Exercise-1

Marked Questions may have for Revision Questions.

ONLY ONE OPTION CORRECT TYPE

Section (A) : Calculation of oxidation number

1. The oxidation number of Oxygen in Na_2O_2 is :
(1) + 1 (2) + 2 (3) – 2 (4) – 1

2. One of the following has both positive and negative oxidation states
(1) F (2) Cl (3) He (4) Na

3. The oxidation state of osmium (Os) in OsO_4 is
(1) + 7 (2) + 6 (3) + 4 (4) + 8

4. Oxidation number of nitrogen in $(NH_4)_2SO_4$ is
(1) $-\frac{1}{3}$ (2) – 1 (3) + 1 (4) – 3

5. In which of the following compounds, the oxidation number of iodine is fractional ?
(1) IF_7 (2) I_3^- (3) IF_5 (4) IF_3

6. The oxidation number of cobalt in $K_3[Co(NO_2)_6]$ is
(1) 0 (2) + 4 (3) + 3 (4) + 6

7. Phosphorus has the oxidation state of +3 in
(1) Phosphorous acid (2) Orthophosphoric acid
(3) Hypophosphorous acid (4) Metaphosphoric acid

8. The oxidation number of Phosphorus in $Mg_2P_2O_7$ is :
(1) + 3 (2) + 2 (3) + 5 (4) – 3

9. In which of the following compounds, nitrogen has an oxidation state of –1 ?
(1) N_2O (2) NO_2^- (3) NH_2OH (4) N_2H_4

10. Which of the following is a redox reaction?
(1) $NaCl + KNO_3 \longrightarrow NaNO_3 + KCl$ (2) $CaC_2O_4 + 2\,HCl \longrightarrow CaCl_2 + H_2C_2O_4$
(3) $Mg(OH)_2 + 2\,NH_4Cl \longrightarrow MgCl_2 + 2\,NH_4OH$ (4) $Zn + 2\,AgCN \longrightarrow 2\,Ag + Zn(CN)_2$

Section (B) : Balancing of redox reactions

1. A reducing agent is a substance :
(1) in which an element undergoes increase in oxidation number.
(2) in which an element undergoes decrease in oxidation number.
(3) which gains electron(s)
(4) which shares electron(s)

2. Consider the following reaction:
$3Br_2 + 6CO_3^{2-} + 3H_2O \longrightarrow 5Br^- + BrO_3^- + 6\,HCO_3^-$
Which of the following statements is true regarding this reaction:
(1) Bromine is oxidized and the carbonate radical is reduced.
(2) Bromine is reduced and the carbonate radical is oxidized.
(3) Bromine is neither reduced nor oxidized.
(4) Bromine is both reduced and oxidized.

3. Which of the following is a redox reaction:
(1) $2\,CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$ (2) $CuSO_4 + 4\,NH_3 \rightarrow [Cu(NH_3)_4]\,SO_4$
(3) $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$ (4) $Cr_2O_7^{2-} + 2OH^- \rightarrow 2\,CrO_4^{2-} + H_2O$

4. Consider the reaction,
$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$
With reference to the above, which one of the following is the correct statement ?
(1) Zn is reduced to Zn^{2+} (2) Zn is oxidised to Zn^{2+}
(3) Zn^{2+} is oxidised to Zn (4) Cu^{2+} is oxidised to Cu.

5. Which reaction does not represent auto redox or disproportionation reaction :
(1) $Cl_2 + OH^- \longrightarrow Cl^- + ClO_3^- + H_2O$ (2) $2H_2O_2 \longrightarrow H_2O + O_2$
(3) $2Cu^+ \longrightarrow Cu^{2+} + Cu$ (4) $(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$

6. In the reaction $X^- + XO_3^- + H^+ \longrightarrow X_2 + H_2O$, the molar ratio in which X^- and XO_3^- react is :
(1) 1 : 5 (2) 5 : 1 (3) 2 : 3 (4) 3 : 2

7. The compound that can work both as an oxidising as well as a reducing agent is :
(1) $KMnO_4$ (2) H_2O_2 (3) $Fe_2(SO_4)_3$ (4) $K_2Cr_2O_7$

8. Which of the following behaves as both oxidising and reducing agents ?
(1) H_2SO_4 (2) SO_2 (3) H_2S (4) HNO_3

9. When $KMnO_4$ acts as an oxidising agent and ultimately forms MnO_4^{2-}, MnO_2, Mn_2O_3 and Mn^{2+}, then the number of electrons transferred in each case is :
(1) 4, 3, 1, 5 (2) 1, 5, 3, 7 (3) 1, 3, 4, 5 (4) 3, 5, 7, 1

Section (C) : Classical Concept of Equivalent weight / Mass, Equivalent weight, n-factor and Normality for Acid, Base and Precipitate

1. When N_2 is converted into NH_3, the equivalent weight of nitrogen will be :
(1) 1.67 (2) 2.67 (3) 3.67 (4) 4.67

2. In the ionic equation $2K^+BrO_3^- + 12H^+ + 10e^- \longrightarrow Br_2 + 6H_2O + 2K^+$,
the equivalent weight of $KBrO_3$ will be :
(1) M/5 (2) M/2 (3) M/6 (4) M/4
(where M = molecular weight of $KBrO_3$)

3. If molecular weight of $KMnO_4$ is 'M', then its equivalent weight in acidic medium would be :
(1) M (2) M/2 (3) M/5 (4) M/4

4. In the conversion $NH_2OH \longrightarrow N_2O$,
the equivalent weight of NH_2OH will be :
(1) M/4 (2) M/2 (3) M/5 (4) M/1
(M = molecular weight of NH_2OH)

5. In the reaction between SO_2 and O_3, the equivalent weight of ozone is :
(1) the same as its molecular weight (2) half the molecular weight
(3) one-third of the molecular weight (4) one-fourth of the molecular weight

6. The equivalent weight of phosphoric acid (H_3PO_4) in the reaction :
$NaOH + H_3PO_4 \longrightarrow NaH_2PO_4 + H_2O$
(1) 59 (2) 49 (3) 25 (4) 98

7. The equivalent weight of $MnSO_4$ is half its molecular weight when it is converted into

(1) Mn_2O_3 (2) MnO_4^- (3) MnO_2 (4) MnO_4^{2-}

8. The equivalent weight of Mohr's salt, $FeSO_4.(NH_4)_2SO_4.6H_2O$ is equal to
(1) Its molecular weight (2) Atomic weight
(3) half-its molecular weight (4) one-third its molecular weight

9. When HNO_3 is converted into NH_3, the equivalent weight of HNO_3 will be :
(1) M/2 (2) M/1 (3) M/6 (4) M/8
(M = molecular weight of HNO_3)

10. In the reaction : $Na_2S_2O_3 + 4Cl_2 + 5H_2O \longrightarrow Na_2SO_4 + H_2SO_4 + 8HCl$,
the equivalent weight of $Na_2S_2O_3$ will be : (M = molecular weight of $Na_2S_2O_3$)
(1) M/4 (2) M/8 (3) M/1 (4) M/2

11. Which of the following relations is incorrect for solutions ?
(1) 3 N $Al_2(SO_4)_3$ = 0.5 M $Al_2(SO_4)_3$ (2) 3 M H_2SO_4 = 6 N H_2SO_4
(3) 1 M H_3PO_4 = 1/3 N H_3PO_4 (4) 1 M $Al_2(SO_4)_3$ = 6 N $Al_2(SO_4)_3$

12. Equivalent weight of carbon in CO and CO_2 are in the ratio of :
(1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 1 : 4

13. $28\ NO_3^- + 3As_2S_3 + 4H_2O \rightarrow 6AsO_4^{3-} + 28NO + 9SO_4^{2-} + 8H^+$.
What will be the equivalent mass of As_2S_3 in above reaction : (Molecular mass of As_2S_3 = M)
(1) $\frac{M}{2}$ (2) $\frac{M}{4}$ (3) $\frac{M}{24}$ (4) $\frac{M}{28}$

Section (D) : Titration

1. How many millilitres of 0.1N H_2SO_4 solution will be required for complete reaction with a solution containing 0.125 g of pure Na_2CO_3 :
(1) 23.6 mL (2) 25.6 mL (3) 26.3 mL (4) 32.6 mL

2. If 25 mL of a H_2SO_4 solution reacts completely with 1.06 g of pure Na_2CO_3, what is the normality of this acid solution :
(1) 1 N (2) 0.5 N (3) 1.8 N (4) 0.8 N

3. A certain weight of pure $CaCO_3$ is made to react completely with 200 mL of a HCl solution to give 224 mL of CO_2 gas at STP. The normality of the HCl solution is:
(1) 0.05N (2) 0.1 N (3) 1.0 N (4) 0.2 N

4. Equivalent mass of a bivalent metal is 32.7. Molecular mass of its chloride is :
(1) 68.2 (2) 103.7 (3) 136.4 (4) 166.3

5. 10 mL of 1 N HCl is mixed with 20 mL of 1 M H_2SO_4 and 30 mL of 1 M NaOH. The resultant solution has :
(1) 20 meq of H^+ ions (2) 20 meq of OH^-
(3) 0 meq of H^+ or OH^- (4) 30 milli moles of H^+

Section (E) : Hydrogen peroxide, Hardness of water

1. The volume strength of 1.5 N H_2O_2 solution is :
(1) 4.8 V (2) 8.4 V (3) 3 V (4) 8 V

2. Temporary hardness is due to bicarbonates of Mg^{2+} and Ca^{2+}. It is removed by addition of CaO as follows :
$Ca(HCO_3)_2 + CaO \longrightarrow 2CaCO_3 + H_2O$

Mass of CaO required to precipitate 2 g $CaCO_3$ is :
(1) 2 g (2) 0.56 g (3) 0.28 g (4) 1.12 g

3. The mass of oxalic acid crystals ($H_2C_2O_4 . 2H_2O$) required to prepare 50 mL of a 0.2 N solution is :
(1) 4.5 g (2) 6.3 g (3) 0.63 g (4) 0.45 g

4. 125 mL of 63% (w/v) $H_2C_2O_4 . 2H_2O$ solution is made to react with 125 mL of a 40%(w/v) NaOH solution. The resulting solution is: (ignoring hydrolysis of ions)
(1) neutral (2) acidic (3) strongly acidic (4) alkaline

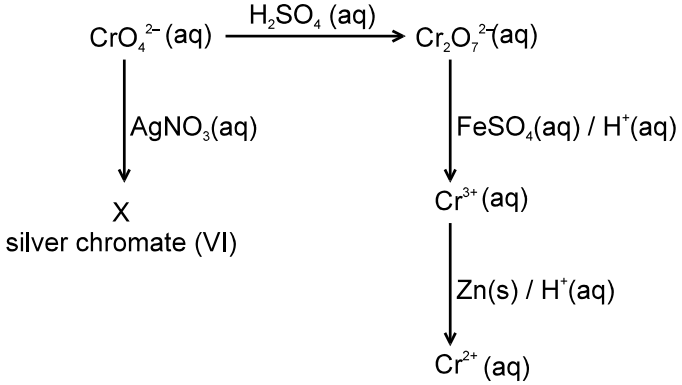
Section (F) : Equivalent Concept for Redox reactions, $KMnO_4$ / $K_2Cr_2O_7$ v/s Reducing Agents & their Redox Titration

1. If equal volumes of 0.1 M $KMnO_4$ and 0.1 M $K_2Cr_2O_7$ solutions are allowed to oxidise Fe^{2+} to Fe^{3+} in acidic medium, then Fe^{2+} oxidised will be :
(1) more by $KMnO_4$ (2) more by $K_2Cr_2O_7$
(3) equal in both cases (4) cannot be determined.

2. Which of the following solutions will exactly oxidize 25 mL of an acid solution of 0.1 M iron (II) oxalate:
(1) 25 mL of 0.1 M $KMnO_4$ (2) 25 mL of 0.2 M $KMnO_4$
(3) 25 mL of 0.6 M $KMnO_4$ (4) 15 mL of 0.1 M $KMnO_4$

3. An element A in a compound ABD has oxidation number –n. It is oxidised by $Cr_2O_7^{2-}$ in acid medium. In the experiment, 1.68×10^{-3} moles of $K_2Cr_2O_7$ were used for 3.36×10^{-3} moles of ABD. The new oxidation number of A after oxidation is :
(1) 3 (2) 3 – n (3) n – 3 (4) +n

4. Consider the reactions shown below :



Which of the following statements is false : [Atomic Mass of Zinc = 65.4]
(1) Silver chromate (VI) has the formula Ag_2CrO_4.
(2) The minimum mass of zinc required to reduce 0.1 mole of Cr^{3+} to Cr^{2+} is 6.54 g.
(3) The conversion of CrO_4^{2-} into $Cr_2O_7^{2-}$ is not a redox reaction.
(4) The equation $Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \rightarrow 6Fe^{3+} + 2Cr^{3+} + 7H_2O$ correctly describes the reduction of $Cr_2O_7^{2-}$ by acidified $FeSO_4$.

5. The number of moles of oxalate ions oxidized by one mole of MnO_4^- ion in acidic medium is :
(1) $\frac{5}{2}$ (2) $\frac{2}{5}$ (3) $\frac{3}{5}$ (4) $\frac{5}{3}$

Exercise-2

Marked Questions may have for Revision Questions.

1. In which of the following reactions is there a change in the oxidation number of nitrogen atom:
(1) $2\,NO_2 \longrightarrow N_2O_4$ (2) $NH_3 + H_2O \longrightarrow NH_4^+ + OH^-$
(3) $N_2O_5 + H_2O \longrightarrow 2HNO_3$ (4) None of these

2. In the reaction $xHI + yHNO_3 \longrightarrow NO + I_2 + H_2O$:
(1) x = 3, y = 2 (2) x= 2, y = 3 (3) x = 6, y = 2 (4) x = 6, y = 1

3. For the redox reaction $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$,
the correct stoichiometric coefficients of MnO_4^-, $C_2O_4^{2-}$ and H^+ are respectively:
(1) 2, 5, 16 (2) 16, 5, 2 (3) 5, 16, 2 (4) 2, 16, 5

4. When SO_2 is passed through an acidified solution of potassium dichromate, the oxidation state of S changes from :
(1) + 4 to 0 (2) + 4 to +2 (3) + 4 to +6 (4) + 6 to +4

5. When SO_2 is passed through a solution of potassium iodate, the oxidation state of iodine changes from
(1) + 5 to 0 (2) + 5 to – 1 (3) – 5 to 0 (4) – 7 to – 1

6. The number of electrons required to balance the following equation,
$NO_3^- + 4H^+ + e^- \longrightarrow 2H_2O + NO$ is
(1) 5 (2) 4 (3) 3 (4) 2

7. Oxidation state of nitrogen is correctly given for

Compound	Oxidation state	Compound	Oxidation state
(1) $[Co(NH_3)_5Cl]Cl_2$	0	(2) NH_2OH	+ 1
(3) $(N_2H_5)_2SO_4$	+ 2	(4) Mg_3N_2	– 3

8. Volume V_1 mL of 0.1M $K_2Cr_2O_7$ is needed for complete oxidation of 0.678 g N_2H_4 in acidic medium. The volume of 0.3 M $KMnO_4$ needed for same oxidation in acidic medium will be:
(1) $\frac{2}{5}\,V_1$ (2) $\frac{5}{2}\,V_1$
(3) $113\,V_1$ (4) can not be determined

9. In which of the following reactions, hydrogen is acting as an oxidising agent ?
(1) With iodine to give hydrogen iodide (2) With lithium to give lithium hydride
(3) With nitrogen to give ammonia (4) With sulphur to give hydrogen sulphide

10. The violent reaction between sodium and water is an example of :
(1) Reduction (2) Oxidation (3) Redox reaction (4) Neutralization reaction

11. SO_2 acts as an oxidant when it reacts with :
(1) Acidified $KMnO_4$ (2) Acidified $K_2Cr_2O_7$ (3) H_2S (4) Acidified C_2H_5OH

12. Which of the following is not a redox reaction ?
(1) $CaCO_3 \longrightarrow CaO + CO_2$ (2) $O_2 + 2H_2 \longrightarrow 2H_2O$
(3) $Na + H_2O \longrightarrow NaOH + 1/2\,H_2$ (4) $MnCl_3 \longrightarrow MnCl_2 + 1/2\,Cl_2$

13. In which of the following pairs, there is greatest difference in the oxidation number of the under lined elements ?
(1) $\underline{N}O_2$ and $\underline{N}_2O_4$ (2) $\underline{P}_2O_5$ and $\underline{P}_4O_{10}$ (3) $\underline{N}_2O$ and $\underline{N}O$ (4) $\underline{S}O_2$ and $\underline{S}O_3$

14. In the chemical reaction, $K_2Cr_2O_7 + XH_2SO_4 + YSO_2 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + ZH_2O$
X, Y and Z are :
(1) 1, 3, 1 (2) 4, 1, 4 (3) 3, 2, 3 (4) 2, 1, 2

15. Which substance serves as reducing agent in the following reaction ?
$14H^+ + Cr_2O_7^{2-} + 3Ni \longrightarrow 2Cr^{3+} + 7H_2O + 3Ni^{2+}$
(1) H_2O (2) Ni (3) H^+ (4) $Cr_2O_7^{2-}$

16. M is molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it is converted into K_2MnO_4 is :
(1) M (2) M/3 (3) M/5 (4) M/7

17. Which of the following reactions depicts the oxidising property of SO_2 ?
(1) $SO_2 + H_2O \longrightarrow H_2SO_3$ (2) $2H_2S + SO_2 \longrightarrow 3S + 2H_2O$
(3) $Cl_2 + SO_2 \longrightarrow SO_2Cl_2$ (4) $2MnO_4^- + 5SO_2 + 2H_2O \longrightarrow 5SO_4^{2-} + 2Mn^{2+} + 4H^+$

18. In which of the following reactions, there is no change in valency ?
(1) $4KClO_3 \longrightarrow 3KClO_4 + KCl$ (2) $SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$
(3) $BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$ (4) $2BaO + O_2 \longrightarrow 2BaO_2$

19. Nitric oxide acts as a reducing agent in the reaction
(1) $4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$ (2) $2NO + 3I_2 + 4H_2O \longrightarrow 2NO_3^- + 6I^- + 8H^+$
(3) $2NO + H_2SO_3 \longrightarrow N_2O + H_2SO_4$ (4) $2NO + H_2S \longrightarrow N_2O + S + H_2O$

20. In the reaction, $\overset{+3}{2FeCl_3} + H_2S \longrightarrow \overset{+2}{2FeCl_2} + 2HCl + S$
(1) $FeCl_3$ acts as an oxidizing agent (2) Both H_2S and $FeCl_3$ are oxidized
(3) $FeCl_3$ is oxidised while H_2S is reduced (4) H_2S acts as an oxidizing agent

21. When $KMnO_4$ reacts with acidified $FeSO_4$
(1) Only $FeSO_4$ is oxidised (2) Only $KMnO_4$ is oxidised
(3) $FeSO_4$ is oxidised and $KMnO_4$ is reduced (4) None of the above

22. Which of the following is a redox reaction ?
(1) H_2SO_4 with NaOH
(2) In atmosphere, O_3 from O_2 by lightning
(3) Nitrogen oxides from nitrogen and oxygen by lightning
(4) Evaporation of H_2O

23. Which of the following elements has least oxidation number ?
(1) $Ni(CN)_4$ (2) $Ni(CO)_4$ (3) Fe_2O_3 (4) SF_6

24. $KMnO_4$ oxidises oxalic acid in acidic medium. The number of CO_2 molecule produced as per the balanced equation is
(1) 10 (2) 8 (3) 6 (4) 3

25. A metal ion M^{3+} loses 3 electrons, its oxidation number will be
(1) +3 (2) +6 (3) 0 (4) –3

26. In which of the following, transition metal has zero oxidation state ?
(1) $[Fe(CO)_5]$ (2) $NH_2.NH_2$ (3) $NOClO_4$ (4) CrO_5

27. Which statement is not correct ?

(1) Potassium permanganate is a powerful oxidising substance
(2) Potassium permanganate is a weaker oxidising agent than potassium dichromate
(3) Potassium permanganate is a stronger oxidising agent than potassium dichromate
(4) Potassium dichromate oxidised a secondary alcohol into a ketone.

28. What is the coefficient of oxalate ion in the following reaction ?

$MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$

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

29. How many litres of Cl_2 at STP will be liberated by the oxidation of NaCl with 10 g $KMnO_4$ in acidic medium: (Atomic weight : Mn = 55 and K = 39)

(1) 3.54 (2) 7.08 (3) 1.77 (4) None of these

Exercise-3

PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

1. The values of x and y in the following redox reaction, $xCl_2 + 6OH^- \longrightarrow ClO_3^- + yCl^- + 3H_2O$ are ब **[AIPMT 2000]**

(1) x = 2, y = 4 (2) x = 5, y = 3 (3) x = 3, y = 5 (4) x = 4, y = 2

2. The oxidation states of sulphur in the anions SO_3^{2-} , $S_2O_4^{2-}$ and $S_2O_6^{2-}$ follow the order : **[AIPMT 2003]**

(1) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-}$ (2) $SO_3^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$

(3) $S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$ (4) $S_2O_6^{2-} < S_2O_4^{2-} < SO_3^{2-}$

3. For decolourization of 1 mole of $KMnO_4$, the moles of H_2O_2 required is **[AIPMT 2004]**

(1) 1/2 (2) 3/2 (3) 5/2 (4) 7/2

4. Which is the best description of the behaviour of bromine in the reaction given below ? **[AIPMT 2004]**

$H_2O + Br_2 \longrightarrow HOBr + HBr$

(1) Proton acceptor only (2) Both oxidised and reduced
(3) Oxidised only (4) Reduced only

5. The number of moles of $KMnO_4$ reduced by one mole of KI in alkaline medium is **[AIPMT 2005]**

(1) one (2) two (3) five (4) one fifith

6. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be : **[AIPMT 2008]**

(1) 7.5 moles (2) 0.2 moles (3) 0.6 moles (4) 0.4 moles

7. When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from : **[AIPMT 2012]**

(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

8. In which of the following compounds, nitrogen exhibits highest oxidation state ? **[AIPMT 2012]**

(1) N_2H_4 (2) NH_3 (3) N_3H (4) NH_2OH

9. A mixture of potassium chlorate, oxalic acid and sulphuric acid is heated. During the reaction which element undergoes maximum change in the oxidation number ? **[AIPMT 2012]**

(1) S (2) H (3) Cl (4) C

10. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$ **[AIPMT 2014]**

(b) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

Role of hydrogen peroxide in the above reactions is respectively:
(1) oxidizing in (a) and reducing in (b) (2) reducing in (a) and oxidizing in (b)
(3) reducing in (a) and (b) (4) oxidizing in (a) and (b)

11. Assuming complete ionization, same moles of which of the following compounds will require the least amount of acidified $KMnO_4$ for complete oxidation **[AIPMT 2015]**
(1) $FeSO_4$ (2) $FeSO_3$ (3) FeC_2O_4 (4) $Fe(NO_2)_2$

12. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidizing behaviour ? **[NEET-2-2016]**
(1) $CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + 2HF$ (2) $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2H_2O$
(3) $2S + 2H_2SO_4 \longrightarrow 2SO_2 + 2H_2O$ (4) $C + 2H_2SO_4 \longrightarrow CO_2 + 2SO_2 + 2H_2O$

13. Name the gas that can readily decolourise acidified $KMnO_4$ solution: **[NEET 2017]**
(1) CO_2 (2) SO_2 (3) NO_2 (4) P_2O_5

14. For the redox reaction **[NEET 2018]**

$$MnO_4^{-2} + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$$

the correct coefficients of the reactants for the balanced equation are

	MnO_4^-	$C_2O_4^{2-}$	H^+
(1)	16	5	2
(2)	5	16	2
(3)	2	16	5
(4)	2	5	16

PART - II : AIIMS QUESTION (PREVIOUS YEARS)

1. In the balanced chemical reaction,

$$IO_3^- + aI^- + bH^+ \longrightarrow cH_2O + dI_2$$

a, b, c and d respectively correspond to **[AIIMS 2005]**
(1) 5, 6, 3, 3 (2) 5, 3, 6, 3 (3) 3, 5, 3, 6 (4) 5, 6, 5,5

2. **Assertion :** $K_2Cr_2O_7$ is used as a primary standard in volumetric analysis.
Reason : It has a good solubility in water. **[AIIMS 2006]**
(1) If both assertion and reason are true and reason is a correct explanation of assertion.
(2) If both assertion and reason are true but reason is not a correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If assertion and reason both are false.

3. **Assertion :** Change in colour of acidic solution of potassium dichromate by breath is used to test drunk drivers.
Reason : Change in colour is due to the complexation of alcohol with potassium dichromate.
(1) If both assertion and reason are true and reason is a correct explanation of assertion. **[AIIMS 2006]**
(2) If both assertion and reason are true but reason is not a correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If assertion and reason both are false.

4. The oxidation states of iodine in HIO_4, H_3IO_5 and H_5IO_6 are, respectively : **[AIIMS 2008]**
(1) + 1, + 3, + 7 (2) + 7, + 7, + 3 (3) + 7, + 7, + 7 (4) + 7, + 5, + 3

5. **Assertion :** Equivalent weight of a base = $\frac{\text{Molecular weight}}{\text{Acidity}}$ **[AIIMS 2008]**

Reason : Acidity is the number of replaceable hydrogen atoms in one molecule of the base.
(1) If both assertion and reason are true and reason is a correct explanation of assertion.
(2) If both assertion and reason are true but reason is not a correct explanation of assertion.

(3) If assertion is true but reason is false.
(4) If assertion and reason both are false.

6. x moles of potassium dichromate oxidises 1 mole of ferrous oxalate, in acidic medium. Here x is : **[AIIMS 2009]**

(1) 3 (2) 1.5 (3) 0.5 (4) 1.0

7. In the following redox equation,

$$xUO^{2+} + Cr_2O^{2-}_7 + yH^+ \rightarrow aUO^{2+}_2 + zCr^{3+} + bH_2O$$

the values of coefficients x, y and z are, respectively : **[AIIMS 2009]**

(1) 3, 8, 2 (2) 3, 8, 7 (3) 3, 2, 4 (4) 3, 1, 8

8. $KMnO_4$ reacts with oxalic acid according to the equation **[AIIMS 2013]**

$2KMnO_4^- + 5C_2O_4^- + 16H^+ \rightarrow 2Mn^{++} + 10CO_2 + 8H_2O$ Here 20mL of 0.1 M $KMnO_4$ is equivalent to:

(1) 20 mL of 0.5 M $H_2C_2O_4$ (2) 50 mL of 0.5 M $H_2C_2O_4$

(3) 50 mL of 0.1 M $H_2C_2O_4$ (4) 20 mL of 0.1 M $H_2C_2O_4$

9. The mass of potassium dichromate crystals required to oxidise 750 cm^3 of 0.6 M Mohr's salt solution is (Given molar mass, potassium dichromate = 294, Mohr's salt = 392) **[AIIMS 2016]**

(1) 0.39 g (2) 0.37 g (3) 22.05 g (4) 2.2 g

10. 3.5 g of a mixture of NaOH and KOH were dissolved and made up to 250 ml. 25 mL of this solution were completely neutralized by 17 mL of (N/2) HCl solution. Then, the percentage of KOH in mixture is

(1) 80 (2) 10 (3) 34 (4) 56 **[AIIMS 2017]**

11 $MnO_2 + NaCl \xrightarrow[H_2SO_4]{H^+}$ choose incorrect statement for above reaction. **[AIIMS 2018]**

(1) Mn goes from +4 to +2 (2) Cl^- is oxidized

(3) Cl_2 yellow gas is released. (4) SO_4^{2-} reduces to SO_2

PART - III : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. When $KMnO_4$ acts as an oxidising agent and ultimately forms MnO_4^{2-}, MnO_2, Mn_2O_3 and Mn^{2+}, then the number of electrons transferred in each case is : **[AIEEE 2002]**

(1) 4, 3, 1, 5 (2) 1, 5, 3, 7 (3) 1, 3, 4, 5 (4) 3, 5, 7, 1

2. What will happen if the solution of potassium chromate reacts with excess amount of nitric acid

(1) Cr reduces in the oxidation state +3 from CrO_4^{2-} **[AIEEE 2003]**

(2) Cr oxidises in the oxidation state +7 from CrO_4^{2-}

(3) Cr^{+3} and $Cr_2O_7^{2-}$ will be formed.

(4) $Cr_2O_7^{2-}$ and H_2O will be formed.

3. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is : **[AIEEE 2005]**

(1) + 4 (2) + 6 (3) + 2 (4) + 3

4. Amount of oxalic acid present in a solution can be determined by its titration with $KMnO_4$ solution in the presence of H_2SO_4. The titration gives unsatisfactory result when carried out in the presence of HCl, because HCl : **[AIEEE 2008, 3/105]**

(1) furnishes H^+ ions in addition to those from oxalic acid.

(2) reduces permanganate to Mn^{2+}.

(3) oxidises oxalic acid to carbon dioxide and water.

(4) gets oxidised by oxalic acid to chlorine.

5. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M HCl solution. The excess of the acid required 15 mL of 0.1 M NaOH solution for complete neutralization. The percentage of nitrogen in the compound is :

[AIEEE 2010, 4/144]

(1) 59.0 (2) 47.4 (3) 23.7 (4) 29.5

6. Consider the following reaction : **[JEE Mains-2013, 4/120]**

$xMnO_4^- + yC_2O_4^{2-} + zH^+ \rightarrow xMn^{2+} + 2yCO_2 + \frac{z}{2} H_2O$

The values of x, y and z in the reaction are, respectively :

(1) 5, 2 and 16 (2) 2, 5 and 8 (3) 2, 5 and 16 (4) 5, 2 and 8

7. For the estimation of nitrogen, 1.4 g of an organic compound was digested by Kjeldahl method and the evolved ammonia was absorbed in 60 mL of $\frac{M}{10}$ sulphuric acid. The unreacted acid required 20 mL of $\frac{M}{10}$ sodium hydroxide for complete neutralization. The percentage of nitrogen in the compound is :

[JEE(Main) 2014, 4/120]

(1) 6% (2) 10% (3) 3% (4) 5%

8. Sodium salt of an organic acid 'X' produces effervescence with conc. H_2SO_4. 'X' reacts with the acidified aqueous $CaCl_2$ solution to give a white precipitate which decolourises acidic solution of $KMnO_4$. 'X' is :

[JEE(Main) 2017, 4/120]

(1) HCOONa (2) CH_3COONa (3) $Na_2C_2O_4$ (4) C_6H_5COONa

9. The hardness of water sample (in terms of equivalents of $CaCO_3$) containing 10^{-3} M $CaSO_4$ is :
(molar mass of $CaSO_4$ = 136 g mol^{-1}) **[JEE(Main) 2019, 4/120]**

(1) 10 ppm (2) 50 ppm (3) 90 ppm (4) 100 ppm

10. The volume strength of 1M H_2O is: (Molar mass of H_2O_2 = 34 g mol^{-1}) **[JEE(Main) 2019, 4/120]**

(1) 11.35 (2) 22.4 (3) 16. 8 (4) 5.6

Answers

EXERCISE - 1

SECTION (A)

1.	(4)	**2.**	(2)	**3.**	(4)	**4.**	(4)	**5.**	(2)	**6.**	(3)	**7.**	(1)
8.	(3)	**9.**	(3)	**10.**	(4)								

SECTION (B)

1.	(1)	**2.**	(4)	**3.**	(3)	**4.**	(2)	**5.**	(4)	**6.**	(2)	**7.**	(2)
8.	(2)	**9.**	(3)										

SECTION (C)

1.	(4)	**2.**	(1)	**3.**	(3)	**4.**	(2)	**5.**	(2)	**6.**	(4)	**7.**	(3)
8.	(1)	**9.**	(4)	**10.**	(2)	**11.**	(3)	**12.**	(3)	**13.**	(4)		

SECTION (D)

1.	(1)	**2.**	(4)	**3.**	(2)	**4.**	(3)	**5.**	(1)

SECTION (E)

1.	(2)	**2.**	(2)	**3.**	(3)	**4.**	(1)

SECTION (F)

1.	(2)	**2.**	(4)	**3.**	(2)	**4.**	(2)	**5.**	(1)

EXERCISE - 2

1.	(4)	**2.**	(3)	**3.**	(1)	**4.**	(3)	**5.**	(2)	**6.**	(3)	**7.**	(4)
8.	(1)	**9.**	(2)	**10.**	(3)	**11.**	(3)	**12.**	(1)	**13.**	(4)	**14.**	(1)
15.	(2)	**16.**	(1)	**17.**	(2)	**18.**	(3)	**19.**	(2)	**20.**	(1)	**21.**	(3)
22.	(3)	**23.**	(2)	**24.**	(1)	**25.**	(2)	**26.**	(1)	**27.**	(2)	**28.**	(4)
29.	(1)												

EXERCISE - 3

PART-I

1.	(3)	**2.**	(1)	**3.**	(3)	**4.**	(2)	**5.**	(1)	**6.**	(3)	**7.**	(2)
8.	(3)	**9.**	(3)	**10.**	(3)	**11.**	(1)	**12.**	(1)	**13.**	(2)	**14.**	(4)

PART-II

1.	(1)	**2.**	(3)	**3.**	(3)	**4.**	(3)	**5.**	(3)	**6.**	(3)	**7.**	(1)
8.	(3)	**9.**	(3)	**10.**	(2)	**11**	(4)						

PART-III

1.	(3)	**2.**	(4)	**3.**	(4)	**4.**	(2)	**5.**	(3)	**6.**	(3)	**7.**	(2)
8.	(3)	**9.**	(4)	**10.**	(1)								