =  $\text{ClO}_3^{-}$
2. Oxidising agent =  $\text{ClO}_3^{-}$ ; Reducing agent =  $\text{N}_2\text{H}_4$
3. Oxidising agent =  $\text{N}_2\text{H}_4$ ; Reducing agent =  $\text{N}_2\text{H}_4$
4. Oxidising agent =  $\text{ClO}_3^{-}$ ; Reducing agent =  $\text{ClO}_3^{-}$

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



1. Oxidizing agent =  $\text{H}_2\text{O}_2$ ; Reducing agent =  $\text{Cl}_2\text{O}_7$
2. Oxidizing agent =  $\text{Cl}_2\text{O}_7$ ; Reducing agent =  $\text{H}_2\text{O}_2$
3. Oxidizing agent =  $\text{H}_2\text{O}_2$ ; Reducing agent =  $\text{H}_2\text{O}_2$
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. **Cu** $_2\text{O}$  is -1
2. **Cl** $\text{O}_3^{-}$  is +5
3.  $\text{K}_2$  **Cr** $_2\text{O}_7$  is +6
4. **H** **Au**  $\text{Cl}_4$  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.  $3d^1 4s^2$
2.  $3d^3 4s^2$
3.  $3d^5 4s^1$
4.  $3d^5 4s^2$

**44** The change in oxidation number of chlorine when  $\text{Cl}_2$  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  $\text{CrO}_6$  is -

1. -6
2. +12
3. +6
4. +4

**46** The oxidation number of phosphorus in  $\text{Ba}(\text{H}_2\text{PO}_2)_2$  is-

1. -1
2. +1
3. +2
4. +3

**47** The oxidation number of S in  $\text{H}_2\text{S}_2\text{O}_8$  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**  $\text{Sn}^{++}$  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.  $\text{NO}_3^-$ ,  $\text{SO}_3$ , Na
2.  $\text{Fe}^{+3}$ ,  $\text{NO}_3^-$ ,  $\text{SO}_3$
3.  $\text{I}^-$ , Na
4.  $\text{I}^-$ ,  $\text{NO}_3^-$

## OXIDIZING & REDUCING AGENTS - LEVEL II

**51** The correct order of N-compounds in its decreasing order of oxidation states is -

1.  $\text{HNO}_3$ , NO,  $\text{N}_2$ ,  $\text{NH}_4\text{Cl}$
2.  $\text{HNO}_3$ , NO,  $\text{NH}_4\text{Cl}$ ,  $\text{N}_2$
3.  $\text{HNO}_3$ ,  $\text{NH}_4\text{Cl}$ , NO,  $\text{N}_2$
4.  $\text{NH}_4\text{Cl}$ ,  $\text{N}_2$ , NO,  $\text{HNO}_3$

**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.  $\text{N}_2\text{H}_4$
2.  $\text{NH}_3$
3.  $\text{N}_3\text{H}$
4.  $\text{NH}_2\text{OH}$

**54** Reducing agent among the following is -

1.	$\text{HNO}_3$	2.	$\text{KMnO}_4$
3.	$\text{H}_2\text{SO}_4$	4.	$(\text{COOH})_2$

**55** Identify the disproportionation reaction

1.  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
2.  $\text{CH}_4 + 4\text{Cl}_2 \rightarrow \text{CCl}_4 + 4\text{HCl}$
3.  $2\text{F}_2 + 2\text{OH}^- \rightarrow 2\text{F}^- + \text{OF}_2 + \text{H}_2\text{O}$
4.  $2\text{NO}_2 + 2\text{OH}^- \rightarrow \text{NO}_2^- + \text{NO}_3^- + \text{H}_2\text{O}$

**56** Nitric acid reacts with PbO but does not react with  $\text{PbO}_2$ , because -

1. PbO is a base while  $\text{PbO}_2$  is a strong oxidizing reagent
2. PbO is a base while  $\text{PbO}_2$  is a weak oxidizing reagent
3. PbO is neutral while  $\text{PbO}_2$  is a strong oxidizing reagent
4. PbO is acid while  $\text{PbO}_2$  is a strong oxidizing reagent

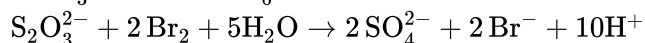
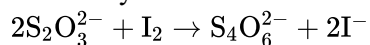
**57** The compound having oxygen in -1 oxidation state is:-

1.	$\text{H}_2\text{O}$	2.	$\text{O}_2\text{F}_2$
3.	$\text{Na}_2\text{O}$	4.	$\text{BaO}_2$

**58** Which of the following does not represent a redox reaction?

1.  $\text{Cr}_2\text{O}_7^{2-} + 2\text{OH}^- \rightarrow \text{CrO}_4^{2-} + \text{H}_2\text{O}$
2.  $\text{SO}_4^{2-} + 2\text{I}^- + 2\text{H}^+ \rightarrow \text{I}_2 + \text{H}_2\text{S} + \text{H}_2\text{O}$
3.  $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$
4.  $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$

**59** In the reactions given below, thiosulphate reacts differently with iodine than with bromine.



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?



1.  $\text{ClO}^-$
2.  $\text{Cl}_2$
3.  $\text{Cl}^-$
4. Both  $\text{ClO}^-$  and  $\text{Cl}^-$

**61** In the conversion,  $\text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_8$  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

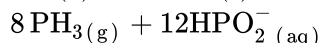
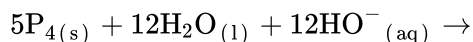
**62**

Given below are two statements:

<b>Assertion (A):</b>	The decomposition of hydrogen peroxide to form water and oxygen is an example of a disproportionation reaction.
<b>Reason (R):</b>	The oxygen of peroxide is in $-1$ oxidation state and it is converted to zero oxidation state in $\text{O}_2$ and $-2$ oxidation state in $\text{H}_2\text{O}$ .
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



1. Oxidising agent =  $\text{P}_4$ ; Reducing agent =  $\text{P}_4$
2. Oxidising agent =  $\text{P}_4$ ; Reducing agent =  $\text{H}_2\text{O}$
3. Oxidising agent =  $\text{H}_2\text{O}$ ; Reducing agent =  $\text{P}_4$
4. None of the above

**64**

Given below are two statements:

<b>Assertion (A):</b>	In the reaction between potassium permanganate and potassium iodide, permanganate ions act as an oxidising agent.
<b>Reason (R):</b>	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

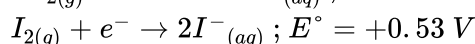
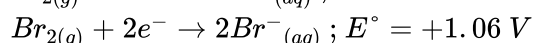
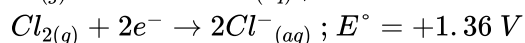
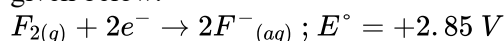
## REDOX TITRATION & TYPE OF REDOX - LEVEL II

**66** The number of moles of  $\text{MnO}_4^-$  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:



The strongest oxidizing and reducing agents, respectively, are:

1.  $\text{Br}_2$  and  $\text{Cl}^-$
2.  $\text{Cl}_2$  and  $\text{Br}^-$
3.  $\text{Cl}_2$  and  $\text{I}_2$
4.  $\text{F}_2$  and  $\text{I}^-$

**68** The  $\text{Mn}^{3+}$  ion is unstable in solution and undergoes disproportionation reaction to give  $\text{Mn}^{2+}$ ,  $\text{MnO}_2$  and  $\text{H}^+$  ion. The balanced ionic equation for the reaction is-

1.	$2\text{Mn}^{3+}_{(aq)} + 2\text{H}_2\text{O}_{(l)} \rightarrow \text{MnO}_{2(s)} + \text{Mn}^{2+}_{(aq)} + 4\text{H}^+_{(aq)}$
2.	$\text{Mn}^{3+}_{(aq)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{MnO}_{2(s)} + 2\text{Mn}^{2+}_{(aq)} + 4\text{H}^+_{(aq)}$
3.	$5\text{Mn}^{3+}_{(aq)} + 2\text{H}_2\text{O}_{(l)} \rightarrow \text{MnO}_{2(s)} + 3\text{Mn}^{2+}_{(aq)} + 4\text{H}^+_{(aq)}$
4.	$2\text{Mn}^{3+}_{(aq)} + 2\text{H}_2\text{O}_{(l)} \rightarrow 2\text{MnO}_{2(s)} + 2\text{Mn}^{2+}_{(aq)} + 4\text{H}^+_{(aq)}$

**69** The strongest oxidising agent among the following is -

1.  $\text{BrO}_3^-/\text{Br}^{2+}$ ,  $E^\circ = +1.50$
2.  $\text{Fe}^{3+}/\text{Fe}^{2+}$ ,  $E^\circ = +0.76$
3.  $\text{MnO}_4^-/\text{Mn}^{2+}$ ,  $E^\circ = +1.52$
4.  $\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}$ ,  $E^\circ = +1.33$

**70** The correct statement about the given reaction is-



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 ( $E^\circ$ ) values of  $\text{Al}^{3+}/\text{Al}$ ,  $\text{Ag}^+/\text{Ag}$ ,  $\text{K}^+/\text{K}$ , and  $\text{Cr}^{3+}/\text{Cr}$  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.	$\text{Ag} > \text{Cr} > \text{Al} > \text{K}$	2.	$\text{K} > \text{Al} > \text{Cr} > \text{Ag}$
3.	$\text{K} > \text{Al} > \text{Ag} > \text{Cr}$	4.	$\text{Al} > \text{K} > \text{Ag} > \text{Cr}$

**72**

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

Based on standard electrode potentials given above, what is the correct arrangement for increasing order of reducing power of elements?

1.  $\text{Ag} < \text{Hg} < \text{Cr} < \text{Mg} < \text{K}$
2.  $\text{Ag} > \text{Cr} > \text{Mg} > \text{Hg} > \text{K}$
3.  $\text{K} > \text{Mg} < \text{Cr} < \text{Hg} > \text{Ag}$
4.  $\text{K} < \text{Mg} < \text{Cr} < \text{Hg} < \text{Ag}$

**73** The correct statement about electrolysis of an aqueous solution of  $\text{CuCl}_2$  with Pt electrode is-

1.	$\text{Cu}^{2+}$ ion reduced at the cathode; $\text{Cl}^-$ ion oxidized at the anode
2.	$\text{Cu}^{2+}$ ion reduced at the anode; $\text{Cl}^-$ ion oxidized at the cathode
3.	$\text{Cu}^{2+}$ ion reduced at the cathode; $\text{H}_2\text{O}$ ion oxidized at the anode
4.	$\text{H}_2\text{O}$ ion reduced at the cathode; $\text{Cl}^-$ ion oxidized at the anode

**74**  $E^\ominus$  values of some redox couples are given below. On the basis of these values choose the correct option.

$E^\ominus$  values :  $\text{Br}_2 / \text{Br}^- = +1.90$

$\text{Ag}^+ / \text{Ag(s)} = +0.80$

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

$\text{I}_2(\text{s}) / \text{I}^- = +0.54$

1. Cu will reduce  $\text{Br}^-$
2. Cu will reduce Ag
3. Cu will reduce  $\text{I}^-$
4. Cu will reduce  $\text{Br}_2$

**75** The correct statement about the electrolysis of an aqueous solution of  $\text{AgNO}_3$  with Pt electrode is:

1.	Pt(s) gets oxidized at cathode whereas $\text{Ag}^+(\text{aq})$ gets reduced at anode
2.	$\text{Ag}^+(\text{aq})$ gets reduced at cathode and is oxidized at anode
3.	$\text{Ag}^+(\text{aq})$ gets reduced at cathode whereas water is oxidized at anode
4.	Ag(s) gets oxidized at cathode whereas $\text{H}_2\text{O}$ is oxidised at anode

## EMF & ELECTRODE POTENTIAL - LEVEL II

**76** A solution contains  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$  and  $\text{I}^-$  ions. This solution was treated with iodine at  $35^\circ\text{C}$ .  $E^\ominus$  for  $\text{Fe}^{3+}/\text{Fe}^{2+}$  is  $+0.77\text{ V}$  and  $E^\ominus$  for  $\text{I}_2/2\text{I}^- = 0.536\text{ V}$ .

The favourable redox reaction is:

1.  $\text{Fe}^{2+}$  will be oxidized to  $\text{Fe}^{3+}$
2.  $\text{I}_2$  will be reduced to  $\text{I}^-$
3. There will be no redox reaction
4.  $\text{I}^-$  will be oxidized to  $\text{I}_2$

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

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

The strongest oxidizing agent in the above equation is:

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

**78** Given :

$E^\ominus_{\text{Cl}_2/\text{Cl}^-} = 1.36\text{ V}$ ,  $E^\ominus_{\text{Cr}^{3+}/\text{Cr}} = -0.74\text{ V}$

$E^\ominus_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}} = 1.33\text{ V}$ ,  $E^\ominus_{\text{MnO}_4^-/\text{Mn}^{2+}} = 1.51\text{ V}$

Among the following, the strongest reducing agent is :

1.  $\text{Mn}^{2+}$
2.  $\text{Cr}^{3+}$
3.  $\text{Cl}^-$
4. Cr

**79**

Given below are two statements:

<b>Assertion (A):</b>	Among halogens, fluorine is the best oxidant.
<b>Reason (R):</b>	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 :  $\text{Fe}^{3+} / \text{Fe}^{2+} = +0.77$

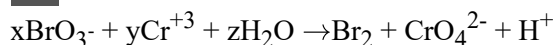
$\text{I}_2(\text{s}) / \text{I}^- = +0.54$ ;

$\text{Cu}^{2+} / \text{Cu} = +0.34$ ;

$\text{Ag}^+ / \text{Ag} = 0.80 \text{ V}$

1.  $\text{Fe}^{3+}$
2.  $\text{I}_2(\text{s})$
3.  $\text{Cu}^{2+}$
4.  $\text{Ag}^+$

**81** In the given reaction,



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:

$E_{\text{Fe}^{3+} / \text{Fe}^{2+}} = 0.77$ ;  $E_{\text{I}^- / \text{I}_2} = -0.54$

$E_{\text{Ag}^+ / \text{Ag}} = 0.80$ ;  $E_{\text{Cu} / \text{Cu}^{2+}} = -0.34$

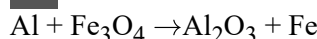
$E_{\text{Fe}^{3+} / \text{Fe}^{2+}} = 0.77$ ;  $E_{\text{Cu} / \text{Cu}^{2+}} = -0.34$

$E_{\text{Ag} / \text{Ag}^+} = -0.80$ ;  $E_{\text{Fe}^{3+} / \text{Fe}^{2+}} = 0.77$

Using the electrode potential values given above, identify the reaction which is not feasible:

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

**83** In the following reaction



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.  $\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg}_{(\text{s})}$
2.  $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}_{(\text{s})}$
3.  $\text{Au}^{3+} + 3\text{e}^- \rightarrow \text{Au}_{(\text{s})}$
4.  $\text{K}^+ + \text{e}^- \rightarrow \text{K}_{(\text{s})}$

## APPLICATION OF ELECTRODE POTENTIAL - LEVEL II

**85** The correct statement about the electrolysis of an aqueous solution of  $\text{AgNO}_3$  with Ag electrode is-

1.	$\text{Ag}^+$ ion gets oxidised at cathode; $\text{Ag}_{(\text{s})}$ is reduced at anode
2.	$\text{H}_2\text{O}$ gets reduced at cathode; $\text{H}_2\text{O}$ gets oxidised at anode
3.	$\text{Ag}^+$ ion gets reduced at cathode; $\text{H}_2\text{O}$ is oxidised at anode
4.	$\text{Ag}^+$ ion gets reduced at cathode; $\text{Ag}_{(\text{s})}$ is oxidised at anode

## EQUIVALENT WEIGHT - LEVEL I

**86** The number of moles of  $\text{KMnO}_4$  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