REDOX REACTIONS

1. 5.3 gm of M2CO3 is dissolved in 150 ml of 1N HCl, the unused acid required 100 ml of 0.5 N NaOH. Hence equivalent weight of M is

   (a) 23 (b) 12 (c) 24 (d) 13

Answer: (a)

Milliequivalents of Acid used = Milliequivalents of acid taken −Milliequivalent of acid unused

$=150\times1-100\times0.5=100$ meq.

Equivalent of acid used = 0.1 equivalents

Equivalents of M2CO3=Equivalents of Acid used

= 0.1 equivalents

Equivalent weight of M2CO3(by data)

= Equivalent weight of M2CO3(by formula)

$\frac{\text{given weight}}{\text{equivalents}} = \frac{\text{Equivalent weight}}{\text{n-factor}}$

Let 'x' be the atomic weight of M

$\frac{5.3}{0.1} = \frac{2x+60}{2}$

x = 23 Equivalent weight of M23= $\frac{}{1}$ =23

(as M is present as M+in M2CO3,its n−factor is 1).

2. In the disproportion reaction:

$H_3PO_2 \to PH_3 + H_3PO_3$

The equivalent mass of H_3PO_2 is (m = molecular mass of H_3PO_2)

(a) $\frac{3m}{4}$ (b) $\frac{3m}{5}$ (c) $\frac{5m}{6}$ (d) $\frac{m}{4}$

Answer: (a)

Change in O.S = 4

$\overset{+1}{H_3PO_2} \to \overset{-3}{PH_3} + \overset{+3}{H_3PO_3}$

Change in O.S = 2

$\therefore$ The equivalent weight of $H_3PO_2 = \frac{m}{4} + \frac{m}{2} = \frac{3m}{4}$

3. For the reaction,

$FeS_2 + KMnO_4 + H^+ \to Fe^{3+} + 2HSO_4 + Mn^{2+} + H_2O$,

if the molar mass of FeS_2 is M, then equivalent mass of FeS_2 would be equal to

(a) m (b) $\frac{M}{10}$ (c) $\frac{M}{11}$ (d) $\frac{M}{15}$

Answer: (d)

$\overset{+2}{Fe}\overset{-1}{S_2} \to 2H\overset{+6}{S}O_4 + Fe^{3+}$ (oxidation half reaction)

$n-factor = [1 \times (3-2) + 2(6-(-1))] = 15$

($\because$ n factor of a compound undergoing redox change is equal to no. of moles of electrons lost, gained or exchanged by 1 mole of the compound.)

So, Eq. wt. of $FeS_2 = \frac{M}{15}$

Hence, (d) is the correct answer.

4. 3.92 g/lit of a sample of ferrous ammonium sulphate reacts completely with 50 ml $\frac{N}{10}$ $KMnO_4$ solution. The percentage purity of the sample is

(a) 50 (b) 78.4 (c) 80.0 (d) 39.2

Answer: (a)

Equivalents of $FeSO_4.(NH_4)_2SO_4.6H_2O$ = Equivalents of $KMnO_4$

$N_1V_1=N_2V_2$

$N_1\times1000=\frac{1}{10}\times50$

$N_1=\frac{1}{200}$

Eq. wt. of $FeSO_4.(NH_4)_2SO_4.6H_2O$ = mol. wt. = 392

∴ Strength of pure salt $=392\times\frac{1}{200}=1.96$ g/lit

∴ % purity $=\frac{1.96}{3.92}\times100=50\%$

5. The volume of 0.1 M HCl required to react completely with 1 gm mixture of Na_2CO_3 and $NaHCO_3$ containing equimolar amount of two is

(a) 106 ml (b) 128 ml (c) 156 ml (d) 212 ml

Answer: (c)

$Na_2CO_3+2HCl\rightarrow2NaCl+Na_2CO_3$

n=2

$NaHCO_3+HCl\rightarrow NaCl+CO_2+H_2O$

n=1

	Na_2CO_3	& $NaHCO_3$
Wt.	x gm	1−x

Mole $=\frac{x}{106}=\frac{1-x}{86}$ ... (1) equimolar amount

Meq of Na_2CO_3 + Meq of $NaHCO_3$ = Meq of HCl

$$\frac{x}{106} \times 2 + \frac{1-x}{86} = 0.1 \times V \qquad ...(2)$$

From (1)

$$\frac{x}{106} = \frac{1-x}{86}$$

$86x = 106 - 106x$

$192x = 106 \Rightarrow x = 0.552$

$1-x = 0.448$

From (2)

$$\frac{0.552}{106} \times 2 + \frac{0.448}{86} = 0.1 \times V$$

$0.0104 + 0.00520 = 0.1 \times V$

$0.01562 = 0.1\ V$

$V = 0.1562$ litre

$V = 0.156$ ml

6. The strength of a mixture of HCl & H2SO4 is 0.1 N. On treatment with an excess of AgNO3 solution, 20 ml of this acid mixture gives 0.1435 gm of AgCl. The strength of the H2SO4is

(a) 24.5 g/litre (b) 2.45 g/litre (c) 49 g/litre (d) 49 g/litre

Answer: (a)

Equivalents of AgCl = Equivalent of HCl

$$\frac{0.1435}{143.5} \times 1 = \frac{20}{1000} \times N_{HCl}$$

$N_{HCl} = 0.05$

$N_{HCl} + N_{H_2SO_4} = 0.1$

$N_{H_2SO_4} = 0.1 - N_{HCl}$

$= 0.1 - 0.05 = 0.05$

Strength of H_2SO_4 = Molarity of H_2SO_4 × Molar mass of H_2SO_4

$$= \frac{\text{Normality of } H_2SO_4}{\text{n-factor}} \times \text{Molar mass of } H_2SO_4$$

$$= \frac{0.05}{2} \times 98 \text{ gm/L} = 2.45 \text{ gm/L}$$

7. An element 'X' in a compound 'XYZ' has oxidation number X^{n-}. It is oxidised by $Cr_2O_7^{2-}$ in acid medium. In an experiment 1.68×10^{-3} mole of $K_2Cr_2O_7$ was required for 3.26×10^{-3} mole of the compound 'XYZ'. Hence the new oxidation state of 'X' is

(a) $(2-n)$ (b) $(3-n)$ (c) $(4-n)$ (d) $(1-n)$

Answer: (b)

Let, oxidation state of X increases from $-n$ to m

n−factor of $XYZ = m-(-n) = m+n$

So, equivalent of $K_2Cr_2O_7$ = Equivalent of XYZ

$1.68\times10^{-3}\times6 = 3.26\times10^{-3}(m+n)$

On solving $m \approx (3-n)$

Hence (b) is correct.

8. 100 mL of N/5 NaOH will neutralize

(a) 0.0618g of H_3BO_3 (b) 0.1855g of H_3BO_3

(c) 1.2368g of H_3BO_3 (d) 0.03092g of H_3BO_3

Answer: (c)

n−factor of H_3BO_3 is 1 as it's a monobasic acid.

equivalents of H_3BO_3 = equivalents of NaOH

$\frac{x}{62} \times 1 = \frac{1100 \times 1}{51000}$ (Let mass of H_3BO_3 reacted be 'x' gm)

x = 1.236 gm

9. 10 ml of a solution of H_2O_2 labelled '10 volume' just decolorises 100 ml of potassium permanganate solution acidified with dilute H_2SO_4. Calculate the amount of potassium permanganate in the given solution.

(a) 0.1563 gm (b) 0.563 gm

(c) 5.63 gm (d) 0.256 gm

Answer: (b)

$2H_2O_2(aq) \xrightarrow{\Delta} 2H_2O(l) + O_2(g)$

'10 volume' H_2O_2 aqueous solution means on heating 1 ml of the H_2O_2 aqueous solution will produce 10 ml of O_2 gas at STP.

Volume strength of H_2O_2 aqueous solution can be related to the molarity of H_2O_2 solution as

Volume strength of H_2O_2 = Molarity of $H_2O_2 \times 11.2$

10 = Molarity × 11.2

Molarity of H_2O_2 solution = $\frac{10}{11.2}$ M

$\underset{n=2}{H_2O_2(aq)} + \underset{n=5}{KMnO_4} \xrightarrow{H^+} Mn^{2+} + O_2$

n−factor of H_2O_2 in the above reaction is 2

n−factor of $KMnO_4$ in the above reaction is 5

Equivalents of H_2O_2 = equivalents of $KMnO_4$

n−factor × Molarity × Volume

= no. of moles of $KMnO_4$ × n−factor

$$2 \times \frac{10}{11.2} \times 10 = \frac{x}{158} \times 5$$

x = 0.563 gm

Mass of $KMnO_4$ in the given solution was 0.563 gm.

10. For the reaction

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

The correct coefficients of the reactants for the balanced reaction are

	MnO_4^-	$C_2O_4^{2-}$	H^+
(a)	2	5	16
(b)	16	5	2
(c)	5	16	2
(d)	2	16	5

Answer: (a)

The above reaction can be balanced by using the ion electron method as under:

Oxidation reaction: $C_2O_4^{2-} \longrightarrow CO_2$

Reduction reaction: $MnO_4^- \longrightarrow Mn^{2+}$

Balancing atoms other than O

$C_2O_4^{2-} \longrightarrow 2\,CO_2$

$MnO_4^- \longrightarrow Mn^{2+}$

Since medium is acidic

$C_2O_4^{2-} \longrightarrow 2CO_2$ (oxygen is already balanced)

$8H^+ + MnO_4^- \longrightarrow Mn^{2+} + 4H_2O$

Balancing Charge

$C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-$ (1)

$5e^- + 8H^+ + MnO_4^- \longrightarrow Mn^{2+} + 4H_2O$ (2)

Multiplying equation (1) by 5 and equation (2) by 2, and adding, we get

$5C_2O_4^{2-} + 2MnO_4^- + 16H^+ \longrightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$

∴ (a)

Alternatively,

'n' factor of $C_2O_4^{2-}$ is 2 and that MnO_4^- is 5.

∴ they would react in the molar ratio of 2 : 5

11. Calculate the maximum amount of $Ba_3(PO_4)_2$ that will form by the reaction of 1 mole of $BaCl_2$ with 0.4 mol of Na_3PO_4.

(a) 0.8 mole (b) 0.5 mole (c) 0.2 mole (d) 1 mole

Answer: (c)

The balanced chemical reaction of $BaCl_2$ with $2Na_3PO_4$ is

$3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2\downarrow + 6NaCl$

The moles of $BaCl_2$ used is $\frac{3}{2}$ times the moles of Na_3PO_4.

∴ To react with 0.4 mol of Na_3PO_4, required moles of $BaCl_2$ would be $0.4 \times \frac{3}{2} = 0.6$.

By 2 moles of $BaCl_2$, 1 mole of $Ba_3(PO_4)_2$ is formed. Thus

Therefore, by 0.4 moles of Na_3PO_4, $0.4 \times \frac{1}{2} = 0.2$ mole of $Ba_3(PO_4)_2$ is formed.

12. In an aqueous solution of barium nitrate, the $[NO_3^-]$ is 0.080M. This solution can be labeled as

(a) 0.040 N $Ba(NO_3)_2$ (b) 0.160 M $Ba(NO_3)_2$

(c) 0.080 N $Ba(NO_3)_2$ (d) 0.080 M NO_3^-

Answer: (c)

In $Ba(NO_3)_2$, the molar ratio of $Ba(NO_3)_2$ to NO_3^- is 1 : 2.

Therefore, the molarity of the $Ba(NO_3)_2$ solution is

$\frac{1}{2} \times 0.080 = 0.040M$

As n−factor of $Ba(NO_3)_2$ is 2, its Normality will be 0.080 N.

13. 100 ml of each of 0.5 N NaOH, N/5 HCl and N/10 H_2SO_4 are mixed together. The resulting solution will be

(a) Acidic (b) Neutral (c) Alkaline (d) None

Answer: (c)

Meq. of NaOH $= 100 \times 0.5 = 50$

Meq. of HCl $= 1 \times \frac{1}{5} 100 = 20$

Meq. of $H_2SO_4 = \frac{1}{10} \times 100 = 10$

Total meq. of acid = 20 + 10 = 30

Total meq. of NaOH = 50

$\therefore$ meq. of NaOH left $= 50 - 30 = 20$

14. In an experiment, 50 ml of 0.1M solution of a salt reacted with 25 ml of 0.1M solution of Sodium sulphite. The half equation for the oxidation of sulphite ion is:

$SO_3^{2-}(aq) + H_2O(l) \rightarrow SO_4^{2-}(aq) + 2H^+(aq) + 2e^-$

If the oxidation number of the metal in the salt was 3, what would be the new oxidation number of the metal?

(a) 4 (b) 1 (c) 2 (d) 0

Answer: (c)

SO_3^{2-} get oxidised and its 'n' factor is 2.

The metal must have been reduced.

Applying the law of equivalence

$50 \times 0.1 \times (3 - n) = 25 \times 0.1 \times 2$

n = 2

15. In the balanced chemical reaction, $IO_3^- + aI^- + bH^+ \rightarrow cH_2O + dI_2$. a, b, c and d respectively correspond to

(A) 5, 6, 3, 3 (B) 5, 3, 6, 3

(C) 3, 5, 3, 6 (D) 5, 6, 5, 5

Answer: (A)

$IO_3^- + aI^- + 6H^+ \rightarrow cH_2O + dI_2$

Step-1, $I^- \rightarrow I_2$ (Oxidn), $IO_3^- \rightarrow I_2$ (Redn)

Step-II $2IO_3^- + 12H^+ \rightarrow I_2 + 6H_2O$

Step-III, $2IO_3^- + 12H^+ + 10e^- \rightarrow I_2 + 6H_2O$

$2I^- \rightarrow I_2 + 2e^-$

Step-IV, $2IO_3^- + 12H^+ + 10e^- \rightarrow I_2 + 6H_2O$

$[2I^- \rightarrow I_2 + 2e^-] \times 5$

Step-V, $2IO_3^- + 10I^- + 12H^+ \rightarrow 6I_2 + 6H_2O$

$IO_3^- + 5I^- + 6H^+ \rightarrow 3I_2 + 3H_2O$

On comparing a = 5, b = 6, c = 3, d = 3

16. Oxidation state of 'V' in $Rb_4Na[HV_{10}O_{28}]$ is

(A) + 5 (B) + 6 (C) 7+ 5 (D) + 4

Answer: (A)

$4(+1)+(+1)+(+1)+10x+28(-2)=0$

$\Rightarrow 10x = 50 \quad \Rightarrow x = +5$

17. O.N. of V in $Rb_4Na[HV_{10}O_{28}]$is-

(A) + 3 (B) + 5 (C) + 4 (D) zero

Answer: (B)

O.N. of Rb = + 1

O.N. of Na = + 1

O.N. of H = + 1

Let O.N. of V = x

O.N. of O =−2

$\therefore \quad 5+1+10x-56=0$

10 x = 50

or x = + 5

18. In a reaction $H_2O+C \rightarrow CO+H_2$

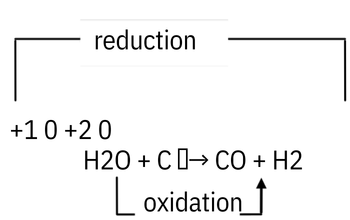
(A) $H_2O$is the reducing agent

(B) $H_2O$is the oxidising agent

(C) Carbon is the oxidising agent

(D) Oxidation-reaction does not occurs

Answer: (B)



$\therefore H_2O$ is the oxidising agent. C is the reducing agent.

19. In which of the following reaction (s) H_2SO_4 act as an oxidising agent and as well as acid?

(A) $C_{12}H_{22}O_{11} + H_2SO_4 \rightarrow 12C + 11H_2O$

(B) $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$

(C) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$

(D) All of the above

Answer: (C)

$Cu + H_2SO_4 \rightarrow CuO + H_2O + SO_2$ (H_2SO_4 act as oxidant)

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ (H_2SO_4 act as acid)

20. In a reaction, 3 moles of electrons are gained by 1 mole of HNO_3.assuming no change in O.N. of hydrogen and oxygen, the possible product obtained due to reduction will be

(A) 1 mole of NO_2
(B) 0.5 mole of N_2O
(C) 1 mole of NO
(D) 0.5 mole of N_2O_3

Answer: (C)

O.N. of N in the product $= +5 - 3 = +2$

Hence product is NO

21. If x gm is the mass of $NaHC_2O_4$ required to neutralise 100 ml of 0.2 (M) NaOH and y gm that required to reduce 100 ml of 0.02 (M) $KMnO_4$ in acidic medium, then

(A) x = y
(B) 2x = y
(C) x = 4y
(D) 4x = y

Answer: (C)

Let mol wt. of $NaHC_2O_4 = M$

$\therefore \frac{x}{M} = 100 \times 0.2 \times 10^{-3} = 20 \times 10^{-3}$ ...(I)

$\frac{2}{5} y \times \frac{\ }{M} = 100 \times 0.02 \times 10^{-3} = 2 \times 10^{-3}$ ...(II)

Dividing equation (I) by equation (II)

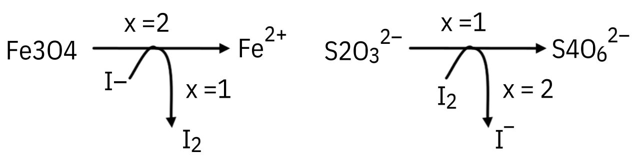
$\frac{5}{2} \times \frac{x}{y} = 10$

or x = 4y

22. 10^{-2} moles of Fe_3O_4 is treated with excess of KI solution in presence of dilute H_2SO_4, the products are Fe^{2+} and $I_2(g)$. What volume of 0.1 (M) $Na_2S_2O_3$ will be needed to reduce the liberated $I_2(g)$?

(A) 50 ml (B) 100 ml (C) 200 ml (D) 400 ml

Answer: (C)



$\therefore Fe_3O_4 + 2I^- \rightarrow Fe^{2+} + I_2$

$\therefore$ no. of moles of I_2 produced $= 10^{-2}$ moles

Let v ml 0.1 (M) $Na_2S_2O_3$ solution is required

$\therefore v \times 10^{-4} = 2 \times 10^{-2}$

or v = 200 ml.

23. The molecular formula of a non-stoichiometric tin oxide containing Sn (II) and Sn (IV) ions is $Sn_{4.44}O_8$. Therefore, the molar ratio of Sn (II) to Sn (IV) is approximately

(A) 1 : 8 (B) 1 : 6 (C) 1 : 4 (D) 1 : 1

Answer: (C)

Let in one mole of the given substance the number of moles of Sn (II) = x moles and number of moles of Sn (IV) = y moles.

∴ $x + y = 4.44$ and $2x + 4y = 16$

By solving $x = 0.88$ and $y = 3.56$

∴ Mole ratio of Sn (II) to Sn (IV) is 0.247:1 ≈ 1:4

24. Which of the following process represents disproportionation?

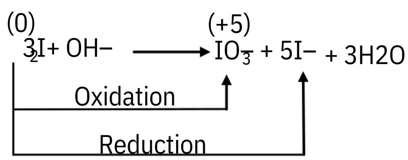
(A) $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$

(B) $3I_2 + 6OH^- \rightarrow IO_3^- + 5I^- + 3H_2O$

(C) $Cl_2 + I_2 \rightarrow 2ICl$

(D) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Answer: (B)



25. 25 ml of a solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave a titre value of 35ml. the molarity of barium hydroxide solution was

(a) 0.14 (b) 0.28 (c) 0.35 (d) 0.07

Answer: (d)

$25 \times N = 0.1 \times 35$; $N = 0.15$

As $Ba(OH)_2$ is diacid base, its n-factor is 2.

Hence $N = M \times 2$ or $M = \frac{N}{2}$

∴ M = 0.07 M

26. The density (in $g\ mL^{-1}$) of a 4.48 M sulphuric acid solution that is 40% H_2SO_4 (molar mass = 98 g mol^{-1}) by mass will be

(a) 1.10 (b) 1.01 (c) 1.50 (d) 1.32

Answer: (a)

Since molarity of solution is 4.48 M. It means 4.48 moles of H_2SO_4 is present in its 1 litre solution.

Mole = $\frac{W_{Sul.Acid}}{M_{Sul.Acid}}$

Mass of 4.48 moles of H_2SO_4 = 4.48 × 98g = 440g

∴ 440g of H_2SO_4 is present in 1000ml solution

Given that sulfuric acid is 40% that means, 40g of H_2SO_4 is present in 100 g of solution.

Thus,

440g of H_2SO_4 is present in $= \frac{100}{40} \times 440g = 1100g$ of solution

Density $= \frac{Mass}{Volume} = \frac{1100}{1000} = 1.1 g/ml$

27. To neutralize completely 20 mL of 0.1M aqueous solution of phosphorous acid (H_3PO_3), the value of 0.1M aqueous KOH solution required is

(a) 40 mL (b) 20 mL (c) 10 mL (d) 60 mL

Answer: (a)

$N_1V_1 = N_2V_2$ (H_3PO_3 is dibasic ∴ M = 2N)

$20 \times 0.2 = 0.1 \times V$

∴ V = 40 ml

28. 0.25 g of a substance is dissolved in 6.25 g of a solvent. Calculate the percentage amount (by mass) of the substance in the solution.

(a) 3.85% (b) 6.85% (c) 48.5 % (d) 91.2 %

Answer: (a)

Mass of solute = 0.25 g

Mass of solvent = 6.25 g

Mass of solution = 0.25 +6.25 = 6.50 g.

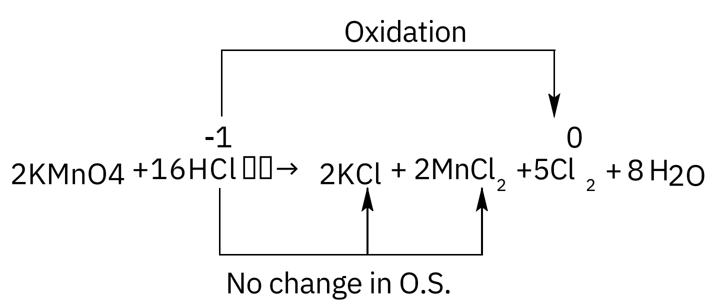
Percentage amount of the solute = $\frac{0.25}{6.50} \times 100 = 3.85\%$

29. What is the equivalent mass of HCl in the given reaction:

$2KMnO_4 + 16\ HCl \rightarrow 2KCl + 2MnCl_2 + 5Cl_2 + 8H_2O$

(a) $\frac{M}{1}$ (b) $\frac{M}{10}$ (c) $\frac{8M}{5}$ (d) none of these

Answer: (c)



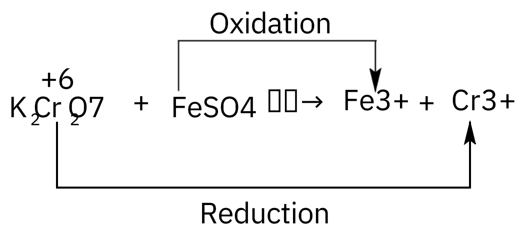
As only 10 moles of Cl− ions undergoes oxidation, n − factor of HCl will be = $\frac{10}{16} = \frac{5}{8}$

Equivalent weight of HCl $= \frac{\text{Molar Mass}}{\text{n−factor}} = \frac{M}{5/8} = \frac{8M}{5}$

30. In the titration of $K_2Cr_2O_7$and ferrous sulphate, following data is obtained: V_1mlof M_1 molar $K_2Cr_2O_7$ requires V_2ml, M_2 molar $FeSO_4$which of the following relations are true:

(a) $6M_1V_1$ [illegible] M_2V_2 (b) M_1V_1 [illegible] $6 M_2V_2$ (c) N_1V_1 [illegible] N_2V_2 (d) M_1V_1 [illegible] M_2V_2

Answer: (a)



No. of equivalent of $K_2Cr_2O_7$=no.of equivalents of $FeSO_4$

$(n-\text{factor})_2 \times M_2 \times V_2 = (n-\text{factor})_1 \times M_1 \times V_1$

$6 \times M_2 \times V_2 = 1 \times M_1 \times V_1$

Therefore, $M_1V_1=6M_2V_2$

31. Find the weight of KOH in its 50 milli equivalents

(a) 1.6 (b) 2.2 (c) 2.8 (d) 4.8

Answer: (c)

- $\text{Meq} = \frac{\text{weight} \times 1000}{\text{Eq.wt.}} \Rightarrow 50 = \frac{\text{weight} \times 1000}{56}$

$\therefore$ Weight of KOH = 2.80 g

32. The number of neutrons in a drop of water (20 drops = 1mL) at 4°C

(a)6.023×1022 (b) 1.338×1022

(c)6.023×1020 (d) 7.338×1022

Answer: (c)

Mass of a drop of water = 0.05×1 g = 0.05 g

No. of moles of water = $\frac{0.05}{18}$

No. of water molecules = $\frac{0.05}{18}$×6.023×1023

1 water molecule certain 8 neutrons

∴ $\frac{0.05}{18}$×6.023×1023 molecule certain $\frac{0.05}{18}$×8×6.023×1023neutrons

= 0.1338×1023 = 1.338×1022

33. Weight of 1 atom of an element is 6.644×10-23 g. What is number of atoms of element in 40 kg of it?

(a) 103g atom (b) 102g atom

(c) 104g atom (d) 10 g atom

Answer: (a)

Weight of Avogadro number (N) of atoms of the element

= 6.644×10-23×6.023×1023 = 40 g

40 g = weight of 1g atom

∴40×103 g = weight of 103 g atom

34. A compound contains one oxygen atom, whose percentage is 34.78%. The mol wt. of the compound is

(a) 56 (b) 50 (c) 36 (d) 46

Answer: (d)

Molecular weight of Oxygen is 16 and its % in compound is 34.78

Thus,
$$34.78 = \frac{\text{Molecular weight of } O_2}{\text{Total weight of compound}} \times 100 = \frac{16}{\text{Total weight of compound}} \times 100$$
$$\text{Total weight of compound} = \frac{16}{34.78} \times 100 = 46$$

35. No. of oxalic acid molecules in 100 ml of 0.02 N oxalic acid are

(a) 6.023×10^{20} (b) 6.023×10^{21}

(c) 6.023×10^{22} (d) 6.023×10^{23}

Answer: (a)

Normality = Molarity × Valence factor

$\therefore$ Molarity = $\frac{\text{Normality}}{\text{Valence factor}}$

Valence factor for oxalic acid = $\frac{\text{mol. wt. of oxalic acid}}{\text{Eq. wt. of oxalic acid}}$

Molarity = $\frac{0.02}{2} = 0.01$

Number of millimoles = 0.01×100

Number of moles = 0.001

$\therefore$ No. of oxalic acid molecules = $0.001\times6.023\times10^{23} = 6.023\times10^{20}$

36. 112 ml of a gas is produced at S.T.P. by the action of 4.12 mg of alcohol ROH with CH_3MgI. The molecular mass of alcohol is

(a) 32 g (b) 41.2 g (c) 82.4 g (d) 156 g

Answer: (c)

$ROH + CH_3MgI \rightarrow CH_4 + Mg$

1 mole

1 mole

So the gas produced is CH_4. 1 mole CH_4 will be produced from 1 mole of alcohol

$\therefore$ 22.4 lit CH_4 will be produced by mol.wt. of alcohol

112 ml CH_4 is produced from 4.12 mg of alcohol

$\therefore$ 22400 ml CH_4 is produced from $\frac{412 \times 22400}{112}$ mg

= 82400 mg = 82.4 g

So ,Mol.wt. of alcohol = 82.4 g

37. A 10.0 g sample of a mixture of calcium chloride and sodium chloride is treated with Na_2CO_3 to precipitate the calcium as calcium carbonate. This $CaCO_3$ is heated to convert all the calcium to CaO and the final mass of CaO is 1.62 gms. The % by mass of $CaCl_2$ in the original mixture is

(a) 15.2% (b) 32.1% (c) 21.8% (d) 11.07%

Answer: (b)

Moles of CaO = $\frac{1.62}{56}$

$\Rightarrow$ Moles of $CaCl_2 = \frac{1.62}{56}$

$\Rightarrow$ Mass of $CaCl_2 = \frac{1.62}{56} \times 111 = 3.21$ gm $\Rightarrow$ % = $\frac{3.21}{10} \times 100$ = 32.1%

38. Equal volumes of 1 M each of $KMnO_4$ and $K_2Cr_2O_7$ are used to oxidise Fe(II) solution in acidic medium. The amount of Fe oxidized will be

(a) more with $KMnO_4$

(b) equal with both oxidizing agents

(c) more with $K_2Cr_2O_7$

(d) cannot be determined

Answer: (c)

The 'n' factor of $KMnO_4$ is 5 while that of $K_2Cr_2O_7$ is 6. So for the same number of moles, $K_2Cr_2O_7$ will have greater equivalence than $KMnO_4$.

39. How many millilitre of 0.5 M H_2SO_4 are needed to dissolve 0.5 g of Cu(II) carbonate?

(a) 6.01 (b) 4.5 (c) 8.1 (d) 11.1

Answer: (c)

$0.5 \times 2 \times V = \frac{0.5 \times 2 \times 1000}{123.5}$ (Eq. wt. of $CuCO_3 = M/2$)

V = 8.097 = 8.1

40. O.N. of V in $Rb_4Na[HV_{10}O_{28}]$ is-

(a) + 3 (b) + 5 (c) + 4 (d) zero

Answer: (b)

O.N. of Rb = + 1

O.N. of Na = + 1

O.N. of H = + 1

Let O.N. of V = x

O.N. of O = − 2

 5 + 1 + 10x − 56 = 0

10 x = 50

or x = + 5

41. When an alkaline solution of K_2CrO_4 is treated with 3% H_2O_2 solution, red brown paramagnetic peroxochromate is obtained as per following equation.

$2K_2CrO_4 + 7H_2O_2 + 2KOH \rightarrow 2\,K_3CrO_8 + 8\,H_2O$

The equivalent weight of K_2CrO_4 for above transformation must be (assuming M is the molar mass of K_2CrO_4)

(a) $\frac{M}{16}$ (b) M (c) $\frac{M}{12}$ (d) $\frac{M}{2}$

Answer: (b)

Oxidation of Cr in K_3CrO_8 = V

$Cr^{+6} \rightarrow Cr^{+5}$

Equivalent mass = $\frac{M}{1}$

42. In which of the following reaction (s) H_2SO_4 act as an oxidising agent and as well as acid?

(a) $C_{12}H_{22}O_{11}$ H2SO4→ 12C + $11H_2O$

(b) S + $2H_2SO_4$ → $3SO_2 + 2H_2O$

(c) Cu + $2H_2SO_4$ → $CuSO_4 + SO_2 + 2H_2O$

(d) All of the above

Answer: (c)

$Cu + H_2SO_4 \rightarrow CuO + H_2O + SO_2$ (H_2SO_4 act as oxidant)

$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ (H_2SO_4 act as acid)

43. In a reaction, 3 moles of electrons are gained by 1 mole of HNO_3. Assuming no change in O.N. of hydrogen and

oxygen, the possible product obtained due to reduction will be-

(a) 1 mole of NO_2 (b) 0.5 mole of N_2O

(c) 1 mole of NO (d) 0.5 mole of N_2O_3

Answer: (c)

O.N. of N in the product = + 5 – 3 = + 2

Hence product is NO

44. Which reaction does not involve either in oxidation or reduction?

(a) $VO_2^+ \rightarrow V_2O_3$ (b) $Na \rightarrow Na^+$

(c) $CrO_4^{2-} \rightarrow Cr_2O_7^{2-}$ (d) $Zn^{2+} \rightarrow Zn$

Answer: (c)

$2Cr^{6+} \rightarrow Cr_2^{6+}$; Neither oxidation nor reduction.

45. The reaction, $3ClO^-(aq) \rightarrow ClO_3^-(aq) + 2Cl^-(aq)$ is an example of -

(a) oxidation reaction

(b) reduction reaction

(c) disproportionation reaction

(d) decomposition reaction

Answer: (d)

Cl atom is oxidized ($Cl^{1+} \rightarrow Cl^{5+} + 4e$) as well as Cl atom is reduced ($Cl^{1+} + 2e \rightarrow Cl^-$). Such reactions are called auto redox or disproportionation reactions.